Ageing outcomes in women and men in Ireland: the role of the religious social context

PhD Thesis

Submitted: 30th April 2020

Joanna Orr MSc

Supervisors:

Rose Anne Kenny & Christine McGarrigle

Declaration

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work. I agree to deposit this thesis in the University's open access institutional repository or allow the Library to do so on my behalf, subject to Irish Copyright Legislation and Trinity College Library conditions of use and acknowledgement. I consent to the examiner retaining a copy of the thesis beyond the examining period, should they so wish (EU GDPR May 2018).

This thesis uses data from The Irish Longitudinal Study on Ageing (TILDA).

Joanna Orr

Signed:

Date:

Acknowledgements

I would like to acknowledge the great contribution to knowledge and research made by all the participants of the Irish Longitudinal Study on Ageing (TILDA). Their commitment, time and effort has ensured the creation of a high-quality dataset which has already had a large impact on public health in Ireland. I also would like to thank the eleven women who consented to be interviewed for the qualitative section of this thesis. Apart from gracefully allowing me to ask them questions about their lives and providing rich, engaging data, their insight was invaluable in shaping my understanding of their Ireland.

I am very grateful to the Irish Research Council for funding this PhD project.

I also would like to thank my friends and family for their unending support. In particular, Paula, Leo, Tom, Siobhan, Deirdre, Louise, Carlijn and Sinead for proofreading, Eileen and George for the moral support, Victor for constant encouragement and patience, and Aymara for being my biggest motivation and favourite distraction.

Finally, I owe thanks to the whole TILDA team, including nurses, researchers and administrative staff. The knowledge and collaboration within TILDA have made it a wonderful place to spend the last few years and I have learned so much. Special thanks to Dan Carey, Katy Tobin and Mark Ward, as well as Linda Hogan. Most of all, thank you to my two brilliant supervisors, Rose Anne Kenny and Christine McGarrigle. They both encouraged me to take this project on and guided me throughout, and it would not have been completed without them. I am so grateful to them both.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

ADL = Activities of Daily Living (limitations)

BMI = Body Mass Index

CAPI = Computer Assisted Personal Interview

CASP = Control, Autonomy, Self-realisation and Pleasure Scale of quality of life

CES-D = Centre for Epidemiologic Studies Depression Scale

CFI = Comparative Fit Index

CI = Confidence Interval

ELSA = English Longitudinal Study on Ageing

EOL = End-of-Life Interview

ESS = European Social Survey

GCM = Growth Curve Models

HR = Hazard Ratio

HRS = Health and Retirement Study

HRT = Hormone Replacement Therapy

IADL = Instrumental Activities of Daily Living (limitations)

ISSP = International Social Survey Programme

LGCA = Latent Growth Curve Analysis

MAR = Missing At Random (data)

MMSE = Mini-Mental State Examination

QoL = Quality of Life

RMSEA = Root Mean Square Error of Approximation

RRR = Relative Risk Ratio

SCQ = Self-Completion Questionnaire

SD = Standard Deviation

SHARE = Survey of Health and Retirement in Europe

TILDA = The Irish Longitudinal Study on Ageing

TLI = Tucker-Lewis Index

TUG = Timed Up-And-Go

WHO = World Health Organization

Thesis Abstract

Aim & background: The aim of this thesis is to explore how the religious social context in Ireland has helped shape the health and ageing outcomes of older women and men. Understanding the factors behind the ability to maintain physical, cognitive and psychosocial wellbeing is crucial in the context of rapidly aging populations. Research recognises differences in health trajectories for men and women, but there is a lack of understanding of the mechanisms behind the role of gender in ageing. Within the Irish context, the impact of social and individual religiosity on women's social roles and ageing outcomes are particularly important. The effects of religiosity on health have been widely studied, but little consensus exists on the pathways that link religiosity and ageing.

Methods: Four studies were conducted using nationally representative data from The Irish Longitudinal Study on Ageing (TILDA). Data was analysed using multilevel modelling techniques to longitudinally test causal relationships between religious belief and practice, parity and ageing outcomes in older Irish men and women. A fifth study combined quantitative data from TILDA with qualitative data from Irish women aged 65 and over. Qualitative data was collected to complement and further illuminate results from the quantitative phase in a mixed methods analysis of wellbeing in later life.

Results: Findings of both quantitative and qualitative data showed that religion and the religious social context are associated with health in late life through complex pathways. Religious attendance in those who are religious was found to be the factor most strongly associated with health. More frequent religious attendance was associated with lower mortality risk, lower depressive symptoms and higher wellbeing. Results for a link between religious attendance and physical function and cognition were inconclusive. Qualitative data suggested the positive associations of religious attendance may be explained by social connectedness and psychological benefits. However, qualitative data also illustrated possible negative effects of religiosity in Ireland.

Conclusion: Religious involvement in those who are religious is likely to be related to health outcomes through social connectedness and other factors which support physical and mental health in Ireland.

Lay Abstract

This thesis has aimed to better understand the way religion in Ireland has impacted on older persons' health and wellbeing. International research has often linked religion and health. Though a lot of the evidence suggests religious persons, or those who are more involved in their religion, have better mental and physical health, there is no real consensus in this area yet. Further, in Ireland the religious context has had a big impact on many areas of people's, in particular women's, lives. For example, women in Ireland had larger families and were less likely to work outside the home than many of their European counterparts. I used nationally representative data from The Irish Longitudinal Study on Ageing (TILDA), alongside data from in-depth interviews with Irish religious women, to better understand how the religious context could affect their health and lives. I found that religious involvement, in the form of church attendance, is associated with better mental health, higher wellbeing and lower mortality. These effects were small, but significant. There were some indications that religious attendance could be related to physical and cognitive function, although these results were mixed. In most cases, however, there were no health differences between those who are religious and those who have no religion. Results from in-depth interviews suggested some religious women experience positive mental health benefits from religious service attendance. Others benefited from the social connections and social opportunities connected with being part of a church community. There were also some indications that being religious in Ireland is not always positive. This could help better understand why some results in religion-health research are mixed. In conclusion, the Irish religious context has helped shape the lives of the older population. Most who are religious experience this positively, however there are ways in which the context could be harmful to some.

Aims and Hypotheses

General aim: To explore how the religious social context in Ireland has helped shape women and men's health and ageing outcomes.

Aim 1:
To test whether high parity in the highly religious Irish context is associated with mortality risk.

Aim 2:
To test longitudinal associations between religious affiliation, non-affiliation and attendance, and objective physical function.

Aim 3:
To test longitudinal associations between religious attendance, religious importance and depressive symptoms, and whether social network mediates these effects.

Aim 4:
To test whether cognitive decline trajectories are associated with measures of religiosity.

Aim 5:
To test whether religiosity helps protect wellbeing in later life in the face of stressful life events, using quantitative and qualitative data.

Value of Research

This thesis constitutes the first time the religion-health link has been explored in the Irish context. This is important because of Ireland's social and religious context, with a majority of the Irish population classing themselves as Catholic. In the over 50s age group most still attend religious services regularly. Beyond the importance of understanding how the effects observed elsewhere play out in the Irish context, it is also important to assess how the changes in religious participation, behaviour and beliefs may affect older adults in Ireland's health and wellbeing, in the context of a secularizing population.

Findings from this thesis suggest that there are some benefits to continued religious involvement for those who are already religious. In particular, maintaining religious attendance may help maintain social networks, social support, access to activities and resources, and mental health resilience. This suggests that helping older persons maintain religious attendance, if so desired, may have public health and personal wellbeing benefits.

Outputs

Publications

Orr J, Kenny RA, McGarrigle C. Longitudinal Associations of Religiosity and Physical Function. 2020; Journal of the American Geriatrics Society. Published online ahead of print. doi:10.1111/jgs.16470

Orr J, Tobin K, Carey D, Kenny RA, McGarrigle C. Religious Attendance, Religious Importance, and the Pathways to Depressive Symptoms in Men and Women Aged 50 and Over Living in Ireland. 2019; Research on Aging 41(9):891-911 doi:10.1177/0164027519860270

Submitted for Publication

Orr J, Kenny RA, McGarrigle C. Higher parity is associated with lower mortality in a European population of women with high fertility: results from Ireland. (under second stage review for inclusion in special issue)

Orr J, Ward M, Kenny RA, McGarrigle, C. Mini-mental State Examination trajectories at age 50 and over: the role of religion and possible mediation through depressive symptoms, social network and smoking

Orr J, Kenny RA, McGarrigle, C. Religiosity and quality of life in older Christian women in Ireland. A mixed methods analysis

Presentations

Platform

Religious affiliation, religious attendance and physical function. TILDA Steering Committee Meeting. Dublin, Ireland. 17th September 2019

Religious affiliation, religious attendance and physical function. TILDA-GBHI Research Seminar. Dublin, Ireland. 10th September 2019

Women, religion and the social determinants of health: A mixed methods study of older women in Ireland. TILDA Scientific Advisory Board Meeting. Dublin, Ireland. 11th May 2018

Women, religion and the social determinants of health: A mixed methods study of older women in Ireland. Irish Gerontological Society Postgrad Day. Dublin, Ireland. 27th April 2018

Religious attendance, loneliness and depressive symptoms in middle aged and older women in Ireland. Society for Social Medicine Annual Scientific Meeting. Manchester, UK. 6th September 2017.

Religious participation and mental health: Associations in women aged 50 and over living in Ireland? International Spirituality in Healthcare Conference. Dublin, Ireland. 21st June 2017.

The relationship between religious attendance and depressive symptoms in women aged 50 and over. TILDA-ESRI Socioeconomic Working Group. ESRI Dublin, Ireland. 22nd March 2017.

Poster

Religious participation and health in a changing Ireland. A qualitative exploration of women aged 65 and over. Irish Gerontological Society Annual Scientific Meeting. Cork, Ireland. 27th September 2019.

Change in religious affiliation in middle aged and older adults in Ireland. What are the implications for health? Irish Gerontological Society Annual Scientific Meeting. Wexford, Ireland. 28th September 2017.

Media Coverage

Press

Bray. A. (2019, August 1). Going to church regularly decreases likelihood of depression in older people. *Irish Independent*. https://www.independent.ie/irish-news/news/going-to-church-regularly-decreases-likelihood-of-depression-in-older-people-new-study-finds-38366202.html

McGarry, P. (2019, August 1). Mass and depression: 'I am sorry for the young people. Where do they go?' *The Irish Times*. https://www.irishtimes.com/news/social-affairs/religion-and-beliefs/mass-and-depression-i-am-sorry-for-the-young-people-where-do-they-go-1.3974434

Houston, M. (2019, August 12). The complex relationship between religion and mental health. *The Irish Times*. https://www.irishtimes.com/life-and-style/health-family/the-complex-relationship-between-religion-and-mental-health-1.3977591

Radio

RTE Drivetime. Interview. 1st August 2019.

Kildare FM Kildare Today. Interview. 2nd August 2019.

Midwest Radio. Interview. 6th August 2019.

Spirit Radio Breakfast Show. Interview. 12th August 2019.

Chapter 1: Background

Chapter summary

This chapter outlines current knowledge of the association between religion and health, as well as providing a rationale for this thesis project by describing the Irish social and religious context. A theoretical framework for understanding these relationships in the Irish context is discussed, and the central and specific research aims are presented.

Chapter 1: Background

1.1 Introduction

The over 50s population in Ireland in the 2010s was born and raised in the early and mid-20th century. This period was a time of great social, economic and cultural change, and these changes shaped the population's lives and futures in countless ways. This thesis focuses on the Irish religious context, and its role in shaping ageing and health outcomes in the older population today. Religion has been shown to have complex direct and indirect associations with health. Religion arguably has a role in the maintenance of mental health and social participation, and it directly impacts on a number of areas of social and cultural life which themselves impact on health. This complex relationship has not been researched in the Irish context. Religiosity worldwide has been shown to be gendered, with differences in belief, practice and social significance in women and men's religion (1). In Ireland, religion has been experienced differently by gender (2, 3), and has been instrumental in shaping the life course of men and women. Research into women's health has become increasingly discussed in recent years, as the neglect in health research to consider women's specific health trajectories has been recognised (4). In this thesis I take a gendered approach, with a special focus on women's religiosity and ageing trajectories to assess the role of the Irish religious social context in shaping ageing outcomes.

1.1.1 How does the social context influence health?

While health is still primarily understood, researched and operationalised (in the form of treatment) within a biomedical framework, the hegemony of the biomedical model of health has been increasingly challenged in recent decades (5, 6). Holistic and biopsychosocial models of health have gained traction as ways of exploring and explaining the way health is maintained and threatened. A biopsychosocial model of health argues for the need to understand health as "affected by multiple levels of organization, from the societal to the molecular." (7). When researching health in the context of ageing, there is much to be gained not only from understanding the physiological processes which maintain health in later life, but the psychological and socio-environmental circumstances which interact with and influence these processes.

In the World Health Organization's (WHO) report on the social determinants of health (8), factors such as stress, early life, social support and food are outlined as social determinants of health. Differences in the risks, access to, and characteristics of these factors are socially determined, through socioeconomic status, but also other tangible and intangible social resources. In the report, Marmot and Wilkinson point out that:

Chapter 1: Background

> 'It is not simply that poor material circumstances are harmful to health; the social meaning of being poor, unemployed, socially excluded, or otherwise stigmatized also matters. As social beings, we need not only good material conditions but, from early childhood onwards, we need to feel valued and appreciated. We need friends, we need more sociable societies, we need to feel useful, and we need to exercise a significant degree of control over meaningful work.'

A simple example of how the social determinants of health might work in Ireland is access to the rural transport programme (9). Only 30% of women aged 75 and over drive regularly in Ireland (10). For an older widowed woman who doesn't drive access to this scheme (which facilitates small bus routes in rural areas, including a door-to-door pick up option) provides the opportunity for continued independence, social participation, access to fresh food, access to doctor's visits, among others. All of these have the potential to impact on her mental and physical health through contact with friends, adequate nutrition, physical activity, access to healthcare and enjoyment. Unfortunately, the programme does not cover all rural areas, and the planning for local services is carried out through a local consultation process (11). Therefore, access to these resources is not equal, and there are further potential social determinants to this access, such as the social capital of the community in which the woman lives, such as income, the level of education within the community, and knowledge of and participation in community issues. The woman's own social capital (closeness to friends, economic resources to hire private transport) also determine how important access to this scheme is.

Changes in health outcomes in later life have already been observed in Ireland due to wider social changes in access to education and fertility control over the last half a century:

> "Major social changes such as the introduction of free secondary schooling and the liberalisation of contraceptive laws are evident in educational attainment and fertility differences by age. […]. Low levels of economic growth which resulted in large-scale out migration is evident in the remarkably high proportion of former emigrants in the older population." (12)

Research into the social determinants of health often focuses solely on socioeconomic characteristics, such as wealth and social class, and extensions of these such as education. Socioeconomic factors are generally accepted as the most important social determinants of health, and ones which are often difficult to disentangle from biological and psychological factors. The WHO report outlined a number of health inequalities between high and low income countries, as well as between individuals and groups with low and high income within countries

Chapter 1: Background

(8). However, when we solely focus on the socioeconomic other factors can be overlooked. One of these factors is gender, which could be considered a biological, psychological and social determinant of health. A further factor is religion, which in countries such as Ireland has considerable importance. These factors are also confounded with socioeconomic position. This thesis will focus on systemic and individual social factors which are separate but related to social class, namely, gender and the religious Catholic social context in Ireland.

1.1.2 Women's health research

It is now well accepted that individuals' health can vary by sex at every level, including environmental, biological, and cellular (13). However, women were until recently systematically excluded from health research (4). While research on some largely female health conditions (female cancers, maternal conditions) has a wealth of evidence behind it, other areas of health have relied on largely male data to be equally applicable to females. For example, clinical trials for cardiovascular health have relied heavily on data on men, even though women represent half of all cardiovascular condition patients (14). Further, research into other female health conditions such as endometriosis remain underfunded (15).

This historical bias in medical research is currently being corrected, although it is not only biomedical research which long ignored sex and gender differences; the origins of sociology were principally concerned with the social causes and effects of power, class and religion, for example, but the differences between men and women were largely seen as given (3). Sex differences in the prevalence and presentation of disease can be attributed to physiological differences between men and women, in particular hormones, as well as cellular differences by sex (13). But paying particular attention to the differences between men and women's interaction with their environment and how these impact on their psychological and physiological health is also important. These interactions are determined by the social context, and the way the social context determines men and women's roles.

1.1.3 What do we know about gendered health outcomes in older age in Ireland?

In research worldwide, as well as in Ireland, differences have been observed in the ageing trajectories of men and women. Women have longer life expectancies than men, as well as having longer expected healthy life years, both worldwide and in Ireland; in 2016, women in Ireland had a life expectancy of 83 compared to 79 for men, and a healthy life expectancy of 73 compared to 71 for men (16). Although cardiovascular disease is the leading cause of death for both men and women, women have a lower prevalence of the disease (17). Women also report a higher prevalence of disabilities in Ireland, however this may be reflecting greater survival into older ages in women (18). In particular it has been shown that cognitive and mental health are

worse for older women, although different aspects of mental health and cognition appear to affect women and men differently (19). For example, Alzheimer's disease is more common in women, even beyond the effect of women's longevity compared to men (20). Gender is also a large determinant of a number of specific physical health conditions which affect people in older age (19). Finally, there are gender differences in social wellbeing too, with one third of older women in Ireland reporting supportive friendships, compared to only 16% of men (21). All this is evidence of gender and gender-related factors influencing ageing pathways, health and wellbeing outcomes.

Beyond these effects gender has, in Ireland as elsewhere, been a determinant for religiosity. Gendered social roles were solidified through the role of the Church in family and social life. Women had a special bond with the Church through their roles in the home as educators and reproducers of the next generation of Catholics (this is further discussed below in section 1.7.4.). The limited opportunities for women to participate in the labour market once they were married and had children meant that religious involvement took on many of the functions that paid work had for men; many women gained social networks, meaning and activities from their participation within the religious community. Results from the 2008 International Social Survey Programme (ISSP) illustrate this; when asked to describe how often their mothers and fathers had attended church when the respondent was a child, the majority responded once a week (71% for both mothers and fathers). However, fathers were more likely than mothers to never attend, or attend infrequently, while mothers were more likely to attend more than once a week (22).

1.2 Religion and health

The possible relationship between religion and health has a long and complex history. While empirical research now largely supports a positive association between religious involvement and better health outcomes (although the mechanisms and causality of this association are still disputed), scientific enquiry into the possibility of a link is relatively new. Religious practice has been linked to health throughout human history; in the world as in Ireland, religious groups were among the first to take responsibility for caring for the sick (23). This has declined in modernity, due in part to the social provision of health, leaving the role of religion in health up for question. Further, it could be argued that religion was the first epidemiologically studied social determinant of health, through Durkheim's study on religious affiliation and suicide (24).

Religious involvement, belief and spirituality have been examined as predictive factors for physical health, mental health, cognitive health and mortality. Results from a wide range of cross-sectional and longitudinal studies have shown that there is a relationship between some

Chapter 1: Background

aspect or aspects of religious practice and health. Associations have been shown with a number of objective physical health outcomes, notably, reduced cardiovascular and all-cause mortality in healthy populations (25), blood pressure, and immune system functioning (26). While associations with mental health aspects such as optimism and coping are widely reported (23), many studies have found both negative and positive relationships of religiosity and mental health (27-29). Similarly, while there have been reports of a protective effect of religiosity on cognition in older age (30), other longitudinal studies in different populations have contradicted these findings (31).

Many areas of religiosity's association with health are yet to be fully understood. Even within the well supported association between religion and some aspects of mental health, there is little consensus on what the mechanisms behind these associations are. While some research has found a stronger link between private spiritual practice (for example meditation) and health (26), many studies stress the importance of organizational participation, generally measured in church attendance (25, 32). Results have also varied in different populations, suggesting socio-cultural factors moderate these associations. For example, stronger links between religion and better health outcomes have been found in Black Americans (32, 33). Some evidence also exists for behavioural pathways between religion and health, although these have also been found to be more salient for specific populations, and there is further need to understand the mechanisms behind them (29, 34). Religious practice as a coping mechanism to face ageing or adverse life circumstance is another plausible mechanism for the positive effect of religiosity (27). However, it has been difficult to disentangle the effects of social involvement in religious activity and private coping through religion.

Broadly, the literature has identified a number of interconnected pathways through which religiosity could have an effect on health; psychological, social or behavioural (35). In their comprehensive work on this link, Koenig and colleagues develop a number of theoretical hypothetical frameworks (23). These are differentiated by the system of belief: Western monotheistic, Eastern mono, poly, pan and non-theistic, and secular humanism. The current thesis examines the relationship of largely Catholic and Christian religion with health in Ireland, a Western monotheistic religious context. The Western Monotheistic theoretical framework of religion and health argues that the ultimate source of the link between religion and physical health is the individual's belief, relationship and attachment to God (Figure 1). It is this source relationship which is then directly and indirectly linked to better health.

The study of the link between religion and health makes sense in the context of ageing. Older adults are known to have stronger religious beliefs and religious practice, beyond cohort effects

Chapter 1: Background

(36, 37). At the same time, older age is a time when many individuals experience health challenges and multimorbidity. The large number of studies that have been carried out exploring the relationship between religion and health in older age have mostly supported a positive link between higher religiosity and better mental and physical health (23, 38, 39). A multidimensional disengagement theory has been found to be supported by the evidence around religion, health and ageing (39, 40). This theory argues that as part of the ageing process, some older adults begin to disengage with formal religious organization and begin to favour informal, private religious activities. This is hypothesised to be related to physical and practical barriers to religious attendance due to increasing age and physical impairments. These declines in formal religious participation and simultaneous increases in private religious practice are accompanied by poorer health, confounding the relationship between religion and health.

Chapter 1: Background

Figure 1. Koenig et al's Theoretical model of causal pathways to physical health, for Western monotheistic religion s (Christianity, Islam, Judaism). (Koenig et al. 2012)(23)
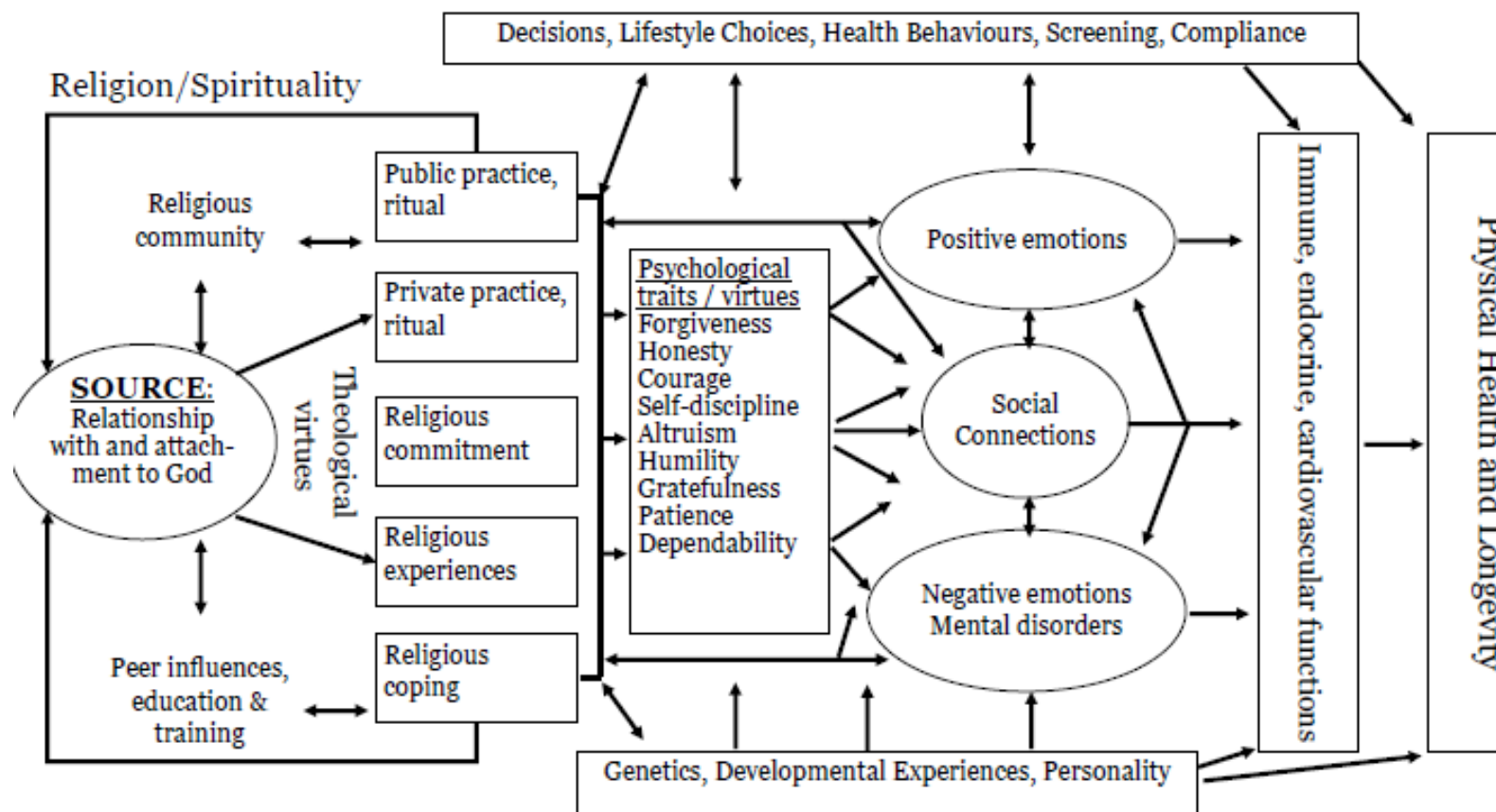
Chapter 1: Background

1.2.1 Spirituality vs religion: Definitions

Religion, religious involvement, and spirituality are complex social phenomena; they do not only include one aspect of social and personal life, but span many, and in many contexts all, areas of life. Religiosity remains poorly understood; what we mean by being religious continues to be explored, as does how we measure the extent of religiosity (41, 42). For this reason, much of the research into religiosity includes different domains or measurements to try to disentangle and clarify these effects. For example, the majority of studies might include a number of different measures of religiosity. These include affiliation, measuring belonging to a social group and theistic tradition, culture and history; attendance, measuring the frequency of involvement with religious events, worships, services; religious importance, measuring feelings of closeness to God or another deity, the strength of this relationship and how important this tradition and practice is to the respondent; as well as number of other religious, social and psychological measures which aim to get at the latent construct of 'religiosity'.

Although there has been much discussion around the different concepts of 'religion' and 'spirituality', there is a lack of consensus on the exact boundaries of the definitions of each. Spirituality in particular has defied exact definitions, with many choosing to not use the concept of spirituality at all, or explicitly choosing to use religion and spirituality interchangeably (23). Religion is generally accepted to involve the beliefs and practices related to the *transcendent*, Higher Power, or deity (God in Christian and Catholic tradition) (23). It is "an organized system of beliefs, practices, and symbols designed (a) to facilitate closeness to the transcendent, and (b) to foster an understanding of one's relationship and responsibility to others living together in a community." The concept of religion is generally agreed upon in the field of religion and health (23, 43, 44).

Spirituality also concerns the *transcendent,* and by most definitions has a large overlap with religion. Koenig and colleagues defined spirituality as a characteristic of the highly religious, which is the historical understanding of the concept (23). However, this is not the way spirituality is conceptualised in many other studies of the link between religion, spirituality and health. Spirituality in current popular usage is often used as a self-defined and loose form of religion. The word tends to be used instead of religion, in part due to the modern negative connotations of religiosity (23). Koenig and colleagues also point out an important problem with the use of spirituality. Because of a lack of clarity in the definition of spirituality, there has been a tendency in research to use concepts such as meaning and purpose in life, peacefulness and gratitude as aspects of spirituality. This then makes it more likely for those who measure

Chapter 1: Background

high in spirituality to measure high in these positive mental health characteristics, and therefore other positive mental health measures such as wellbeing.

It is not within the scope of this thesis to unpack the meaning and implications of the use of religion versus the use of spirituality. The social context in Ireland, as well as the age group being studied, suggests the use of religion is more appropriate. I therefore use religion, and the facets of religiosity, as the determinant of health under study within this thesis.

1.2.2 Religion and mental health

The link between religion and mental health is possibly the most well supported religion-health association. Increased religiosity has been consistently shown to be associated not only with increased happiness, wellbeing, optimism, quality of life and other types of positive affect, but also with decreased depressive symptomatology, decreased anxiety and anxiety disorders, decreased probability of suicide and decreased substance abuse prevalence (23, 45, 46). This picture is somewhat complicated by the fact that a relatively high number of studies also found higher negative mental health outcomes in the more religious. For example, Koenig and colleagues' review of the literature found that 11% of studies on anxiety found a positive association between religiosity and anxiety, compared to 49% that found a negative association, and 23% of studies of psychotic disorders found a positive association with religiosity, compared to 33% that found a negative association (23).

Early theory and research on the religion-mental health link suggested that religious belief could cause and aggravate mental illness, with cases of schizophrenia, hallucinations and extreme mental distress often presenting alongside high religious fervour (23). Studies looking at the association regularly reported increased risk of mental distress in the more religious; however, these studies relied on student or psychiatric clinical populations (47). Once studies started including healthy, community-dwelling, representative samples, results began to change.

A meta-analysis found that the overall association between religion and better mental health was positive, but also found that effects varied by type of religiosity explored and mental health outcome (48). Thus, while institutional religion, ideological religion and personal devotion were all positively associated with life satisfaction, only institutional religion was positively associated with low psychological distress. Personal devotion was negatively associated with low psychological distress, making the overall association between religiosity measures and low psychological distress negative. This shows that although most aspects of religion are associated with better mental health, this relationship is complex and the measures used for both

religion and mental health, as well as the mechanisms linking them, need to be carefully considered.

Several mechanisms have been suggested for the relationship between religion and mental health. Among them are behavioural and social mechanisms, where better health and social behaviours associated with religiosity positively impact on mental health. One of the most important mechanisms suggested to be responsible for the religion-mental health association is coping. A large number of studies have found that religion is a commonly used strategy for coping with difficult life events such as illness, bereavement and hardship (49). Pargament and colleagues have suggested that religious coping can be both negative and positive. Negative religious coping is related to a fearful relationship with God, feelings of punishment, and focus on shame and guilt (50). Positive religious coping relates to trusting in a higher meaning, believing that everything is 'for a reason', and feeling loved by God. Further, the effectiveness of religious coping in protecting mental health depends on the type of religious coping utilized (27). However, positive coping is more widely used, and use of positive religious coping tends to neutralise the negative effect of negative religious coping.

1.2.3 Religion and physical health
The link between religion and physical health is less well supported than that of religion and mental health, however, the weight of the evidence generally suggests a positive effect of religion on physical health. Positive associations have been found in a majority of studies examining religion and lowered mortality risk, better self-rated health, fewer physical impairments, better immune system function and improved blood pressure (23, 25, 51, 52), although some more recent studies have suggested that there are both negative and positive associations between religion and cardiovascular health, and religion and cancer adjustment (53, 54).

An objective health outcome which has been relatively well supported by the literature is mortality. There is substantial evidence that higher religious involvement is associated with lower cardiovascular as well as all-cause mortality risk (55). However also of interest are the differences observed when using different measures of religiosity; a more recent study of the religion-mortality link found that there was a dose-response between frequency of religious attendance and lowered risk of mortality. However, increased religious importance was conversely associated with an increased risk (56).

The measures used in the analysis of the relationship between religion and physical health have been shown to be important. While many studies use one measure of religion, or measures of

Chapter 1: Background

self-rated religiosity ('how religious are you?'), when studies include more than one measure of religiosity it has been often observed that some aspects of religious practice and belief are positively associated with health and others are negatively associated. A meta-analysis testing various hypothesis of the religion-physical health link only found persuasive evidence for a link between religious attendance and reduced mortality risk (57). This meta-analysis also found that hypotheses on whether highly religious people had lower mortality risk, whether religion slows the progression of cancer, and whether religion improves recovery from acute illness failed to produce any supporting evidence. On the other hand, they found some supportive evidence for religion being protective of cardiovascular disease, and, surprisingly, some supportive evidence of being prayed for improving recovery from illness. This suggests that there are different pathways linking different aspects of religion and different areas of physical health. For example, the supportive evidence for prayer could be reflecting a religious social support mechanism.

1.2.4 Religion and cognition

The link between religion and cognition is complex and has to date been less researched than the link between religion and other health domains. The research into a link between religiosity and cognition has found both links to higher dementia mortality in the highly religious, as well as some instances of higher prevalence of Alzheimer's/dementia among the more religious (23). On the other hand, a number of studies have observed slower rates of decline among the more religious (30). A recent literature review of healthy populations found that a majority of studies suggest that religiosity could be protective of cognitive decline in mid and later life (58).

Mechanisms suggested for the link between religion and cognition include behavioural, social and psychological. The religious are less likely to smoke or be heavy drinkers, both of which are implicated in the development of brain pathologies (30, 59). Depression has also often been shown to be associated with cognitive decline, however, it is still unclear whether depressive symptoms are on the causal pathway to cognitive decline, or whether they are a symptom of early cognitive decline (60). It is important to keep this possible mental health link in mind when studying a religion-cognition association. Another interesting aspect of the mechanisms possibly linking religion and cognitive function is the fact that lower intelligence in the religious has been a consistent finding in religion research (31, 61). If those with higher religiosity have baseline cognitive scores which are lower this might have a confounding effect on a cognition-religion link.

Chapter 1: Background

1.2.5 Religion, fertility and health

Higher religiosity is associated with higher parity, both at the individual and country levels (62, 63). Many religions include childbearing and family formation as important part of their value structure, with the Bible in Christian traditions for example including various petitions for procreation ("Behold, children are a heritage from the Lord, The fruit of the womb is a reward" Psalm 127:3, New King James Bible). Catholicism in particular has been characterised as a pronatalist religion, in the sense that Catholicism has specific rules against the use of contraception. These rules were restated explicitly in 1968 with the Vatican's issuing of *Humanae Vitae*, in which artificial contraception was condemned as intrinsically evil, but 'natural' methods for family planning were allowed in some circumstances. These implicit and explicit rules, along with the social value ascribed to children and large families, has an impact on fertility in the highly religious and to a lesser extent in more religious countries.

The effects of parity on women's health have been well studied but are still not fully understood. The effect of parity on mortality has been widely debated, although the evidence leans towards a U-shaped relationship between parity and mortality, in which having two to four children is associated with increased longevity, but higher or lower parity is associated with decreased life expectancy (64, 65). The association between older age at last birth and increased longevity has also been reported across a range of studies, and has supported the hypothesis that older age at menopause is related to lower mortality (66, 67). However, studies of historical and modern cohorts have shown divergent results. In particular, differences in the cultural-religious characteristics of cohorts seem to imply that social circumstances and social context may be in part moderating these outcomes (64).

Parity is also related to general health, although, in contrast to the effects on mortality, earlier age at first parity appears to be the driver of morbidity. Women who have their first child earlier appear to be at increased risk in older age of a number of conditions, including diabetes, high blood pressure and poor physical performance (68-70). Similarly, later last child birth has also been shown to be associated with decreased morbidity and increased longevity (71, 72). Nulliparity and high parity have also been associated with higher probabilities of long-term illness and worse physical function (68, 69, 71). Possible causes for these associations include a selection effect of healthier women into higher parity; women with higher socioeconomic position being more likely to give birth at older ages; hormonal protective effects of some level of pregnancy, birth and breastfeeding, coupled with the taxing effects of the same at higher levels; or socioeconomic benefits of having some children and disadvantages of having no children or too many children.

Chapter 1: Background

1.2.6 Health and the nonreligious

An emerging body of research has begun to examine the link between religion and health in the nonreligious. Surprisingly, the nonreligious have largely been left out of this area of research until relatively recently (73). Research into religion and health has in most cases generally ignored them or treated them in the same way as the religious. In studies using scale measures of religiosity, the nonreligious have often been included and expected to behave in the same way as those who are religious. In other cases, those who report not having a religion are simply excluded from the analyses. It has been argued that failing to assess differences in health outcomes by religious affiliation is a mistake due to possible important social and behavioural differences among these groups (74). I believe this is also applicable to those without a religious affiliation.

New studies have begun delving into these possible effects. In a large US sample, there were no overall significant differences in health outcomes between the religiously affiliated and the non-affiliated, although atheists and agnostics had better results on some physical health outcomes, and worse results on others (73). Similarly, Baker and colleagues found that some non-affiliated had better physical health outcomes, while other types of non-affiliated had worse mental health outcomes (75). Further work has shown that some non-affiliated, in particular atheists, experience religion more negatively than those who are affiliated (76). In the same way, while religious attendance was positively associated with mental health outcomes for those affiliated with a religion, it did not benefit the non-affiliated (77).

1.3 The Irish social context

Ireland in the 20th century was exceptional in many ways; after the country gained independence its developmental, socio-cultural and economic trajectories veered from those in mainland Europe and Great Britain in countless ways. In contrast to many of its European neighbours, the country experienced a late but rapid process of industrialisation, with deep consequences for its socioeconomic development. Ireland continued to have a large proportion of rural dwellers late into the century, making the shape of everyday life and communities much different to other European contexts. Further, the slow economic growth of the post-independence period, as well as other social factors related to rural dwelling and the inheritance system, ensured a mass emigration from the country which characterised most of the century.

One hugely important factor within this context was religion, the Catholic Church, and the decline in religiosity starting in the second half of the century. Ireland was, and still remains, one of the most religious countries in Europe in terms of practice and belief (78). The percentage of Catholics in the country peaked in 1961, with 95% of the population describing

Chapter 1: Background

themselves as such. It was not only Catholic affiliation which was high; Irish Catholics were also notable for their high levels of religious practice. In 1973-74, 91% of Catholics attended religious services at least once a week (79). The Catholic Church had enormous influence in numerous areas of Irish life. Formally, both education and healthcare were largely managed and delivered by the Church. Informally, the Church was influential in a number of other ways. But this influence has been declining since its peak in the 1960s. In his ground-breaking work into the sociology of the Catholic Church in Ireland, Tom Inglis discusses Bourdieu's idea of *habitus* (79). This concept encompasses a systematic worldview as well as a conformity with this worldview: "The habitus, embodied in the home, school and church, produces specific Catholic ways of being religious and ethical." It is this *habitus* which the Church carefully fostered throughout the past two centuries in Ireland, and which is now in decline.

I outline below the ways in which the Irish socio-religious context directly and indirectly impacted on the life course trajectories and health of women and men born in early and mid 20th century Ireland. Other social processes were present and likely extremely impactful in the lives of the over 50s in Ireland today; for example, emigration touched the lives of the majority during this time, either through personal experience or through family fragmentation. The large proportion of the population that lived and lives in rural areas is also an important factor in the Irish social context. I will not explore these explicitly, but these are often part of the bigger picture relating the social context to health in Ireland and will therefore be discussed when appropriate.

1.3.1 Religious belief and practice

Irish Catholicism has been characterised by a high level of religious belief and practice. Figures from the most recent census in Ireland indicate that 78% of the population are Catholic and only 10% are not religious. This percentage is higher in older adults, with 81% of 50 to 54 year olds and 91% of 80 to 84 year olds in 2016 describing themselves as Catholic (80). This is high relative to other similar European populations; for example, 2011 Census statistics for England and Wales indicated that 59% of the population were Christian and 25% were not religious (81).

European Social Survey (ESS) data showed that Ireland had the second highest level of religious attendance, after Poland, out of 31 countries surveyed, with over 60% of respondents reporting at least monthly attendance (78). The majority of Irish Catholics still attend mass weekly, or more than weekly. Data from the ESS in 2009 showed that 41% of Catholics attended once a week, with another 6% attending a few days a week, and 4% attending every day (22). Perhaps more striking is the fact that only 3% of Catholics never attended mass. The attendance profile of the Irish population is largely influenced by age. The proportion of those

Chapter 1: Background

attending mass weekly has been shown to increase in each age group after age 35. The proportion of those attending mass more often than weekly also increases with age, in particular after age 55, when substantial proportions attended a few times a week or everyday (22). Another important determinant of mass attendance is education. A linear trend in the proportion of mass attenders by level of education completed has been observed, where higher educational attainment is associated with decreased likelihood of weekly mass attendance; however, the same is not observed for differences by profession (22).

Another facet of religious practice which is often used to describe religiosity is prayer. In 2009, half of Catholics surveyed reported praying every day (22). Only 4% said they never prayed, and 11% said they prayed less often than monthly. Frequency of prayer was associated with mass attendance, with 70% of those who prayed every day attending mass at least weekly. Even starker are results from the 1973-74 National Survey of Religion in Ireland, when the older population would have been in their early teens to early-mid-life, which found that 97% of respondents prayed at least once a day (79).

Other, more intangible, concepts have been used to assess religiosity. Some surveys ask questions such as 'how religious are you?' The ESS in 2009 found that on a scale from zero to ten, with zero representing not at all religious and ten representing very religious, most Irish respondents placed themselves between five and eight (72%) (22). The average score in Irish religiosity in 2002 was six, compared to a rest of EU average of five. However, although the rest of EU average has oscillated between 4.5 and 5 in the time between 2002 and 2012, the Irish average has experienced a sharper decline, reaching just under 5 in 2012 (82).

Again, the level of religiosity is strongly influenced by age and gender. In Breen and Healy's ESS data analysis from 2014, women aged 60 and over had the highest levels of religiosity both in 2002 and 2012. Further multivariate analysis of these results showed that, once controlling for age, local area, education level and time point, women had religiosity which was almost one point higher than men's (0.80). All other variables were also significant, with age, rural area and lower education predicting higher religiosity (82). Also of interest is the relationship between self-rated religiosity and religious attendance. Both are high in Ireland in comparison with the rest of Europe. However, while Ireland has the second highest attendance level in Europe, the level of religiosity is only the 11th in the area. Most other European countries have levels of religiosity which are much higher than their level of attendance (78). This is illustrative of a particularity of Irish religion, where attendance is still seen as a central tenant of what being religious is. The data from Europe suggests that, while people may still privately consider themselves to be religious, the proportion of those practicing is much smaller. This has

often been described as 'believing without belonging' (83). Believing without belonging is less descriptive of Ireland, as attendance levels remain high.

Religious beliefs in Ireland are also high in comparison with other similar countries. Data from 1991 to 2008 from the International Social Survey Programme (ISSP) was used to compare religious beliefs over 30 participating countries (84). Ireland consistently scored low on levels of disbelief in God ("I don't believe in God"), and relatively high on levels of belief in a personal God. Even in 1991 however, there was some uncertainty in this belief, with only just over 40% agreeing with the statement "I know God really exists and I have no doubts about it." Although this was relatively high by international standards, Ireland also had the steepest decline in certainty of the existence of God, with a decline of 15 percentage points between 1991 and 2008.

In Moral Monopoly, Tom Inglis argues that Irish Catholicism has followed a largely legalistic approach to morality, namely an approach where the Catholic hierarchy set hard rules, and the laity follow these rules with little questioning (a 'simple' faith) (79). This was certainly true to an extent throughout the 19th and 20th centuries and can be evidenced by the forms of practice outlined above, in particular attendance at mass. Other rules include taking Holy Communion in a state of grace (which includes at least yearly confession), duties at Easter, and educating one's children in the Catholic faith (more on education in Section 1.3.2. below). Raising one's children as Catholic and maintaining their Catholic status includes receiving the sacraments, in particular baptism, confirmation and Holy Communion.

Inglis also argues that part of the reason for Catholicism's continuity within the Irish context was its ability to incorporate other forms of framing morality; for example, another form of religious behaviour is magical-devotional practice, which utilizes formulas and rituals to petition a God or gods to impart favours (79). Irish Catholicism accepts these types of beliefs to an extent and incorporates many into itself. For example, many Catholic rituals and practices can be seen as 'magical' in nature; ritualistic practices such as the use of 'cures', pilgrimages to holy sites, novenas and the rosary include both legalistic aspects and magical thinking. In 1973-74 half the population reported having made a pilgrimage (79).

1.3.2 Religious influence on education

Tom Inglis argues that control of the education system was fundamental to the Church maintaining adherence to its teachings (79). The vast majority of schools in the country were managed by the Church throughout the 19th and 20th century (85). The first multidenominational school was not established until 1978 and out of 3,500 National Schools in 1984, 3,400 were

Chapter 1: Background

run by the Catholic Church, while most of the rest were run by the Church of Ireland or other Protestant Churches (79). Catholic schools still account for over 90% of available primary and 50% of secondary schools in the country today (86). The Church and the State had a symbiotic relationship when it came to education provision, with the Church providing land for building schools as well as staff to run and maintain them, while the State paid salaries and maintenance (79, 86). The provision of universal secondary education in Ireland since 1967 has meant that practically all children were educated within this framework. This influence over education meant that Catholic ethos was easily and effectively handed down inter-generationally.

Catholic schools were largely segregated by sex and run by Catholic brothers, priests or nuns. This segregation has been argued to be part of the system of lifelong establishment and control of gender roles in Ireland (2, 79). An example of this comes from a 1960 report for the Council of Education. It states that 'the desirability of providing instruction in domestic science for girls following a secondary school course is so obvious it does not require to be stressed.' (2). Many women experienced distress in this rigid environment, although this was not the experience of all (2). The religious had a monopoly over the teaching profession, with little space for lay teachers in Catholic schools. Lay teachers were also rarely given positions of power within the schools (87, 88). The Church was also responsible for the training of these teachers, which was undertaken as an important and rigorous process (79). Religious education was not only to be instructed in half hour lessons every school day, but it permeated all other areas of the curriculum and teaching (79). This control of schools extended the reach of the Church out from inside the church walls and into everyday life for children, young people and families.

The decline in the Church's grasp on education is reflected in analyses of religious attendance by education and age. Hornsby-Smith and Whelan used data from the 1990 European Values Study and found that although educational attainment was associated with lower church attendance in the under 40s, it did not have an impact on church attendance in those aged 40 and over (82, 89). This may be reflecting higher religious influence in education before 1970, which would have followed that generation throughout their educational career. It also is reflective of the homogeneity of religious attendance in the mid-century, and the decline over time in younger age groups. Incidentally, 1970 was also the year in which the ban on Catholics attending Trinity College Dublin was lifted by the Roman Catholic hierarchy (90). This is a further example of the Church's loosening grasp on education.

1.3.3 Religious influence over health and healthcare provision

Healthcare in Ireland was largely managed and provided by the Catholic Church beginning in the 19th century and throughout the 20th century. Separation of the two institutions has only

begun in earnest in the past few decades (79), and even today, the provision of new hospitals has often been assigned to religious orders, provoking widespread criticism. An example of this was the controversy surrounding a new national maternity hospital for Dublin being run by a religious order, and the subsequent change of the government's plans (91). Estimates suggest that during the 1970s the Church was in charge of running 46 private hospitals and over 100 homes and orphanages, including 25 nursing and convalescent homes and 32 geriatric homes (79, 92). The majority of doctors, nurses and healthcare workers were trained in Catholic schools, and the Catholic ethos in healthcare was strong. This had an effect on the provision of healthcare, in particular contraception, sterilisation, and reproductive assistance technologies, all of which were either illegal or very difficult to access. This, alongside the strong emphasis on women's role as mothers, had a large impact on fertility rates. It was the gains made in the demands for access to contraception, as well as the stark urgency of the AIDS crisis, which in part precipitated the decline in religious influence over healthcare. The decline in new vocations further made the level of Church involvement in healthcare impossible to maintain (79).

Important to consider additionally is the role of religion in individual's health practices and beliefs. As discussed above, Irish Catholicism is relatively compatible with magical religious thought and belief, and it successfully incorporates these in many areas. Irish Catholics have high rates of belief and practice in religious healing rituals. These range from prayers for one's own health and the health of family and friends, lighting candles for successful health outcomes, as well as pilgrimages to holy sites, and the use of 'cures' (faith healing) (79). Belief in the efficacy of faith healing practices remained very high in 1998, with 75% believing in the practice (93). There is no evidence to say that the use of these religious appeals for health in the Irish context discourages individuals from seeking medicalised healthcare, suggesting that these religious rituals are practiced alongside other forms of health-seeking, and are not likely to result in negative health impacts.

1.3.4 Family formation and trajectories

The religious as well as the social context in Ireland put a large emphasis on marriage and family formation, especially for women. This was rather typical of most western cultures in the mid-to-late 20th century, however, the strength of the norm in the Irish case was notable. Ireland had very low rates of births outside of marriage, especially when compared to its closest neighbours, the UK. In Ireland in 1980 it was estimated that a total 5% of births occurred outside marriage (94), compared to 12% in the UK (95). These statistics also mask another consequence of the force of the social norm; when births outside of marriage did occur they were very often disguised in one way or another. Adoption and forced adoption for single

Chapter 1: Background

mothers were extremely common in the mid-century. The practice of single mothers giving up their children for adoption, or being forced to, reached its peak in 1967, when 97% of all babies born to single mothers were adopted (96). An extreme consequence of the stigma around birth outside of marriage was the high rate of infanticide in Ireland in the 20th century. Pregnancy concealment and giving birth in secret were unfortunately common, and for some women, an extreme and tragic consequence of this were the accidental or purposeful death of their babies (96).

The emphasis on marriage for women also was accompanied by an emphasis on motherhood and childbearing, as the pinnacle of Irish womanhood. For married women, childbearing was intrinsic to the role of wife. The Catholic Church did not prescribe high childbearing, however, it exercised control over fertility by censorship and tight control over public morality. The Church explicitly forbid artificial contraception methods, and also influenced the state towards the censorship of materials which could educate couples on other methods of family planning. The battle for family planning and reproductive rights has been one of the key fault lines in the separation of Church and state in Ireland, beginning from the late 1960s with demands for access to contraception for married couples, and through to 2018, with the referendum to repeal the 8th amendment of the constitution which had banned abortion in the country for the last 35 years. For many of the women growing up and experiencing their childbearing years in the mid and later half of the century, this meant few choices regarding the size of their families. The Irish fertility rate was 3.78 in 1960 and remained comparatively high at 1.89 in 2000, while the EU averages for the same dates were 2.58 and 1.47 respectively (97). Families with eight or more children were not outside the norm. Further, while many women would have liked more control over their bodies and the size of their families (98), large family sizes were also idealised and the ideal family in the Irish social conscience was large (99).

While marriage was the norm, Ireland also had the largest proportion of single persons in Europe, with over 20% of women and over 35% of men aged 35 to 44 having never been married in 1961 (94). This affected men more than women and was a consequence of a number of social and economic forces, including inheritance law, emigration and the social norm regarding marriage, where cohabitation or single parenthood became prohibitively difficult within Irish society. These numbers declined until the 1980s, when they increased again; however, this increase was due to an increase in cohabitation and later age at first marriage (94). Another way in which we can see the religious habitus changing in Ireland in respect to marriage and family formation is the fact that the divorce rate, once close to 0% as divorce was illegal up until 1995, was up among Catholics as well as the general population in 2016 (80).

Chapter 1: Background

1.3.5 Labour-force participation

As I have discussed, the Catholic *habitus* required women to be primarily mothers, wives and homemakers. This principally caring role is even enshrined in Article 42.1 of the Irish Constitution, which reads:

> "In particular, the State recognises that by her life within the home, woman gives to the State a support without which the common good cannot be achieved. […] The State shall, therefore, endeavour to ensure that mothers shall not be obliged by economic necessity to engage in labour to neglect of their duties in the home."

Women's labour-force participation in Ireland has been intrinsically tied into women's family trajectories. Although this is arguably true in most countries, the strength of this association in Ireland was particularly strong. The rigid gender roles ingrained through the religious habitus and religious education served to make marriage and family a societal priority for women. A marriage bar, which required women in the civil service to give up their jobs on marriage, was enforced during much of the 20th century. The effects of the bar were not only felt by women in the civil service, with many employers across industries enacting some version of a marriage bar. At the same time, due to societal pressures and gendered expectations, many women gave up their jobs when they married (2). Kiely and Leane's qualitative work on older Irish women's working lives found that out of 42 participants, 37 married and 33 left their jobs when they married or became pregnant (88). There were no social provisions for women who had children to remain employed, and for the majority of women who did not give up work when they married, having children forced them to leave.

This unequal access to labour opportunities had knock on effects. Single women and married women who remained in the labour market received lower pay than their male counterparts, in part due to an expectation that they would eventually leave to fulfil their family duties. Gendered work expectations left women with little choice in terms of access to work. The work available for women who were not nuns (as many of the more highly valued traditionally female professions, such as teaching and healthcare, were dominated by members of religious orders) was limited and poorly paid. There were also further financial implications of early retirement, such as the loss of pension income in later life. This further served to make the prospect of marriage a necessary pathway for many women. Kiely and Leane's work also found that, among their participants, most returned to some form of paid work eventually. However, the women had fractured working lives, with the majority participating in the labour market in a sporadic manner (88).

Chapter 1: Background

1.3.6 Church abuse scandals

The inconsistency between the Church's teachings and the behaviour of several members of the hierarchy came to light through a series of abuse scandals beginning in the 1990s. The sharp contrast between the Church's official stance on morality and its willingness to cover up for and forgive brothers, priests and bishops guilty of abuse of children and other vulnerable persons has been argued to be the final big catalyst for the decline in the Church's influence in Ireland (79). Beyond the real psychological implications for the victims of this abuse, there was a significant impact on the relationship between the Church and laity. For victims, abuse resulted in a loss of confidence in the Church, not least because of the way they were treated when reporting (100). Many victims reported having lost their faith as a result of the abuse, and while some regained it, others did not. The religious practice of the general public was also impacted, with attendance, satisfaction with the Church and trust in Church personnel all declining as a result of the scandals. However, there was no evidence of a decline in faith in God (100).

1.3.7 Disaffiliation and estrangement from the Church in Ireland

Although the proportion of practicing Catholics in Ireland is high, it has been in decline for the past 50 years. The percentage of Catholics in Ireland was at its highest point in 1961, when 95% of the population were Catholic (80). Secularization, and whether or not it is happening, has been a topic of debate in the sociology of religion internationally for the past few decades (101). In western contexts, religious practice and affiliation have unquestionably been in decline. Those who argue that secularization is an overstated phenomenon suggest that although religious practice and affiliation are in decline, this does not necessarily mean that religious belief is disappearing. At the same time, a decline in the power and influence of the Catholic Church in Ireland, accompanied by a relaxation of the rules of Catholicism for most people, has been consistently observed over the past half a century. Tom Inglis's recent work examines the ways people in Ireland today create meaning, and he argues that 'God and religion are [no longer] woven into their everyday life' (102).

Secularization in Ireland is, as many other aspects of the religious context, unique. Similarly to other parts of the world, Ireland has experienced a decline in the main, 'traditional' religions (Catholicism and Protestantism), while also experiencing a smaller increase in 'non-traditional' and 'new' religions (103). Thus, secularization in Ireland is not necessarily a linear phenomenon. However, decline in affiliation and religious practice have been well documented. The proportion of the population self-describing as Catholic has been in decline since its peak in 1961 with a more rapid decline since the 1990s (80). While this effect is largely observed in the younger population, there was a substantial proportion of those aged 50 and over stating that

Chapter 1: Background

they have 'no religion' at the last census, and this proportion grew relative to the previous census. The percentage of non-believers in Ireland is small by international standards (104).

It is important to think about what may distinguish those who have disaffiliated, 'lapsed' or become estranged from the Church in Ireland. As has been shown above, Church membership, its teachings and religious practice were absolutely the norm in Ireland during most of the last century. Breaking from this would necessarily have had some consequences, in particular for those in the oldest age groups. This also raises the question of what may have caused these individuals to become disillusioned with the Church and its teachings.

Data from the ISSP shows differences between practice in childhood and current practice. In the youngest age group (aged 18 to 24) as many as 65% attended weekly at age 12, but only around 18% were attending weekly when surveyed (22). This suggests that religious attendance is still practiced within the family, further evidenced by data from the ESS4, which shows that while the 25 to 34 age group have the lowest levels of weekly attendance (19%), level of weekly attendance is actually higher in the younger age group (15-24, 29%). The percentage of those attending weekly then increases again after age 35 (37%). This suggests that mass attendance is carried out within the family setting, and that young people whose levels of mass attendance declined when they left home, may return to regular mass attendance when they have families of their own. An uptake in religiosity in young families makes sense in the Irish context; children in this age group are involved in baptisms, communion and confirmation; for many who are not particularly religiously devout, initiating the children into Catholicism is still important for a variety of reasons. How much this is a generational effect remains to be seen. For example, those in older generations are more likely to both have attended at age 12 and be weekly attenders currently. This suggests that declines in attendance are less salient in the older age groups.

When considering Inglis' three stages of religious morality – magical, legalistic, individualistic - there is evidence that Ireland has moved away from the legalistic model of religious morality (where the Church was arbiter of what was morally right and wrong through strict rules), into a more individualistic interpretation of morality. For example, the percentage of Catholics strongly agreeing with the statement "Gays and lesbians are free to live life as they wish" increased by nearly 8% between 2002 and 2009 (22).

Chapter 1: Background

1.4 Theoretical frameworks

1.4.1 Biopsychosocial model

I have already touched upon the biopsychosocial model of health. This will be one of the main theoretical frameworks used to interpret the results of this thesis. The biopsychosocial model of health and disease argues that these are a result of the interaction between a person's social, psychological and biological circumstances (5, 7). The biopsychosocial model is useful in examining the complex circumstances which determine whether older people are able to age successfully. The analysis of religion's role in health is well suited to the use of a biopsychosocial model, as religion itself encompasses a number of different areas of human experience, which have potentially different impacts on human wellbeing. If we consider successful ageing to include the lack of debilitating conditions, such as depression, dementia or cardiovascular disease, the biopsychosocial model allows us to take into consideration not only the current state of a condition and its biological causes, but also the social and psychological risk or protective factors exacerbating or preventing it.

Cohen and Koenig first explored how the biopsychosocial model of health could be applied to the religion-health link (74). They argued that studying the relationship between religion and health should take a 'truly multidisciplinary approach.' They reviewed physical and mental health separately and touched upon the fact that much research has used social support as an explanatory factor in the relationship between religion and health. They also discuss the importance of cultural and religious differences. Loren Marks advanced this biopsychosocial model by linking religious practices, spiritual beliefs and faith community with physical, mental and social aspects of health respectively (105). In this model practices, beliefs and community are interrelated with each other, much in the same way as biological, psychological and social factors are interconnected. Marks not only developed this model using a comprehensive review of the literature, but also her own experience of qualitative work with communities of various religions. In this way, she was able to include a perspective which has often been neglected, namely the way individuals conceptualise the religion-health link in their own lives. Many studies before and since Cohen, Koenig and Marks discussed the biopsychosocial model have found religious effects in some contexts but not others. Although context is often discussed when results differ from the majority of the literature in different samples, little has been done to develop theory around the importance of social context and how it could influence outcomes.

1.4.2 Social identity theory and person-culture fit

Two further theories which link the psychological to the social, and which will help frame the Irish context in the way it can affect health, are social identity theory and person-culture fit

theory. Social identity theory is a well-recognised area of social psychology, which explores the importance of group membership in developing self-esteem and sense of belonging (106). We view the world in terms of in-groups and out-groups, and the strength of our in-group attachment impacts how we conceptualise ourselves and others. Strong identification with the groups an individual belongs to can promote feelings of belonging, community, solidarity and wellbeing. On the other hand, when our in-group is threatened, this can threaten our self-esteem, wellbeing and even physical health (107). A decline of strength or cohesiveness of one's in-group can lead to interpersonal conflict and loss of self-esteem. One study linking religious social identity and psychological wellbeing found that having a strong religious social identity explained the positive associations between religious attendance and psychological wellbeing (108). Religious affiliation and church membership are important categories of belonging, especially in a religious country such as Ireland. The change in religiosity in the country could be seen as a threat to Catholicism as an in-group, and the impact of this has not to date been studied.

A newer theory related to social identity theory has examined person-culture fit (109). Within this theory, the extent to which an individual 'fits' within their culture helps determine their level of adjustment and in particular their mental health. This has been examined in the context of religiosity, with results suggesting that the more religious have better self-rated health in religious countries (110). As Ireland becomes less explicitly Catholic, the level of 'fittingness' of Catholics, and especially those in older generations raised in a fully Catholic society, is likely to be in decline.

1.4.3 Life course approach to health

Life course approaches to health incorporate an important temporal aspect into a wider biopsychosocial framework (111, 112). Foetal and childhood development, as well as biological, social and psychological characteristics across the rest of the life course are assessed as determinant, influential and modifying factors of later life health (113). The life course approach to health research takes advantage of the many birth cohort studies which are now reaching later life, and therefore have data across the life course. The complexity of the models generated by this perspective, which necessarily account for temporal factors, as well as complex interrelationships between biological, psychological, and social factors, require sophisticated data analysis techniques. New statistical techniques have made advances in life course epidemiology possible (113).

Life course models are particularly useful when examining the trajectories and outcomes of women's health. Women's health is influenced by a number of biological, psychological and

social factors, as already outlined in this introduction. However, the timing of events, in particular reproductive events, are also of crucial importance in determining women's health (112). For example, timing of menopause onset has been shown to be associated with women's longevity, with women who experience early menopause at increased mortality risk (114, 115). Timing of first and subsequent pregnancies and births has also been found to be associated with health and mortality risk, in particular in relation to early first births (116, 117). Pregnancy and birth timing could influence health outcomes not only biologically, but psychologically and socially (116). An example of the complexity of these effects is breast cancer risk, which is lower in women who experience first births in adolescence (116, 118, 119). This illustrates how women's health trajectories are often complexly shaped by not only biological/hormonal pathways throughout life, but also social and psychological pathways, the timing of which is also crucial.

A key question sought to be answered by researchers using a life course approach is whether lifestyle factors and environment in later life can modify the effects of early life characteristics, to what extent these can be modified, and when are the key periods to apply these interventions (112). Unfortunately, there are limits to how rigorously a life course approach can be applied with the current data. Studies which have followed respondents from early life are best placed to study these effects. Data used in this thesis includes recall measures of childhood characteristics and early life events. I have used these as much as possible in the design of the individual studies within this thesis, and while not able to apply strict life course models, I use life course methodology and ideas to guide the research.

1.5 The current thesis

The current thesis uses Marks and Koenig et al's biopsychosocial frameworks to develop a conceptual model for the Irish context (23, 105). This model further incorporates social identity and person-culture fit theories to account for the effect of the Irish social context, and the change in this social context over the course of the past half a century. Finally, a life course perspective is also applied to account for the important links between early life and change over the life course and later life. Figure 2 demonstrates how the model is conceptualised. Dashed lines indicate pathways that will explicitly be tested. How each specific aim is related to the conceptual framework is marked by a number, referring back to the research aim.

1.5.1 Research aims

The aim of this thesis is to explore how the religious social context in Ireland has helped shape women and men's health and ageing outcomes. The Irish context provides an interesting opportunity to study the role of social and individual religiosity in influencing ageing pathways.

Chapter 1: Background

The effects of religiosity on health have been widely studied, but little consensus exists on the pathways that link religiosity and ageing. Also novel in the Irish context is the effect of declining religious practice and religious social salience, and how this could interact with the religion-health link. Beyond the effect of religious involvement, the influence of the Church on social norms has had an impact on social factors which directly impact women in particular, including parity.

Aim 1:

To test whether high parity in the highly religious Irish context is associated with mortality risk.

Aim 2:

To test longitudinal associations between religious affiliation, non-affiliation and attendance, and objective physical function.

Aim 3:

To test longitudinal associations between religious attendance, religious importance and depressive symptoms, and whether social network mediates these effects.

Aim 4:

To test whether cognitive decline trajectories are associated with measures of religiosity.

Aim 5:

To test whether religiosity helps protect wellbeing in later life in the face of stressful life events, using quantitative and qualitative data.

Figure 2. Theoretical framework for the current thesis, adapted from Koenig et al, 2012 (23)
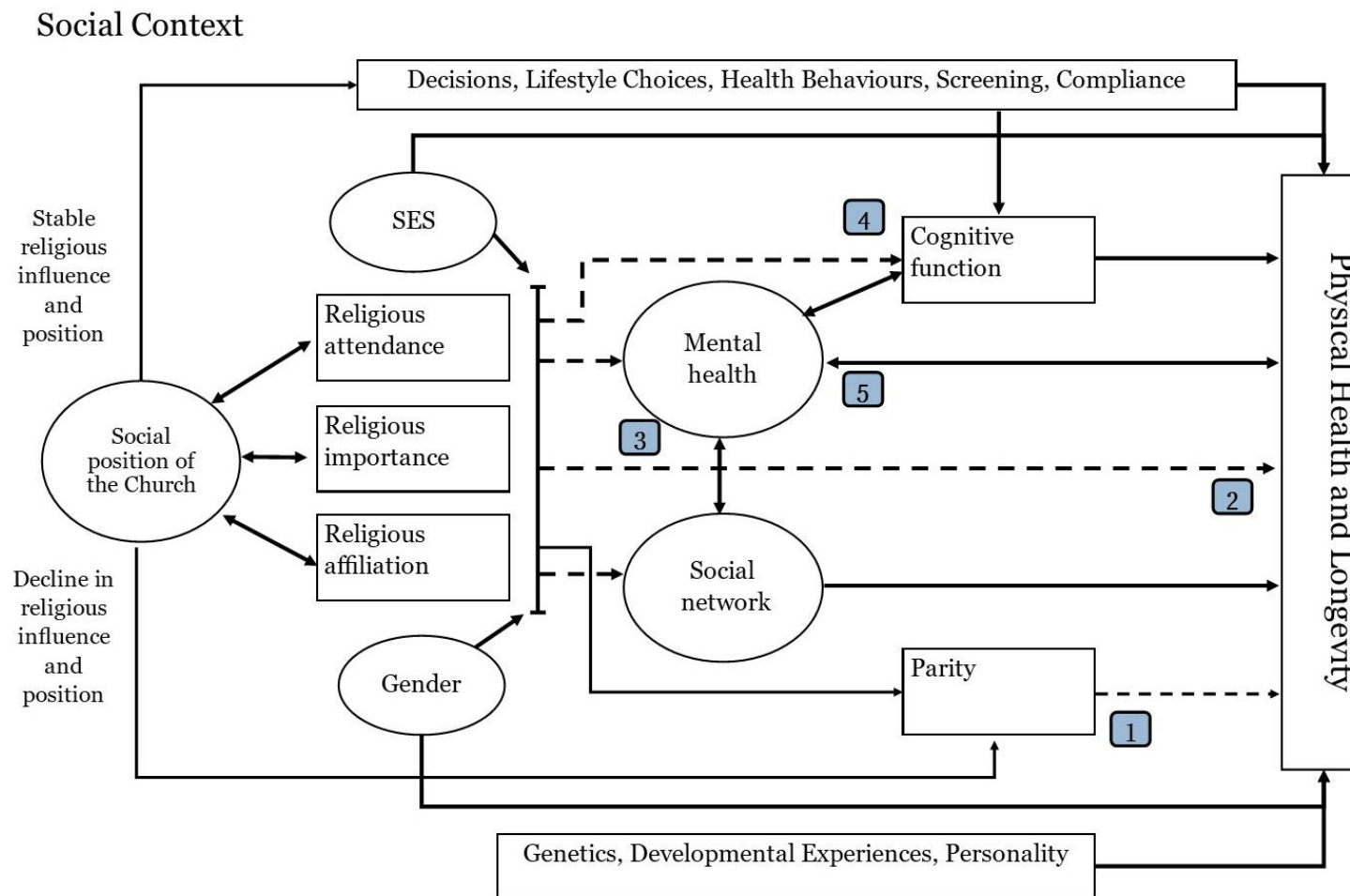
Chapter 1: Background

1.5.2 Thesis outline

Chapter 1 describes the religion and health literature, the religious and social context in Ireland, and the rationale for the current thesis.

Chapter 2 describes the methodology used for the current thesis.

Chapter 3 will address Aim 1, through a study titled "Higher parity is associated with lower mortality in a European population of women with high fertility: results from Ireland." I take advantage of the unique characteristics of the Irish context (high fertility, low use of contraceptives) to assess the association between parity and mortality in this context.

Chapter 4 will answer Aim 2, through a study titled "Longitudinal associations of religiosity and physical function in older Irish adults." Objective physical function measures central to the process of ageing have rarely been examined in the context of religiosity. Further, the role of non-religiosity has often been ignored in the context of health. I compare both the religious and nonreligious, as well as those with high and low religious attendance, in the context of declining religiosity in the country.

Chapter 5 will answer Aim 3, through a study titled "Religious attendance, religious importance, and the pathways to depressive symptoms in men and women aged 50 and over living in Ireland." Testing the association longitudinally, as well as assessing a possible mechanism through social network, will further shed light on how religious practice and beliefs are associated with mental health.

Chapter 6 will answer Aim 4, through a study titled "Mini-mental State Examination trajectories at age 50 and over: the role of religion and possible mediation through depressive symptoms, social network and smoking." Using the association tested previously between religion, social network and depressive symptoms, I test how these could fit into a mechanism protective against cognitive decline.

Chapter 7 will answer Aim 5, through a mixed methods study titled "Religiosity and quality of life in older Christian women in Ireland: A mixed methods analysis." Having examined the associations between with fertility and mortality, and religiosity and depressive symptoms, physical function and cognitive decline, I finally examine wellbeing. I use qualitative data to

Chapter 1: Background

further explore and explain the associations found. I incorporate quantitative and qualitative data at this stage to gain a more complete picture of the way social and individual religiosity can help shape ageing trajectories for Irish women.

Finally, Chapter 8 will draw conclusions from the studies presented. I will also discuss the limitations of the current work and make recommendations for future work and for public policy.

Chapter 2: Methodology

Chapter summary

This chapter describes the overall methodology for this thesis, including design, data and analysis strategies. Both data sources used are described as are the data collection methods.

Chapter 2: Methodology

2.1 Introduction

This thesis addresses the ways in which the social context in late 20th century Ireland has impacted on women and men's health in later life. More specifically, I have sought to expand knowledge on the way that religion and the religious social context have influenced the mental and physical health outcomes of the over 50s population in Ireland. I also hope to further test whether there are differences in the way these effects materialise by gender. I used a large longitudinal quantitative dataset to conduct four separate quantitative analyses on the relationship between religion and health in Ireland. A final fifth analysis used a parallel-databases convergent mixed methods design. This portion of the thesis sought to assess overall wellbeing by analysing quantitative data and qualitative data in parallel, and then integrating the results.

2.2 Quantitative phase

Quantitative data for this study comes from the Irish Longitudinal Study on Ageing (TILDA). TILDA is a nationally representative study of the community-dwelling over 50s population in Ireland, which collects data on the social, economic and health circumstances of the sample. TILDA was established in 2006, with its first wave of data collection initiated in 2009. The objectives of the TILDA study, as set out in the 2010 design report, have been to establish baseline data on older people in Ireland, leading to improvements in public policy and planning; to offer insight into ageing processes; to put ageing on the public agenda and give older people a voice; and to lead to extensive analysis of the database by both national and international researchers (121). TILDA was designed to be harmonized with a number of international large-scale longitudinal studies on ageing, such as the Health and Retirement Study in the United States (HRS), the Survey of Health and Retirement in Europe (SHARE), and the English Longitudinal Study on Ageing (ELSA). Since 2010, TILDA has completed five waves of data collection, with the sixth wave currently underway. Each wave of TILDA has gained ethical approval from the Trinity College Dublin Research Ethics Committee. This thesis uses data from the first five waves of TILDA. I describe the sample, response and retention rates of each wave of TILDA below. A summary of the sample and attrition over the first five waves is given in Figure 3.

Chapter 2: Methodology

Figure 3. TILDA sample retention and attrition, Waves 1-5
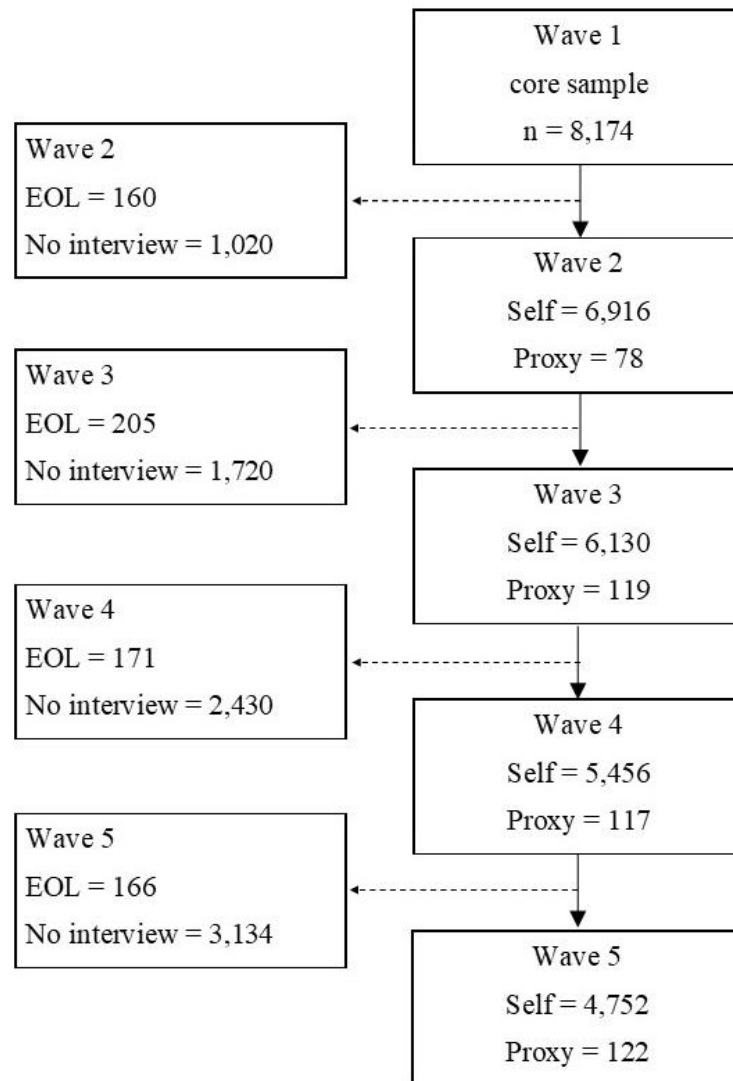
Note: Core sample refers to the Wave 1 sample aged 50 and over.

2.2.1 TILDA baseline (Wave 1)

Sampling for the first wave of TILDA was conducted using the RANSAM random sampling procedure (122), with the Irish Geodirectory as a sampling frame. The Geodirectory is a complete listing of all residential addresses in the Republic of Ireland recorded by the Irish Postal Service (An Post) (123). The addresses sampled were selected by first grouping addresses into clusters, based on District Electoral Divisions, then a number of clusters were

Chapter 2: Methodology

randomly selected, and finally, 50 addresses were randomly selected from each cluster (122). The final sample was of 8,174 individuals aged 50 and over, from 6,279 households, as well as 330 partners aged under 50 (young partners) (total = 8,504). This constituted a 62% response rate for households with an eligible participant. Wave 1 interviews were completed between October 2009 and February 2011. Data were collected through three different formats: Computer Assisted Personal Interview (CAPI), Self-Completion Questionnaire (SCQ), and Health Assessment.

All participants at each wave completed a CAPI interview. CAPI interviews were completed in the participant's own home by a trained social interviewer and included items on the participant's health, economic and social circumstances, as well as some cognitive measures. Questions on religious affiliation, practice and belief were included in the CAPI. Participants at each wave were also asked to complete an SCQ and return it to the TILDA offices in a pre-paid envelope provided by the interviewer. The SCQ contained questions on social activities, personality, nutrition, and other items which might be considered sensitive. At Wave 1 a total of 6,914 participants returned a completed SCQ (84.6%). All participants were invited to complete a health assessment at Waves 1 and 3. Health assessments were not carried out at Waves 2, 4 and 5. At Wave 1, participants were invited to attend a dedicated health centre in Dublin or Cork. Participants who preferred not to travel to attend a health assessment due to mobility or other issues were offered a health assessment at home. Home health assessments measured a reduced number of health measures due to the practicalities of completing the assessment at home. All health assessments were carried out by trained research nurses, and included anthropometric measures such as height and weight, physical function measures such as Timed-Up-and-Go and grip strength, and cognitive measures. The in-centre health assessment also collected more detailed measures of cardiovascular, bone and eye health (124). During Wave 1, a total of 5,894 over 50s participants completed a health assessment (72.1%), 860 of whom completed a health assessment at home.

2.2.2 TILDA follow-up (Waves 2, 3, 4 and 5)

A summary of the sections included in each data collection wave is presented in Figure 4. Data collection for Wave 2 was completed between February 2012 and March 2013. Proxy interviews were introduced in Wave 2 to capture information for participants who were temporarily or permanently unable to complete the interview themselves. Proxy interviews were sought in cases where the participant was not able to complete an interview due to cognitive decline, temporary absence, and hospitalisation, among others. Proxy interviews did not collect

some personal information regarding attitudes or behaviours, and also did not collect cognitive or physical function measures. Participants who moved into a nursing home between Waves 1 and 2 were offered an interview in the nursing home if cognitively able. Additional to these, there were 291 young partners and 160 end of life (EOL) interviews. There was no separate health assessment at Wave 2. Social interviewers were instead trained to administer a number of physical function and cognitive tests. During the CAPI interview, interviewers completed Timed-Up-and-Go and grip strength measurements, as well as the Mini-Mental State Examination (MMSE). In all subsequent waves, the MMSE was included in the CAPI.

The third wave of TILDA was completed between March 2014 and October 2015. All participants were again invited to participate in a health assessment at Wave 3. A total of 5,165 participants aged 50 and over completed the health assessment at Wave 3 (80.3%), 1,065 in their own home and 4,100 at the dedicated health assessment centre. Wave 4 data collection was carried out between January and December 2016. There was no health assessment at Wave 4, but CAPI interviewers completed Timed Up-and-Go (TUG) and grip strength tests during the interview at home. Wave 5 data collection was completed between January 2018 and December 2018. Again, there was no health assessment at Wave 5, but interviewers completed TUG and grip strength tests as part of the CAPI in the participant's own home.

Figure 4. Sections included in each of the first five waves of data collection of TILDA. Adapted from tilda.tcd.ie/where-are-we-now
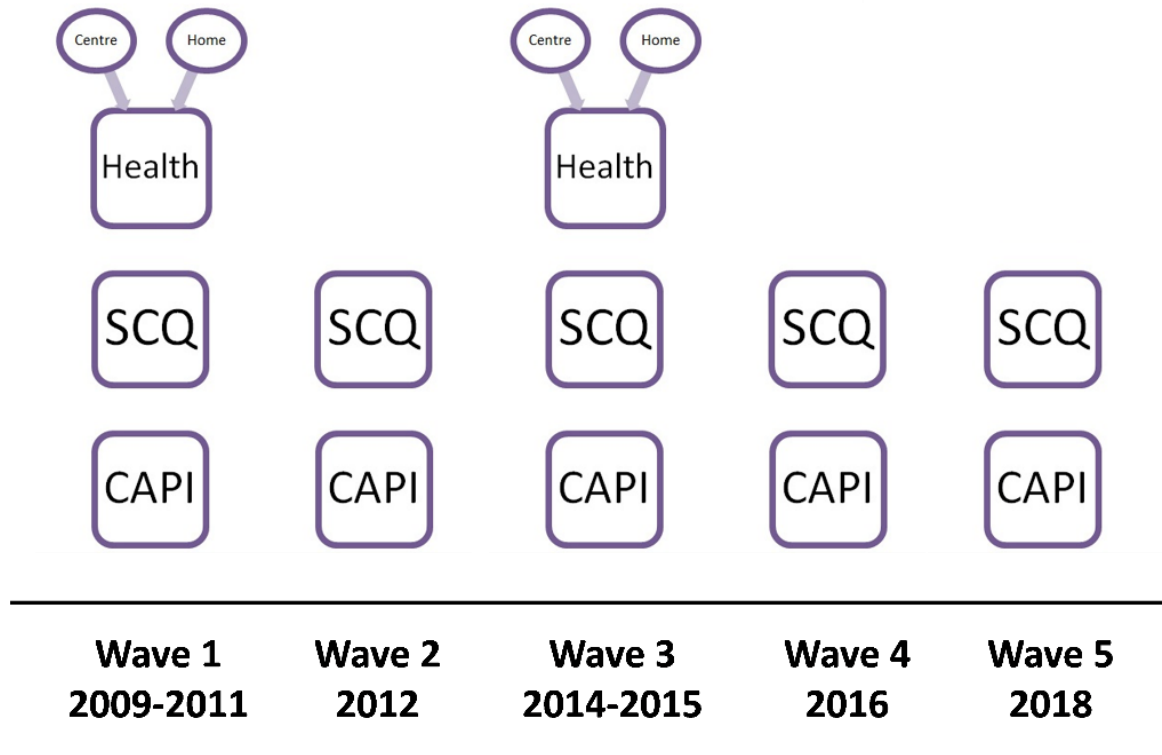
CAPI: computer-assisted personal interview
SCQ: self-completion questionnaire
Health: TILDA health assessment

Chapter 2: Methodology

2.2.3 Measures

Full details of all measures used is given in each paper's methodology. In short, a range of measures of religiosity are used, which were measured at each wave of TILDA. These include independent measures of religion, and outcome measures of physical, mental and cognitive health. An outline of the religious measures available in TILDA is given in Table 1.

Table 1. Religiosity measures in TILDA

Measures	Responses
Affiliation: What is your religion?	Roman Catholic
	Anglican/Church of Ireland/Episcopalian
	Methodist
	Presbyterian
	Other Christian
	Other religion (Please specify)
	No religion
Attendance: About how often do you go to religious services?	Never/Almost never
	Once or twice a year
	Every few months
	Once or twice a month
	Once a week
	More than once a week
Importance: How important would you say religion is in your life?	Very important
	Somewhat important
	Not too important
Comfort and strength: Do you find that you get comfort and strength from religion or not?	Yes
	No
Prayer: I would now like to ask you a question about praying. About how often do you pray apart from at religious services? **(Wave 3 only)**	More than once a day
	Once daily
	A couple of times a week
	Once a week
	Less than once a week
	Never

Chapter 2: Methodology

A range of outcome variables are used. Among them are; mortality, physical function (TUG, grip strength), depressive symptoms (Centre for Epidemiologic Studies Depression Scale (CES-D)), quality of life (Control, Autonomy, Self-realisation, Pleasure Scale (CASP-12)), and cognition (MMSE). All analyses were adjusted for important covariates, including age, education, marital status and self-rated health. Analyses which included men and women were adjusted for sex, or stratified by sex.

2.2.4 Analysis strategies

A range of analysis strategies are used throughout the current work. Each analysis is described in detail in each paper. As a summary, all quantitative analyses in this thesis are longitudinal. I use variations of multilevel modelling techniques, structural equation modelling, and survival analysis. As one of the focuses of this thesis is the importance of gendered effects, most of these analyses are stratified by sex to better compare gender differences.

2.2.5 Missing data and attrition

Due to the longitudinal nature of the TILDA study and of the current work, careful consideration was given for the handling of missing data, and in particular, missing data due to attrition or death. Details of missing data strategies are given in each individual paper. To summarize, I use different strategies to handle missing data, each used depending on the source of the missingness (attrition, item non-response), the likelihood of bias (data Missing At Random (MAR) and nonignorable missing data), and the overall analysis strategy. I use maximum likelihood estimation, multiple imputation and censoring, as well as full-case analysis, weights and robust standard errors as strategies to deal with data missingness and bias in each of the different analyses.

2.3 Individual study designs

2.3.1. Study 1

Full details of the methodology used for this paper can be found in Chapter 3. I used data from all female respondents participating in Wave 1 of TILDA (n=4,429). Data on mortality was derived from two sources, follow up TILDA interviews and public records data from the General Register Office (GRO). Respondents were asked about the number of children they had, and this number was used as the parity variable. Data was analysed using Cox proportional hazards survival models. Models were adjusted for childhood and sociodemographic covariates.

Chapter 2: Methodology

Models were also tested for mediation pathways, including a physical health, a mental health, and a social pathway. Data were imputed and survey weights were used to account for the complex nature of the dataset.

2.3.2. Study 2

Full details of the methodology for this paper can be found in Chapter 4. Data from men and women who had observations on two or more measures of physical function were used (n=6,122). The two measures of physical function used were Timed Up-and-Go (TUG) a measure of functional mobility, and grip strength, a measure of general upper body strength. Linear mixed effects regression models for TUG and grip strength were estimated. I then assessed the association with religiosity by including religious affiliation and religious attendance at baseline. To include the effects of attendance without excluding the nonreligious I split the Catholic group into two attendance levels; high attenders (those who attended at least once a month) and low attenders (those who attended less than once a month).

2.3.3. Study 3

Full details of the methodology for this paper can be found in Chapter 5. Data from men and women with observations at two or more time points on the measures of interest were used (n=6,759). Latent Growth Curve Models (LGCMs) were estimated for depressive symptoms (CES-D 8), social connectedness (number of close family and friends), religious attendance and religious importance over the first four waves of TILDA. These were then analysed using a structural model to assess the association between religious measures at baseline and over time on depressive symptoms at baseline and over time. A structural model was then used to assess whether social connectedness at baseline or over time mediated these effects.

2.3.4. Study 4

Full details of the methodology for this paper can be found in Chapter 6. Data from men and women with observations on the Mini-Mental State Examination (MMSE) measure of global cognition were used (n=7,336). Participants with conditions which severely affected cognition at baseline were excluded (n=94). Latent Class Growth Analysis (LCGA) was conducted to identify different latent trajectory classes for MMSE performance. These classes were then analysed using multinomial logistic regression to assess the differences in the probability of being in each class by religious affiliation (religious vs nonreligious) and by high and low

religious attendance among those who are religious. Finally, the Karlson, Holm and Breen method for mediation in nested nonlinear probability models was used to test three possible mediating variables, depressive symptoms, smoking and social connectedness.

2.3.5. Study 5

This study used a convergent mixed methods design. This is outlined in detail below.

The convergent design

Convergent research designs are a useful way of bringing together the strengths of both quantitative and qualitative research. The rationale for the use of a convergent design for this thesis is the desire to illustrate and further enrich and explain the findings of quantitative data analysis from a large, longitudinal, nationally representative study. Convergent designs have the advantage of providing a fuller picture, by allowing the analysis of generalizable, quantitative, large scale data, while illustrating and deepening understanding by using qualitative, in-depth data. Convergent designs involve the collection of quantitative and qualitative data concurrently but separately. Data is analysed separately, and then brought together by combining, comparing, synthesising and/or contrasting. The current study uses a parallel-databases convergent design, where the data of the two parallel strands (quantitative and qualitative) are conducted independently, analysed separately, and then brought together during an integration phase.

Quantitative data from the Irish Longitudinal Study on Ageing (TILDA) is used to test whether and in what way religious attendance is related to wellbeing in the over 50s population in Ireland. Qualitative data, collected in 2018 via semi-structured interviews with women aged 65 and over, is used to explore the ways in which older women relate their health to their religious experience and practice within the Irish social context.

Both data types are collected as a way to broaden knowledge in this area. Convergent designs are useful in producing "different but complementary data on the same topic." (Morse, 1991, p.122, cited in Creswell & Clark, 2011, p.77) (120). Qualitative data helps expand and contextualise the evidence provided by the nationally representative quantitative data (120).

Quantitative phase.

56

Chapter 2: Methodology

The design, sampling and measures of the quantitative phase have already been described (Section 2.2). The quantitative analysis for this paper is described in detail in Chapter 7. In short, data from 2,017 Catholic or other Christian women aged 57 and over at Wave 1 of TILDA were used to estimate longitudinal mixed effects models of the Control, Autonomy, Self-Realisation and Pleasure scale (CASP). Two adverse life events were included in the models (recent cancer diagnosis and recent widowhood). Interactions with level of religious attendance (high or low) were used to test whether religious attendance moderated the effect of life events on CASP.

Qualitative phase

Design

The objective of the qualitative phase of this convergent mixed methods study was to complement, illustrate, help explain and give new insight on the findings from nationally representative quantitative data. More specifically, the relationships explored between religiosity, religious social factors, and health in ageing within the TILDA sample can be further understood through the narratives and experiences of women within the social and religious context. I sought to conduct semi-structured interviews using a flexible instrument to gain insight into religion, health and ageing experiences, but also to allow insight to emerge from the women's own narratives. Ethical approval for this project was obtained from the Trinity College Dublin School of Medicine Research Ethics Committee.

The instrument

The interview instrument was designed by narrowing down the main topics I wished to explore, with relation both to the data available within the quantitative dataset, as well as the theoretical framework underpinning the project. The main themes included in the interview instrument were the life course trajectories of engagement with religion; religious practices; personal beliefs; community and participation; family and other social networks; and health and wellbeing (see Appendix 2.1). The interview was designed as a semi-structured, flexible instrument which ensured collection of data on the key themes of interest, while allowing for probing and further exploration of emergent themes.

Sampling

Purposive sampling was undertaken for this project. I set out to recruit between eight and twelve women aged 65 and over, who considered themselves to be Christian (Catholic or other).

Chapter 2: Methodology

I chose to sample from North Dublin city due to practical considerations, particularly accessibility. The sampling strategy included the following steps: 1. Compiling a database of Catholic and other Christian churches in the north Dublin city area (n=14). 2. Initiating contact with these churches to introduce the project and request assistance with recruitment. A letter for stakeholders (church staff, parish priest, sacristy members) was sent out (Appendix 2.2), including a potential participant letter (Appendix 2.3), and a participant advertisement with information about how to get in touch with the researcher (Appendix 2.4). 3. A week after initial written contact, I attempted to contact each church by phone. At this stage I secured cooperation from five churches. One of these ran an advertisement for the study in their newsletter, while four others posted the advertisement on their noticeboards. Nine women were recruited through this method. Another two women were recruited through snowball sampling (word of mouth through women already participating in the study).

Data collection

Interviews were conducted individually with each participant. All interviews were conducted in the TILDA offices in Trinity College Dublin, apart from one which was conducted in the participant's own home at her request. I spoke to participants on the phone or by email before the interview and outlined the details of participation as set out in the participant information sheet. A copy of this information sheet was given to participants upon meeting (Appendix 2.5). Participants signed informed consent forms after a short informal discussion, during which they were assured of the voluntary nature of their participation, and that they were free to withdraw consent or refuse to answer any question at any time (Appendix 2.6).

Analysis strategy

I used thematic analysis to analyse the data arising from qualitative interviews. Qualitative data analysis, and thematic analysis more specifically, generally consists of five interconnected and non-linear phases: Compiling, disassembling, assembling, interpreting and concluding (125, 126). Management, disassembling and reassembling of data was carried out using NVivo 12.

Compiling: The data came from 11 in-depth semi-structured interviews. The data were compiled into an analysable form by transcribing recorded interviews. I completed transcribing of all interviews, and this was taken as a part of the iterative nature of the qualitative analysis process. Transcription is seen as an opportunity to get to know the data intimately (127, 128). Interview transcripts were then imported into NVivo for formal analysis of the themes.

Chapter 2: Methodology

Disassembling: Disassembling in qualitative research is often referred to as coding. This process involves the researcher taking the data and breaking it down into sections or pieces, categorised or grouped together in 'codes.' These codes generally represent detailed themes and ideas which exist within the data and relate to the phenomenon under study. Many qualitative researchers allow the themes in their data to 'emerge' in an inductive process (129). Within this study, themes were identified during the design phase, and the interview instrument was organized to collect data on these themes. However, I also wished to allow for themes to emerge from the data, and this flexibility was built into the instrument. Disassembling the data, therefore, was initially conducted through coding on the pre-determined themes, while allowing for themes to emerge from the data. Which is to say, the coding strategy was both established *a priory* using the themes with which the interview instrument was designed, while simultaneously allowing for themes to emerge.

Reassembling: Data were then assembled into wider themes. The themes already established at the outset and set out within the interview instrument were used as a primary guide for reassembling data into themes, as well as allowing for emergent themes to be added into this framework. A hierarchical structure was created of these themes. As the lead researcher, I completed this process and also validated it through intra-researcher coding. Intra-coder reliability refers to coding being consistent within the same researcher (130). I coded all interviews twice along the lifespan of the study and was satisfied that deviances between first and second coding were not significant. This phase of analysis requires analytical and reflective thinking by the researcher. I was guided by a set of questions set out by Cooper and colleagues (126, 131) to query and review the thematic hierarchy developed for the data. These include: "Is this a theme, and if so, does it inform my understanding of the research question?" "Does the data sufficiently support this theme?" "Is this theme coherent?"

Interpreting: Although interpreting is one of the final stages in qualitative data analysis, it is often conducted by researchers alongside the other phases of analysis. Interpreting of the data for this project was conducted at each stage of data analysis. This was done through the writing of 'memos', which reflected my own immediate interpretations after interacting with the data (130, 132). For example, I wrote reflective memos after each interview, after transcribing interviews, and during the coding process.

Concluding: Final interpretation of the data consists of drawing conclusions based on the wide themes within the data, as well as more granular insights from comparing detailed accounts

across participants. Once interpretation is completed, the research analysis is finalised by concluding, in other words, answering the initially set out research question.

Integration of qualitative and quantitative results

In the context of mixed methods research, the above analysis strategy requires a further step: integration of quantitative and qualitative results. Due to the nature of the sequential, convergent mixed methods design (parallel datasets), the data are analysed separately, and interpretations and conclusions are drawn using both datasets and data analyses (120). Integration of the quantitative and qualitative phases of the current work was conducted in two ways: 1) A dedicated mixed methods analysis of wellbeing, incorporating quantitative data from TILDA on quality of life, religion and adverse life events; as well as qualitative data on the ways religion helps women cope, and other ways religion may support, and undermine, wellbeing. And 2) as part of the general discussion of the overall thesis. Inferences are drawn at each phase, and meta-inferences including observations and results of both quantitative and qualitative data are drawn during the discussion of the current thesis (120).

Chapter 3: Higher parity is associated with lower mortality in a European population of women with high fertility: results from Ireland

Chapter summary

As I discussed in the introduction to this thesis, the Irish social and religious context has had tangible and measurable impacts on the lives of the population, in particular on the lives of those aged 50 and over. One of these impacts has been on the number of children Irish families have (parity). Irish women have, on average, more children than most of their European and North American counterparts, and this contrast is greater in older generations. The religious context influenced and shaped this characteristic of the Irish population through cultural influence, through the Church's promoting of pronatalist ideals, and structurally, through the limitation on contraception availability and information on family planning. Research to date suggests that women (and men, to a lesser extent) who have two or three children have lower risk of morbidity and mortality when compared to those with zero or one child, or four or more children (a U-shaped relationship). However, much of this research has come from modern populations with low fertility rates. Research looking at historical samples has shown inconclusive effects, and this type of research is limited due to the lack of available data on important covariates. The first specific aim of this thesis was therefore to take advantage of the naturally high parity in the Irish population aged 50 and over to assess whether the U-shaped relationship observed in other European studies was also present in the Irish population. I further aimed to test whether any effects observed could be explained by health characteristics found to be associated with parity, including the relationship between high parity and religiosity.

This paper is currently under second stage review for a special edition of the Biological Sciences Section of the Journals of Gerontology, Series A: "Intersection of Reproductive and Aging Biology".

Chapter 3: Parity and Mortality

Abstract

Background: Research has often found a U or J-shaped association between parity and mortality. Many researchers have suggested repeated pregnancy, childbirth and lactation taxes the body. Available research has concentrated on populations with controlled fertility or historic populations. Ireland presents an opportunity to explore these associations in a modern sample with high fertility.

Methods: I use data from the Irish Longitudinal Study on Ageing (TILDA) to test whether parity is associated with mortality in women aged 50 and over (n=4,429). I use Cox proportional hazards models to model survival and adjust for demographics and early life circumstances. I test whether physical, social or mental health characteristics mediate these effects. Models were also stratified by birth cohort to test possible cohort effects.

Results: Higher parity was associated with lower risk of mortality, even after adjustment for early life circumstances. Physical and mental health mediation models found no mediation effects. A social mediation model found a partial mediation effect for religious attendance, with frequent religious attendance partially explaining the association between parity and mortality risk. Birth cohort analyses showed these results were driven by the 60 to 69 age group.

Conclusions: Increasing parity is associated with decreasing mortality risk in this sample. This analysis provides evidence against a taxing effect of parity. The effects of parity could only be partially explained through religious participation. These findings are in contrast to much of the literature on this question in similar populations. Lack of fertility control in Ireland may have 'selected' healthier women into high parity. Social explanations for these associations should be further explored.

Chapter 3: Parity and Mortality

INTRODUCTION

Ireland had the highest fertility rate in Europe in the mid to late twentieth century, with the average total births per woman fluctuating between 3.2 and 4.1 between 1960 and 1980 (133). In contrast, the average fertility rate in the rest of the European Union varied between 1.9 and 2.7. After 1980 the fertility rate declined and approximated the European average, however, it remains one of the highest in the region. Access to contraception in Ireland was illegal or tightly regulated until 1992 (134, 135). Research into the link between parity and mortality has not often had the opportunity to explore whether parity is related to mortality in areas with high parity; the research has tended to look at European and North American modern populations (136). Research into the association between parity and mortality has on the most part found a non-linear relationship, with null or low parity and high parity (often defined as 5 or more live births) both being associated with higher risk of mortality in modern developed nations (136, 137). The literature suggests a number of competing hypotheses (64). The "disposable soma" theory suggests that pregnancy, childbirth and lactation tax the body's resources, and that there is a trade-off between increased parity and longevity (64, 136). Other theories suggest that social and health factors 'select' women into childbearing and into high parity (a 'healthy woman' effect). In modern populations this relationship is confounded by socioeconomic factors, such as education and employment (138).

Biologically, nulliparity has been found to be associated with higher risk of breast cancer (119) and ovarian cancer (139) while a parity of one to three has been associated with higher risk of thyroid cancer compared to nulliparity (140). High parity has been found to be a risk factor for cervical cancer (141) and any childbirth increases the risk of high grade cervical cancer in women with persistent human papilloma virus infection (142). Nulliparity has also been linked to a general faster accumulation of health limitations, (143) while a high number of births have been associated with higher prevalence of heart disease, diabetes, and obesity (144-147). Higher parity is associated with later menopause (148, 149). Later age at menopause is in turn associated with later mortality (114, 115). Lower socio-economic status, as well as early first childbirth, which is associated with lower socio-economic status, are both associated with higher parity (116, 117, 150, 151). Such associations between socioeconomic factors and parity may confound the relationship between parity and mortality, with social deprivation plausibly being the driver for both.

In this context, the Irish population aged 50 and over provides a natural experiment; artificial contraception was difficult or impossible to access for most women in this cohort, and knowledge of fertility awareness methods was inconsistent (79, 152). This provides the

63

Chapter 3: Parity and Mortality

opportunity to investigate this question in a sample with fewer socio-economic differences between those with null, low and high parity. I will investigate if high parity is associated with mortality within this population and investigate potential health and social mediators between parity and mortality.

METHODS

Sample

The Irish Longitudinal Study on Ageing (TILDA) is a nationally representative prospective cohort study of community-dwelling adults aged 50 and over living in Ireland (122, 123). The first wave of data collection was completed between October 2009 and February 2011. Respondents were recruited through stratified random sampling and completed at-home computer-assisted personal interviews. I used data from women participating at Wave 1 of TILDA, and follow-up data on mortality. A total of 4,429 female respondents aged 50 and over with valid parity data were interviewed at Wave 1.

Measures and analysis

Mortality data was obtained from follow up interviews with informants nominated by the respondent at their previous interview, and from public records of death from the General Register Office (GRO) where no end-of-life interview was obtained. Follow up within the study is ongoing but was censored for respondents without a death at final interview date (January-December 2018). Respondents lost to follow up were censored at the end of the follow up period for publicly available data through the GRO (28th February 2017).

Parity was defined as the number of reported children from each respondent. There was no direct measure for number of live births in the TILDA dataset; therefore, a composite measure was derived. Respondents were asked their total number of living children (including step, foster and adoptive children). Respondents were asked if any of their children lived with them. Any respondent who described any of their live-in children as step, foster or adoptive children had the total number of children adjusted accordingly (n=3). Respondents who completed a Self-Completion Questionnaire (SCQ) at Wave 1 were also asked if they had ever experienced the death of a child. Respondents who reported the death of a child were given +1 on the total number of children (n=417).

Because of large numbers of missing data on some variables of interest I used multiple imputation to enable me to analyse all observations. Imputation was used to account for missing values in Body Mass Index (BMI) (missing = 1252), father's social class (missing = 198),

Chapter 3: Parity and Mortality

hormone use during menopause (missing = 13), religious attendance (missing = 5), education (missing = 3), and childhood health (missing = 1). Imputation was conducted for different types of variables (normally distributed continuous, count variables, ordered categorical, and categorical), therefore multiple imputation by chained equations (MICE) was used, which does not make assumptions about the joint distribution of missing data and uses a separate distribution for each variable (153).

Auxiliary variables to aid in the imputation process were used, chosen based on correlation analysis and previous knowledge of associations. These variables were number of children, diabetes, age, self-rated health, any cardiovascular disease, smoking, marital status and local area. A total of 10 datasets were imputed, and a randomly chosen seed number was included in the code for replication purposes. All imputations were carried out using Stata's mi impute chained command (Stata 15.1).

Initial univariate associations between parity and covariates were carried out using Chi 2 and univariate linear regression. Covariates were examined by number of children (zero, one, two, three, four, five or more). I tested univariate associations between parity and early life circumstances, and health characteristics measured at baseline. Physical, social and mental health factors which were found to be univariately associated with parity were included as possible mediators in survival analyses.

Cox survival models were fit using continuous parity and continuous parity squared to assess whether there was a curvilinear relationship between parity and mortality (136, 137). The best fitting models were selected. Models were then adjusted for childhood and sociodemographic covariates. These included self-reported childhood health (excellent, very good, good, fair, poor) and wealth (well-off, about average, poor), education (primary/none, secondary, third/higher), father's social class (Professional/Managerial, Non-manual, Skilled/Semi-skilled manual, Unskilled, Farmer, Parents never worked), smoking (never, past, current), and marital status (married or cohabiting, divorced or separated, widowed).

The next stage of analysis tested mediation pathways for possible current physical, social and mental health mediators of the relationship between parity and mortality. Mediation was considered to have occurred when the putative mediator was univariately associated with parity; when included in adjusted models it had an independent effect on mortality; and the inclusion of the putative mediator changed the size of the effect of parity on mortality, a strategy first outlined by Baron and Kenny (154). Potential health mediators included current number of medications used and self-rated health (excellent, very good, good, fair, poor) as measures of

Chapter 3: Parity and Mortality

general health, any cardiovascular disease (CVD; includes high blood pressure, angina, heart attack, heart failure, heart murmur, abnormal heart rhythm, stroke, transient ischemic attack, and any other heart disease. Excludes diabetes or high cholesterol) (155), diabetes (156, 157), breast cancer (119), thyroid cancer (140), ovarian cancer (139), cervical cancer (141, 142), menopause (no menopause, menopause with no hormone replacement therapy (HRT) use, menopause with HRT use) (115, 148, 149) and BMI, overweight and obesity (146).

Potential social mediators included a count of close relatives and friends; whether the respondent participates in social or sports groups; religious attendance (Never/almost never (including nonreligious); weekly or more often); and transfers to and from children. Transfers to and from children were determined through a series of questions regarding financial and non-financial assistance given to children. Financial assistance included any gifts of money (totalling €250 or more), property or business given in the past 10 years. Non-financial assistance included any help provided to children outside the household (help provided to co-resident children is not included). This help included but was not limited to household help (gardening, shopping, etc), paperwork (financial, legal, etc), as well as caring for grandchildren for at least one hour a week. The same questions (excluding caring for grandchildren) were asked regarding help received from children. Answers were coded into four categories (neither gives nor receives (includes nulliparous); receives only; gives only; gives and receives). Mental health mediators included frequency of loneliness (never; rarely; some of the time; all of the time); and the Penn State Worry Questionnaire, a 16 item scale used to measure the trait of worry, with higher scores indicating more general propensity to worry (158).

Models adjusted for physical, social and mental health characteristics were stratified by birth cohort (decades) to account for differences in Irish women's access to contraception, as well as social norms regarding family size, extra-marital childbearing and single parenthood. I used left-truncation of the time scale to account for the time unobserved before entry into the study (159). This is specified by including the date of entry into the study, in this case date of first interview. I defined the beginning of the period 'at risk' as date of birth. To account for the complex nature of the survey data used, I used Stata's svy command to specify population weights, clustering and sampling design. All analysis was carried out using Stata 15.1 (160).

Sensitivity analysis

A sensitivity analysis was carried out using number of children as a categorical variable with eight categories (zero, one, two, three, four, five, six, and seven or more children). Wald tests of linearity were conducted to test for linear trends of increasing number of children. I also

conducted a second supplementary analysis using the med4way suite of commands available in Stata for a formal assessment of mediation (161). This is included as a supplementary analysis as this command is not compatible with imputed data.

RESULTS

The follow up period for respondents lost to follow-up was seven years. Respondents with Wave 5 data were followed for an average of eight years. A total of 495 deaths were recorded in the sample (11.2%), and the mean survival time was 88.6 years [95% CI 87.7; 89.4]. Parity in the sample is described in Table 2. Mean parity was 3.21 (SD = 2.12). An informal comparison with data from Eurostat suggests this is slightly below the average in Ireland for the period 1960 to 2005 (during which time much of the TILDA sample would have been of childbearing age, 15 years to 45 years). Further comparison with Eurostat data suggests the trends in fertility are similar in both samples (See Appendix 3.1).

Table 2. Description of parity in the sample of women (1925 and 2005) in Ireland, all women (n=4,429)

	Childbearing decades (aged 15 – 45)	Median	Mean	SD	Range
Total		**3**	**3.21**	**2.13**	**0 – 15**
Age 50 to 59	1965-2005	3	2.83	1.72	0 – 15
Age 60 to 69	1955-1995	3	3.27	1.98	0 – 13
Age 70 to 79	1945-1985	4	3.65	2.61	0 – 15
Age 80 plus	1925-1975	4	3.79	2.84	0 – 14

Associations between parity and covariates using weighted and imputed values are given in Table 3. The corresponding non-imputed full-sample descriptive analyses tables are given in Appendix 3.2. Women with between two and four children had the lowest unadjusted mortality, while nulliparous women had the highest. Demographic factors such as age and education were all related to parity in the expected directions; nulliparous as well as high parity women were more likely to be older, and women with lower parity were more highly educated. Women with fathers in professional or managerial classes were more likely to have no children or only one child, while women with fathers who were farmers were most likely to have five or more children. Those who had ever been married were more likely to have children and have a higher quantity of children. Women with high parity were more likely to have never smoked, and both nulliparous women and women with high parity were less likely to be current smokers. Childhood health and wealth were not associated with parity.

Chapter 3: Parity and Mortality

Table 3: Early life and demographic characteristics by number of children, weighted and imputed values (n=4,429)

	Total (n= 4,429)	Zero (n=540)	One (n=285)	Two (n=837)	Three (n=982)	Four (n=795)	Five or more (n=990)	P Value
Mortality % (n)	11.2 (n=495)	16.5 (n=89)	14.4 (n=41)	9.2 (n=77)	7.6 (n=75)	9.6 (n=76)	13.8 (n=137)	<0.001
Age (mean (SD))	63.7 (9.9)	65.3 (10.9)	63.1 (10.2)	61.2 (9.1)	61.8 (9.0)	63.2 (9.3)	67.7 (10.0)	<0.001
Father's social class %								
Professional/Managerial	10.9	16.9	16.2	12.5	10.5	10.5	5.9	<0.001
Non-manual	6.6	6.9	6.1	8.9	4.8	6.3	6.7	
Skilled/Semi-skilled	31.7	29.3	34.8	32.2	35.8	28.9	30.0	
Unskilled	17.3	10.0	13.8	18.4	18.0	18.5	19.6	
Farmers	26.8	32.0	24.3	22.3	23.1	30.1	29.4	
Parents never worked	6.7	4.9	4.9	5.7	7.8	5.9	8.4	
Wealth at age 14 %								
Well off	11.6	13.9	10.5	13.6	10.7	11.5	9.7	0.273
Average	70.9	68.7	70.9	69.6	72.5	71.0	71.5	
Poor	17.6	17.4	18.6	16.8	16.8	17.5	18.8	
Self-rated health at age 14 %								
Excellent	55.4	55.9	47.7	57.7	55.5	53.2	57.0	0.354
Very good	25.4	23.5	29.1	23.6	25.1	28.1	25.1	
Good	12.4	11.5	15.1	12.7	12.9	12.1	11.6	
Fair	4.9	6.9	6.3	4.2	4.4	4.5	4.8	
Poor	2.0	2.2	1.8	1.9	2.1	2.1	1.6	
Education %								
Primary or none	28.4	20.6	25.7	23.8	24.5	27.2	42.0	<0.001
Secondary	40.9	36.7	43.7	41.9	42.2	42.5	38.8	
Third level	30.8	42.7	30.6	34.3	33.3	30.3	19.2	
Marital status %								
Married	64.4	30.0	58.3	72.8	71.7	74.1	62.7	<0.001
Single	7.8	55.7	7.0	1.7	0.7	0.1	0.3	
Divorced/Separated	7.7	3.2	13.0	9.7	9.9	6.7	5.8	
Widowed	20.1	11.1	21.8	15.9	17.7	19.1	31.2	
Smoking %								
Never	50.4	51.3	44.9	47.1	50.8	49.7	54.6	0.012
Past	31.3	33.9	36.1	33.0	29.7	30.4	29.4	
Current	18.3	14.8	19.0	20.0	19.5	19.9	16.1	

Note: P values represent probability for Chi2 tests for categorical variables, and for Poisson regression for continuous variables (age). Estimates with missing data were calculated using imputed values.

Bivariate associations between parity and physical, social and mental health characteristics are presented in Table 4. Certain health characteristics were associated with parity; those with one child were the least likely to report their health as excellent, and the most likely to report their health as poor. BMI was linearly associated with parity, with increasing BMI in those with higher parity. Cardiovascular conditions were most likely in women with high parity. High parity was also related to diabetes risk, and those with two to four children had the lowest risk.

Chapter 3: Parity and Mortality

Parity appeared to be associated with ovarian cancer incidence, although this did not reach significance. Those with one child had the highest ovarian cancer risk. Parity was not associated with any other type of cancer. Women with high parity had the highest number of physical limitations, while women with two to four children had the lowest. Women with two to four children were the most likely to have used HRT during menopause.

The size of the social network was associated with number of children, with those with more children having more close family and friends, with those with only one child having the lowest number. Social participation was similar by parity, apart from those with one child, who were less likely to participate in social or sports groups. Those with one child were also most likely to neither give nor receive support to/from children, and those with five or more children were the most likely to give and receive, but also to receive only. There was a U-shaped association with religious attendance, with those with one or two children being least likely to attend religious services regularly and most likely to not be religious. Finally, those with one child were most likely to experience frequent loneliness, and those with no children had the lowest levels of worry.

Chapter 3: Parity and Mortality

Table 4: Physical health, social and mental health characteristics by parity (n=4,429)

% / mean (SD)	Total (n= 4,429)	Zero (n=540)	One (n=285)	Two (n=837)	Three (n=982)	Four (n=795)	Five or more (n=990)	*P Value*
Self-rated health								
Excellent	16.5	17.2	11.2	18.5	15.9	18.4	14.9	*0.004*
Very good	28.2	25.0	26.7	31.5	29.6	27.3	26.7	
Good	32.4	32.6	35.4	26.5	33.6	33.1	34.7	
Fair	17.8	20.0	18.3	17.9	16.3	16.7	18.8	
Poor	5.2	5.2	8.4	5.5	4.6	4.5	5.1	
BMI	28.6	27.9	28.2	28.3	28.7	28.7	29.1	*<0.001*
	(5.6)	(5.2)	(5.6)	(5.7)	(5.6)	(5.7)	(5.7)	
Medications	2.9	2.8	3.0	2.6	2.8	2.8	3.2	*<0.001*
	(2.8)	(2.6)	(3.1)	(2.7)	(2.7)	(2.6)	(2.8)	
CVD	45.5	46.3	46.0	42.3	42.7	41.8	53.4	*<0.001*
Diabetes	6.0	6.1	7.0	4.4	5.0	5.4	8.5	*0.004*
Breast cancer	3.8	3.9	4.2	2.8	3.6	4.2	4.3	*0.562*
Ovarian cancer	0.3	0.6	1.1	0.1	0.2	0.1	0.2	*0.083*
Thyroid cancer	0.1	0.0	0.0	0.0	0.1	0.0	0.2	*0.484*
Physical impairments	2.6	2.8	2.5	2.1	2.5	2.7	2.9	*<0.001*
	(2.6)	(2.7)	(2.5)	(2.4)	(2.6)	(2.5)	(2.6)	
Menopause								
No HRT	72.5	73.2	73.4	66.9	72.2	71.0	77.5	*<0.001*
HRT	18.5	17.1	19.6	20.8	17.5	18.7	17.9	
No menopause	8.9	9.7	7.1	12.3	10.4	10.3	4.5	
Relatives and friends	10.1	8.4	7.4	9.4	9.5	10.6	12.5	*<0.001*
	(5.8)	(6.2)	(4.2)	(5.6)	(4.9)	(5.6)	(6.2)	
Social participation	39.3	40.6	32.0	40.2	38.4	41.0	40.0	*<0.001*
Transfers to children								
Neither gives nor receives (includes nulliparous)	37.9	100.0	49.6	34.9	25.5	24.4	26.0	*<0.001*
Receives only	12.0	0.0	7.5	9.3	12.5	13.2	20.1	
Gives only	23.7	0.0	26.8	30.0	31.2	30.2	18.9	
Gives and receives	26.4	0.0	16.2	25.8	30.9	32.3	35.1	
Religious attendance								
Never/Almost never	11.9	11.7	17.0	12.9	13.4	11.6	8.5	*<0.001*
Infrequently	24.9	24.7	20.8	31.3	26.7	23.9	20.5	
Frequently	60.4	61.0	54.5	50.1	57.6	63.8	69.7	
Not religious	2.8	2.6	7.6	5.6	2.3	0.7	1.3	
Loneliness								
Never	73.8	73.7	68.2	73.8	77.7	74.3	72.0	*<0.001*
Some of the time	15.9	16.2	15.2	17.2	12.9	15.5	17.7	
Moderate amount of the time	7.0	7.6	9.8	5.4	7.0	6.1	7.5	
All of the time	3.4	2.5	6.9	3.6	2.4	4.1	2.9	
Penn State worry scale	17.3	16.0	17.9	17.5	17.6	17.2	17.3	*<0.001*
	(8.3)	(8.1)	(8.5)	(8.3)	(8.4)	(8.2)	(8.4)	

Note: P values represent probability for Chi2 tests for categorical variables, OLS regression for normally distributed continuous variables (BMI, number of relatives and friends) and Poisson regression for Poisson distributed continuous variables (number of medications, number of physical impairments, Penn State Worry Scale). Estimates with missing data were calculated using imputed values.

Chapter 3: Parity and Mortality

Cox Proportional Hazard Models

A linear model using continuous parity was selected as the best model fit. The initial model, adjusted only for age (as timescale), showed that parity was associated with a 4% reduction in the risk of death for each additional child (HR=0.96, 95% CI=0.92; 0.99). This effect was increased when childhood and sociodemographic factors were included in the second model (HR=0.94, 95% CI=0.90; 0.98). Models adjusted for health characteristics are shown in Table 5. Models adjusted for current health characteristics did not suggest any mediation pathways for the relationship between parity and mortality. Only the inclusion of self-rated health and physical impairments had an impact on the size of the main effect, increasing the effect slightly. Only self-rated health and ovarian cancer were independently associated with mortality risk when all other health characteristics were adjusted for.

Table 5. Cox proportional hazards models adjusted for health characteristics (HR) (n=4,429)

	Model 3 Self-rated health	Model 4 Medications	Model 5 CVD	Model 6 Diabetes	Model 7 Ovarian cancer	Model 8 BMI	Model 9 Impairments	Model 10 HRT	Model 11 Full
Total Parity	**0.95 [0.91; 0.99]**	**0.94 [0.90; 0.99]**	**0.94 [0.90; 0.99]**	**0.94 [0.90; 0.98]**	**0.94 [0.91; 0.99]**	**0.94 [0.90; 0.98]**	**0.93 [0.90; 0.98]**	**0.94 [0.90; 0.98]**	**0.94 [0.90; 0.98]**
Self-rated health									
Very good	1.41 [0.92; 2.15]	*	*	*	*	*	*	*	1.37 [0.90; 2.08]
Good	**1.98 [1.32; 2.96]**	*	*	*	*	*	*	*	**1.81 [1.20; 2.72]**
Fair	**2.85 [1.90; 4.28]**	*	*	*	*	*	*	*	**2.43 [1.58; 3.73]**
Poor	**4.37 [2.69; 7.11]**	*	*	*	*	*	*	*	**3.41 [2.03; 5.72]**
Medications	*	**1.08 [1.04; 1.12]**	*	*	*	*	*	*	1.02 [0.97; 1.06]
CVD	*	*	1.10 [0.90; 1.33]	*	*	*	*	*	0.93 [0.74; 1.15]
Diabetes	*	*	*	**1.48 [1.05; 2.08]**	*	*	*	*	1.26 [0.91; 1.74]
Ovarian cancer	*	*	*	*	**5.51 [2.20; 13.8]**	*	*	*	**4.17 [1.56; 11.1]**
BMI	*	*	*	*	*	1.02 [1.00; 1.04]	*	*	1.00 [0.98; 1.03]
Impairments	*	*	*	*	*	*	**1.10 [1.06; 1.15]**	*	1.04 [0.99; 1.09]
HRT use	*	*	*	*	*	*	*	0.97 [0.54; 1.73]	0.96 [0.53; 1.72]
No HRT use	*	*	*	*	*	*	*	1.00 [0.60; 1.66]	1.04 [0.63; 1.73]

Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). Model 2 sociodemographic circumstances: education, childhood health and wealth, father's social class, marital status smoking. Models 3 to 11 are adjusted for sociodemographic circumstances.

Chapter 3: Parity and Mortality

Results for adjustment by social characteristics are presented in Table 6. Again, the inclusion of possible social mediators had little impact on the size of the effect of parity on mortality. Only religious attendance attenuated the size of the effect slightly. Religious attendance also had an independent effect on mortality, with women who were religious and attended frequently having lower mortality risk than those who were religious but attended less regularly or never. Although social participation appeared to have a small protective effect, this became non-significant once adjusting for other social characteristics. Giving practical and financial help to children was also independently associated with lowered mortality risk. Finally, models adjusted for mental health characteristics are presented in Table 7. No independent effects were observed when including mental health characteristics, and there was no impact on the effect size of parity on mortality.

Table 6. Cox proportional hazards models adjusted for social characteristics (HR) (n=4,429)

	Model 3 Family and friends	Model 4 Social participation	Model 5 Social transfers	Model 6 Religious attendance	Model 7 Full
Total Parity	**0.94 [0.91; 0.99]**	**0.94 [0.90; 0.98]**	**0.94 [0.90; 0.99]**	**0.95 [0.91; 0.99]**	**0.95 [0.90; 0.99]**
Family and friends	0.99 [0.98; 1.01]				1.00 [0.98; 1.01]
Social participation	*	**0.79 [0.65; 0.96]**	*	*	0.85 [0.70; 1.05]
Social transfers	*	*	*	*	*
Receives only	*	*	1.07 [0.81; 1.42]	*	1.02 [0.77; 1.36]
Gives only	*	*	**0.69 [0.51; 0.94]**	*	**0.70 [0.51; 0.95]**
Gives and receives	*	*	0.91 [0.70; 1.20]	*	0.92 [0.70; 1.21]
Religious attendance	*	*	*	*	*
Rarely	*	*	*	**1.39 [1.10; 1.76]**	**1.38 [1.09; 1.73]**
Never	*	*	*	**2.03 [1.49; 2.75]**	**1.95 [1.43; 2.66]**
Not religious	*	*	*	1.49 [0.73; 3.06]	1.48 [0.71; 3.06]

Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). Model 2 sociodemographic circumstances: education, childhood health and wealth, father's social class, marital status smoking. Models 3 to 7 are adjusted for sociodemographic circumstances.

Chapter 3: Parity and Mortality

Table 7. Cox proportional hazards models adjusted for mental health characteristics (HR)

	Model 3 Penn State Worry	Model 4 Loneliness	Model 5 Full
Total Parity	**0.94 [0.90; 0.98]**	**0.94 [0.90; 0.98]**	**0.94 [0.90; 0.98]**
Penn State Worry scale	1.01 [1.00; 1.02]	*	1.01 [1.00; 1.02]
Loneliness (ref: Never)			
Some of the time	*	0.84 [0.63; 1.12]	0.81 [0.60; 1.09]
Most of the time	*	1.13 [0.79; 1.62]	1.06 [0.73; 1.53]
Always	*	1.33 [0.84; 2.11]	1.23 [0.76; 1.98]

Note: Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). Model 2 sociodemographic circumstances: education, childhood health and wealth, father's social class, marital status smoking. Models 3 to 5 are adjusted for sociodemographic circumstances.

When models were stratified by birth cohorts, significant effects of parity on mortality were observed for those born between 1941 and 1950 (aged 60 to 69) and those born between 1931 and 1940 (aged 70 to 59) (Table 8). Effects for the youngest cohort (aged 50 to 59) were associated with increased mortality but had wider confidence intervals. The inclusion of potential physical, social or mental health mediators had minimal impact.

Chapter 3: Parity and Mortality

Table 8. Cox proportional multivariable model results for total parity and social characteristics using weighted and imputed values by birth cohorts (HR) (n=4,429)

	Unadjusted*	Model 2 Socio-demographic	Model 3 Physical health	Model 4 Social	Model 5 Mental health
1951 – 1960 (age 50 to 59, n=1,811)	1.10 [0.93; 1.29]	1.09 [0.91; 1.31]	1.14 [0.93; 1.39]	1.11 [0.91; 1.35]	1.09 [0.90; 1.31]
1941 – 1950 (age 60 to 69, n=1,386)	**0.83 [0.74; 0.94]**	**0.80 [0.69; 0.92]**	**0.79 [0.68; 0.91]**	**0.83 [0.73; 0.95]**	**0.79 [0.68; 0.92]**
1931 – 1940 (age 70 to 79, n=873)	0.98 [0.92; 1.04]	**0.93 [0.86; 0.99]**	**0.93 [0.86; 1.00]**	**0.91 [0.84; 0.98]**	**0.92 [0.86; 0.99]**
1911 – 1930 (age 80 to 99, n=359)	0.96 [0.90; 1.01]	0.97 [0.91; 1.03]	0.97 [0.91 to 1.03]	0.97 [0.90; 1.05]	0.95 [0.89; 1.02]

Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). Model 2 sociodemographic circumstances: education, childhood health and wealth, father's social class, marital status smoking. Models 3 to 5 are adjusted for sociodemographic circumstances.

Sensitivity analysis

An analysis using non-imputed, non-weighted data, excluding BMI, and using the number of children as a categorical variable, had consistent results and suggested that the effects were linear (Table 9). Apart from women with one child, women with higher numbers of children all had smaller HRs than nulliparous women. These HRs showed a declining linear trend with increasing numbers of children, confirmed in all models using Wald tests. A further supplementary analysis, using the med4way Stata command with non-imputed, non-weighted data to conduct a formal mediation analysis of physical, social and mental health factors was completed. Results for this analysis are presented in Appendix 3.2. This supplementary analysis largely supported the results of the main analysis, although results were less easily interpretable due to differing sample sizes.

Chapter 3: Parity and Mortality

Table 9. Model results for parity as categorical variable (HR) (n=4,166)

	Unadjusted*	Model 2 Socio-demographic**	Model 10 Full model
Total Parity (ref: zero children) (n=513)			
1 (n=259)	1.13 [0.76; 1.68]	1.05 [0.67; 1.63]	1.00 [0.64; 1.55]
2 (n=784)	0.86 [0.62; 1.20]	0.75 [0.51; 1.10]	0.81 [0.55; 1.19]
3 (n=936)	0.75 [0.54; 1.02]	**0.67 [0.46; 0.98]**	0.68 [0.47; 1.00]
4 (n=747)	0.78 [0.56; 1.08]	0.70 [0.48; 1.03]	0.72 [0.49; 1.06]
5 (n=420)	0.75 [0.52; 1.07]	0.67 [0.44; 1.02]	0.66 [0.44; 1.00]
6 (n=241)	0.69 [0.46; 1.03]	**0.62 [0.39; 0.97]**	0.67 [0.43; 1.06]
7+ (n=266)	**0.50 [0.34; 0.75]**	**0.43 [0.27; 0.67]**	**0.42 [0.27; 0.66]**
Likelihood ratio Chi 2***	*	**78.44 (p<0.001)**	**65.33 (p<0.001)**
Wald test for linear hypothesis	**17.62 (p=0.014)**	**20.09 (p=0.005)**	**19.35 (p=0.007)**

Estimates presented are hazard ratios (HR) and their corresponding 95% confidence intervals (CI).
Note: Models do not include BMI due to large number of missing values, and data are not imputed or weighted.
*adjusted for age (timescale variable)
**Model 2 childhood and early circumstances: education, childhood health and wealth, father social class, religion, any marriage, smoking
*** Likelihood ratio test Chi2 compare nested models. Model 2 is compared to the unadjusted model. All other models are compared to model 2.

DISCUSSION

I have shown that in this population mortality risk decreased with increasing number of children. This result remained consistent after adjustment for socio-economic and childhood circumstances, and after testing possible mediation pathways. The effect was partially mediated by religious attendance, although the reduction in effect was marginal. I did not find any other mediating pathways. Birth cohort analyses showed that the 1941-1950 birth cohort was the main driver of this association.

Chapter 3: Parity and Mortality

These findings are in contrast to comparable populations in England and the US (162). The majority of studies exploring parity and mortality in modern developed populations have found that the effects of parity are U or J-shaped (136, 137, 144). However, a review of a number of studies using historic and contemporary populations found that, although there was substantial variation, historic populations showed a trend for higher parity being associated with lower mortality (138). Mortality risk has been found to be lower in high parity women in other comparable populations, such as Norway (116, 162). In Norway, this effect has been hypothesised to be related to high-quality social protections, which could remove some of the social, financial and healthcare burdens associated with high parity (162). This could point towards the higher risk associated with high parity in other contexts being, at least in part, caused by social rather than physiological factors.

In Ireland, the lower use of oral contraceptives (OC) and other forms of fertility management up until the late twentieth century resulted in high fertility. Some studies have found evidence of higher parity being protective of mortality in populations where fertility was not controlled (138, 163). The impact of mass use of OC on mortality and health has not yet fully been assessed, although a net benefit has been suggested (164-170). In Ireland, OC use is only likely in the younger age group in the over 50s population (in the TILDA sample, those who were turning 50 to 59 in 2010, and would have had wider access to OC starting from the 1990s). If OCs have a net protective effect against mortality, it is plausible that lower mortality effects amongst women with two to four children who controlled their fertility in comparable populations would not be observed in Ireland. The current analyses provide some evidence for this; effects were only observed in those aged 60 to 79, with opposing (non-significant) effects in those aged 50 to 59 (who would have had wider access to contraceptive methods). Those aged 80 and over could be considered a 'survivor cohort', and this may explain why associations were weaker in this age group.

Another idiosyncrasy of the Irish population in this time period is that marriages happened relatively late in life (171). Beginning a childbearing trajectory at a younger age has been hypothesised to tax physical resources before full maturity, leading to earlier deterioration of health (172). Age at first birth is also related to parity itself, as those who have their first child at a young age tend to have longer fertility histories and a higher total number of births (151). As Irish women have tended to begin their childbearing trajectories at older ages, early childbirth as a risk factor associated with high parity is attenuated in this population. This may help explain the differences between the Irish, and English and US samples.

Chapter 3: Parity and Mortality

The possible mediation effect of religious attendance in this sample is worth some attention. Religious involvement, and specifically religious attendance, has been fairly consistently associated with lowered mortality risk, although most of the evidence still stems from the US (173). Findings from the current work suggest that women who attend religious services regularly have more children, and that this religious attendance is both independently associated with a lower mortality risk but also accounts for a small part of the effect of high parity on reduced risk. Women who attend religious services more regularly could be more highly religious, and religiosity has been shown to be predictive of high parity (62, 63). Alternatively, women who have big families may have formed stronger attachments to the Church, through the commitment required to complete the various rites of passage expected of Irish children and families throughout childhood (christening, confirmation, etc.) It is plausible that in the Irish context, women who were more religious had a larger number of children, and these large families in turn cemented the women's religious involvement. In this way, religious attendance could be part of the reason differing results are observed in Ireland when compared to other similar contexts. These contextual factors could also include the high social value placed on large families in Ireland (99).

This study represents an opportunity to use high quality data with eight years of follow up to assess the impact of parity on mortality, in a population which has not been previously studied in this context. However, there are some limitations to this study. The measure of parity used counts living children, not live births, with adjustments made for having lost a child and having counted foster or adopted children as biological children. It is likely that there is some degree of error in this measure. However, such measures of parity are relatively common in the parity-mortality literature (162, 174). Even with these considerations, data on fertility in Ireland has notoriously been poor (175). An additional concern is that I could not estimate the effect of parity on mortality for those who died before being observed. I have statistically adjusted for this by using left truncation. The use of birth-cohort stratified analyses also somewhat controls for these biases. The use of population weights also serves to approximate the sample characteristics more closely to the wider population.

My results suggest that high parity in this sample is either protective of health and longevity, or that an underlying mechanism selects healthier women into high parity in populations with low contraceptive use and high fertility. If higher parity is protective of longevity, we would expect to see Irish women living for longer than their European counterparts. Data from Eurostat shows that life expectancy in Ireland has largely followed the same patterns as European life expectancy,

although Irish life expectancy was lower than the European average up until the mid-00s (176). This suggests that higher parity is not protective, but that we may be observing selection effects into high parity. However, these results also suggest that high parity in itself is not harmful, and its effects on health may be largely dependent on the population and social context. Further work into possible social pathways in the relationship between parity and mortality would be beneficial.

Chapter 4: Longitudinal associations of religiosity and physical function in older Irish adults.

Chapter summary

Having found that the religious social context is associated with mortality through individual level religiosity and indirectly through parity, I sought to further understand how religiosity itself could be directly associated with physical function. Physical function has been neglected as one of the outcomes for the possible relationship between religion and health. Objective measures of physical function have rarely been used in published research on religiosity. The importance of attendance within the Irish context was outlined in the introduction to this thesis; attendance, for the majority of those in older generations, was and is an important and habitual part of life. Attendance is also the aspect of religiosity which has the most plausible association with physical function, and the maintenance of physical function into later life. Attendance may, through a social and mental health mechanism, help protect physical health trajectories and outcomes.

Chapter 4: Physical Function

Abstract

Background: Research into the link between religion and physical function has shown inconsistent results. Most studies have used self-reported measures of physical function, and many have excluded those who are not religious, and only compared levels of religious engagement within those who are religious. I aimed to assess the longitudinal associations of religious affiliation and religious attendance on two objective measures of physical function.

Methods: I used longitudinal data from the Irish Longitudinal Study on Ageing (TILDA). TILDA is a nationally representative study of adults aged 50 and over. A total of 6,126 respondents were assessed on the Timed-Up-and-Go (TUG) and grip strength measures on at least two occasions and had data on their religious affiliation and attendance at baseline. Data was collected approximately every two years over ten years. Longitudinal linear mixed effects models were estimated to calculate the effect of religious affiliation and attendance on TUG and grip strength over time.

Results: TUG scores increased by an average 0.1 seconds with each year of age, and this increased to 0.3 seconds by age 73. Grip strength scores decreased by 0.2kg with each year of age and this increased to -0.3kg per year by age 72. There were no overall differences between religious affiliations in TUG or grip strength scores.

Conclusions: Religious affiliation does not predict performance on objective physical function measures. Results are discussed with reference to the changing religious characteristics of the Irish population.

Chapter 4: Physical Function

INTRODUCTION

Results of studies on religion and physical health have been mixed (23). This link is complicated by the fact that membership of a religious group is often entangled with other important characteristics that also contribute to health, such as socio-economic status, ethnicity, education and social standing (177). Demographic changes have seen an increase in those with no religious affiliation in younger age groups in Ireland (178). As the population ages and with increasing secularisation an increasing proportion of adults in the older age groups will be religiously unaffiliated. If there are health implications associated with religious affiliation, these should be understood so that appropriate health and social planning can be developed and put in place. The large proportion of religiously affiliated in Ireland, as well as the fast rate of change in religious affiliation and practice, make this a pertinent question in this context.

Some longitudinal studies have shown disability and physical function limitations to be lower in older adults who are more religious, in particular those who attend religious services (179-181). However, other longitudinal studies have found complex associations; Ahrenfeldt and colleagues' work on European older adults found that being involved in a religious organization, as well as being religiously educated, was associated with fewer health limitations, although those who prayed but were not involved in other aspects of religious participation had poorer health outcomes (182). Similar results have been found by others, with religious service attendance being associated with lower physical limitations while religious salience was associated with worse physical limitations (183). Reverse causality mechanisms have also been suggested between attendance and physical limitations, where increased physical limitations lead to a decline in religious attendance (184, 185). The literature has concentrated on specific religious behaviours and often ignored affiliation to different religions or no affiliation as an explanatory factor. Those not affiliated with a religion have been understudied in this context.

I aimed to longitudinally test whether older adults differ in their performance on two objective measures of physical function (Timed Up-and-Go (TUG) and grip strength) by religious affiliation using data from the Irish Longitudinal Study on Ageing (TILDA). I further investigated whether these results can be explained through the effect of religious service attendance.

I will test the following hypotheses:

1. Religious affiliation will not be associated with scores on the TUG or grip strength tests.

Chapter 4: Physical Function

2. Religious attendance will be positively associated with better performance on the TUG and grip strength tests.

METHODS

Study and sample

TILDA is a large-scale longitudinal study using a nationally representative sample of adults aged 50 and over living in Ireland. A total of 8,174 participants were recruited at baseline. Baseline data was collected in 2009 and 2010, and participants were followed up approximately every two years. Participants were interviewed in their own homes using a Computer Assisted Personal Interview (CAPI). Informed consent was obtained from all participants, and ethical approval for TILDA was granted by the Trinity College Dublin Research Ethics Committee. Detailed information on the study design and sampling is given elsewhere (122, 123). The current analyses use data from the first five waves of data collection for the TUG measure, and from the first four waves for the grip strength measure. The sample includes participants who had valid data at two or more waves on the measures of interest (n=6,122). Missingness and the impact of attrition because of death was examined. Details on missingness and deaths are given in Appendix 4.1.

Measures

Religious affiliation measured at baseline was used to assess differences in physical function by affiliation. Affiliation was collected using the question "What is your religion?" Possible responses were: Roman Catholic; Anglican/Church of Ireland/Episcopalian; Methodist; Presbyterian; Other Christian; Other religion; No religion. These responses were recoded into "Catholic", "Other religions" and "No religion." The level of attendance was measured using the question "About how often do you go to religious services?" Possible responses were: Never/almost never; Once or twice a year; Every few months; Once or twice a month; Once a week; More than once a week. Nonreligious respondents were routed past this question. To include the effects of attendance without excluding the nonreligious I split the Catholic group (comprising 88% of the sample) into two attendance levels; high attenders (those who attended at least once a month) and low attenders (those who attended less than once a month). I did not include attendance levels for those affiliated with other religions due to small numbers.

Chapter 4: Physical Function

Two measures of physical function were examined; The TUG test is a widely used measure of functional mobility, with predictive power for disabilities and frailty in older adults (186, 187). TUG is measured by having the participant stand up from a standard armchair, walk three meters, turn around, walk back and sit down again. TUG scores are presented in seconds. A lower score indicates a faster time to complete the test. In TILDA, TUG was measured in two different settings; in the first and third waves of data collection, respondents were invited to complete a health assessment, which was carried out by a research nurse in a dedicated health assessment centre or at the respondent's own home. TUG was measured during this health assessment. In the second, fourth and fifth waves of data collection, TUG was measured by a trained interviewer during the CAPI interview in the home setting. Interviewers and health assessment research nurses followed the same protocol at each wave when measuring TUG. For the current analyses, TUG observations were winsorized at the top and bottom 0.5% to avoid undue influence from extreme values.

Grip strength is used as a measure of general body strength and frailty and is a predictor for physical function and decline (188-190). Grip strength was also measured in two settings: during an in-centre or at home health assessment (Waves 1 and 3), and during home interview (Waves 2 and 4). Grip strength measures were only available at the first four waves of TILDA. Grip strength was measured in kilograms using a hydraulic hand dynamometer (Baseline, Fabrication Enterprises, Inc., White Plains, NY). Participants were asked to squeeze the dynamometer as hard as possible for a few seconds. The same protocols were used in each setting, with the exception that four readings were taken during the health assessment (two on each hand), and only two were taken during the at-home interview (two on the dominant-hand only). The maximum reading was taken from each set of tests at each wave. Grip strength observations were winsorized at the top and bottom 1% for the current analyses.

Covariates measured at baseline were selected based on theory and existing literature. Covariates included were age (centred around the mean age, 62, for ease of interpretation of results), centred age squared (age^2), centred age cubed (age^3)(to account for the possible non-linear association with age)(191, 192), self-rated health (excellent, very good, good, fair, poor)(193), medication use (number of medications)(194, 195), marital status (married or cohabiting, never married, separated or divorced, widowed)(196), highest level of education achieved (none/primary, secondary, third level)(197), father's highest level of education (less than primary, primary, more than primary, don't know)(198), smoking status (199), number of limitations of activities of daily living (ADLs)(200), and depressive symptoms, measured using the Centre for Epidemiologic Studies

Chapter 4: Physical Function

Depression Scale (CES-D), where a higher score indicates higher depressive symptomatology (201-203). Height at baseline was also included as a covariate (191, 192). Height was measured in the Wave 1 health assessment and was also self-reported. I used measured height, and where this was not available, I used self-reported height.

Analysis strategy

I first explored the cross-sectional associations between the measures of physical function and covariates by religious affiliation at baseline. Means and standard deviations are presented for continuous covariates and percentages are presented for categorical covariates. I used linear mixed effects regression models to assess the effect of baseline religious affiliation and attendance on TUG and grip strength and TUG and grip strength change, using Stata's mixed command. Data with repeated measures is highly correlated within individuals; mixed effects models use both fixed and random effects and are thus able to take this correlation into account. Linear mixed effects regression uses all available data to fit models, which maximizes sample sizes. In this analysis I included all individuals with observations for two or more time points. I present robust standard errors obtained using Stata's vce(robust) command. I tested whether the effects of time on the outcomes were non-linear by testing models using age^2 and age^3, and the model with the best fit was selected. I included interactions in each model between religious affiliation and $age/age^2/age^3$, to account for the effect of time on the outcome. I chose an unstructured covariance for all models as a conservative approach that does not impose a covariance structure on the model. I present initial models adjusted only for religious affiliation, sex and age. All further analyses were stratified by sex to better understand sex-specific trajectories, and to avoid the models being overburdened with interactions.

Finally, I repeated all models replacing the religious affiliation measure with the measure accounting for high and low attendance among Catholics, to test whether the observed effects could be explained by religious service attendance. I produced plots of predicted scores using Stata's fitted command, which uses both random and fixed coefficients to generate predicted values, by sex, age and religious affiliation/attendance to aid the interpretation of results. All analyses were carried out in Stata 15.1.

Chapter 4: Physical Function

RESULTS

Details on missingness and deaths are given in Appendix 4.1. In short, most missingness was attributable to the mode of data collection (in health assessment). There was a total of 1,062 deaths in respondents aged 50 and over between Wave 1 and Wave 5 of TILDA. Of these, 458 (43.1%) had two or more observations for the TUG and grip strength measures and were therefore included in the final sample. The included and excluded deceased sample were generally more similar to each other than to the full sample. The excluded deceased had slightly slower TUG and slightly higher grip strength.

Most of the sample were regular attenders, attending services once a week. A substantial minority attended more often. Men were more likely than women to be nonreligious or to never attend, whereas women were more likely than men to attend more than once a week (Table 10). Frequency of attendance within the sample did not markedly change over time (Figure 5).

Table 10. Frequency of religious attendance at baseline, men and women (n=6,122)

Level of attendance	Frequency of attendance %	Total	Women (n=3,295)	Men (n=2,827)
Low attenders	Never or almost never	9.5	8.2	11.0
	Once or twice a year	10.3	9.0	11.9
	Every few months	8.3	8.4	8.1
High attenders	Once or twice a month	7.9	8.0	7.8
	Once a week	46.0	46.4	45.5
	More than once a week	12.4	15.8	8.5
Not religious		5.5	4.1	7.1

Note: column percentages are given.

Chapter 4: Physical Function

Figure 5. Frequency of religious service attendance by study wave
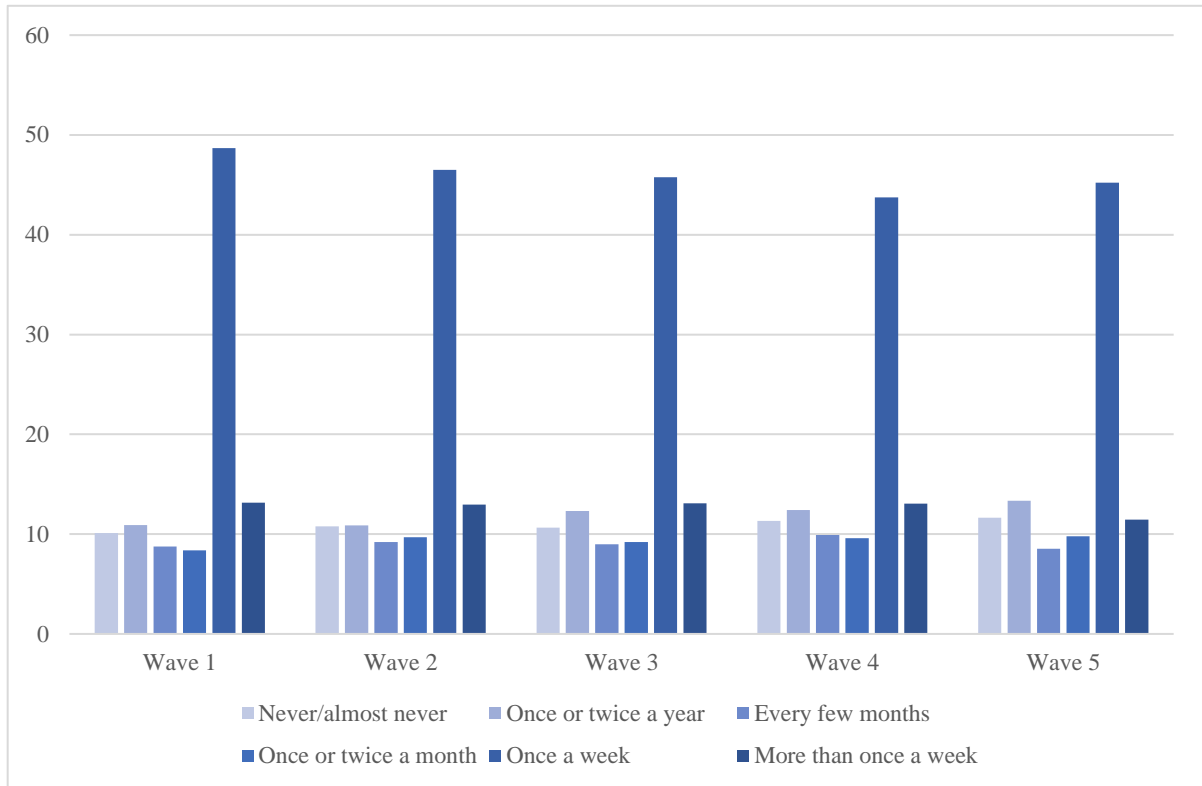
Note: Non-religious respondents are not included. Sample sizes are different at each wave. The sample size for each wave is as follows: Wave 1 n= 5,785; Wave 2 n=5,680; Wave 3 n=5,179; Wave 4 n=4,780; Wave 5 n=4,141.

Univariate associations between health and physical function measures and religious categories (high attendance Catholics who attend at least once a month, versus low attendance Catholics who attend less frequently, as well as the other religious and the nonreligious) were examined and are presented in Table 11. The nonreligious had lower TUG scores and higher grip strength scores. The nonreligious were also taller. High attendance Catholics had the lowest CES-D scores, while low attendance Catholics had the highest. Those of other religions had slightly higher mean medication use. The nonreligious had slightly higher frequency of vigorous physical activity, and they were the most likely to report their health as excellent, while low attendance Catholics were most likely to self-report poor health. Half of high attendance Catholics and those with other religions had never smoked, while low attendance Catholics were those most likely to be current smokers.

Chapter 4: Physical Function

Table 11. Sample health and physical function characteristics at baseline (n=6,122)

Measures % / Mean (SD)	Total	Catholic high attender (n=3,848)	Catholic low attender (n=1,560)	Other religion (n=372)	Non religious (n=342)
TUG, seconds (mean (SD))	9.0	9.2	8.9	9.1	8.4
	(2.6)	(2.6)	(2.7)	(2.6)	(1.7)
Grip strength, kg (mean (SD))	27.8	27.1	29.1	27.7	30.6
	(9.9)	(9.7)	(10.1)	(9.3)	(9.5)
Height, cm (mean (SD))	166.0	165.3	167.0	166.6	169.5
	(9.3)	(9.2)	(9.5)	(9.4)	(8.7)
CESD (mean (SD))	5.6	5.1	6.6	6.2	6.1
(scale range: 0-48)	(7.0)	(6.4)	(8.0)	(7.0)	(7.5)
ADLs (mean (SD))	.10	.09	.11	.12	.12
(scale range 0-6)	(.44)	(.43)	(.46)	(.45)	(.40)
Number of medications	2.5	2.5	2.4	2.7	2.2
(mean (SD))	(2.6)	(2.6)	(2.7)	(2.8)	(2.5)
Physical activity (mean (SD))	1.0	0.9	1.1	1.2	1.5
	(2.0)	(1.9)	(2.0)	(2.2)	(2.3)
Self-rated health (%)					
Excellent	17.4	17.2	16.6	17.2	23.4
Very good	30.2	30.6	29.2	34.4	26.3
Good	32.3	33.4	32.1	26.6	27.5
Fair	16.2	15.7	16.3	18.6	19.6
Poor	3.9	3.2	5.8	3.2	3.2
Smoking status (%)					
Never	44.9	50.1	33.0	49.7	36.0
Past	38.8	38.0	39.6	38.2	45.9
Current	16.3	12.0	27.5	12.1	18.1

Note: TUG and grip strength values are for individual baselines. As some of the sample did not have TUG or grip strength data for Wave 1, their baseline is taken as the first observation taken for each measure (TUG Wave 1 n = 5,224; Wave 2 n = 865; Wave 3 n = 28; Wave 4 n = 5; Grip strength Wave 1 n = 5,228; Wave 2 n = 870; Wave 3 n = 24).

Sociodemographic differences by religious affiliation and attendance were also univariately examined (Table 12). Low-attendance Catholics and the nonreligious were the youngest groups. Over half the sample were female, although males were over-represented in the nonreligious group. High attendance Catholics were less likely to be separated or divorced. High and low attendance Catholics had similar levels of education, with high proportions of no/primary education and secondary education. Those with other religions and the nonreligious were more likely to have third level education. Father's education followed a similar pattern to own education level, although low

attendance Catholics were more likely to have fathers who had completed more than primary education than high attendance Catholics.

Table 12. Sample sociodemographic characteristics at baseline (n=6,122)

Measures % / Mean (SD)	Total	Catholic high attender (n=3,848)	Catholic low attender (n=1,560)	Other religion (n=372)	Non religious (n=342)
Female (%)	53.8	56.9	48.6	56.2	40.4
Age, years (mean (SD))	62.7	64.1	59.5	63.1	60.2
	(9.0)	(9.3)	(7.6)	(9.4)	(7.1)
Marital status (%)					
Married	72.5	73.1	71.7	71.2	70.2
Never married	8.9	9.1	8.3	7.3	9.9
Separated/Divorced	6.8	4.1	11.1	10.2	14.3
Widowed	11.8	13.6	8.9	11.3	5.6
Education (%)					
Primary/None	25.7	27.8	26.9	14.0	10.2
Secondary	41.2	41.9	42.2	38.7	31.0
Third level	33.1	30.3	31.0	47.3	58.8
Father's education (%)					
Less than primary	10.9	11.3	11.3	8.1	7.0
Primary	56.9	62.4	50.6	40.9	42.1
More than primary	24.4	19.7	27.8	42.5	41.8
Unknown	7.8	6.6	10.3	8.6	9.1

Adjusted TUG mixed effects models showed that, once all covariates were held constant, average TUG completion time at baseline was 8.3 seconds for men and 8.4 seconds for women at age 62, and this time increased by 0.1 seconds for both men and women with each year of age. The rate of change increased over time. TUG trajectories by religious affiliation and attendance are presented in Figure 6. Religious affiliation was not associated with TUG scores or TUG score trajectories for men or women.

Chapter 4: Physical Function

Figure 6. Predicted TUG scores by religious affiliation and religious attendance, men and women (n=6,122)
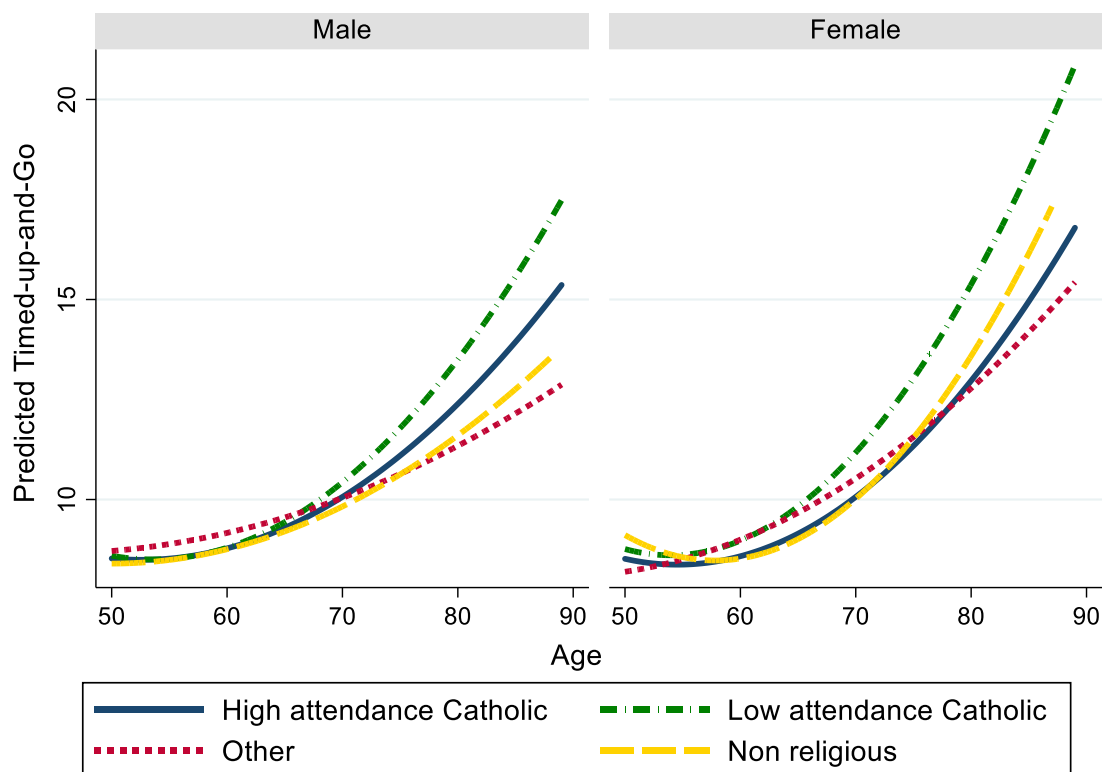
When accounting for the level of attendance in Catholics I found that low attendance Catholic women had slower TUG scores. Holding all other covariates constant, Catholic low attendance women had TUG scores around a third of a second slower than scores for high attendance Catholic women with the same characteristics otherwise at age 62 (8.63 vs 8.29, a difference of 0.34 seconds, 95% CI 0.15 to 0.52). Interactions with age were significant for low attendance Catholic women, suggesting a greater rate of change in their TUG scores; the average high attendance Catholic woman had a TUG score of 12.72 seconds at age 80 compared to low attendance women, who at age 80 had an average score of 15.90 seconds. There were no main effects of religious attendance for men, although there was a significant interaction effect for Catholic low attenders and age[3]. Catholic low and high attendance men who were otherwise similar at age 62 only differed by .13 seconds in their TUG scores (95% CI -0.03 to .29) but had significantly different rates of

90

Chapter 4: Physical Function

change after the age of about 70. Low attendance Catholic men at age 80 had predicted fitted scores of 13.49 seconds, compared to 12.05 for high attendance Catholic men of the same age with otherwise identical characteristics. Full model results are presented in Table 13.

Table 13. Mixed effects multi-level models showing fixed and random effects for Timed Up and Go (TUG) by religious affiliation and religious attendance (n=6,122), stratified by sex (men=2,827; women=3,295)

	Model 0	Model 1 Religious affiliation Estimate (95% CI)		Model 2 Religious attendance Estimate (95% CI)	
Fixed effects		Women	Men	Women	Men
Sex (Female)	-.01 (-.10; .09)				
Age	**.10 (.09; .10)**	**.09 (.07; .10)**	**.08 (.07; .09)**	**.08 (.07; .09)**	**.07 (.06; .09)**
Age²	**.00 (.00; .00)**	**.00 (.00; .00)**	**.00 (.00; .00)**	**.00 (.00; .00)**	**.00 (.00; .00)**
Age³	**.00 (.00; .00)**	**.00 (.00; .00)**	**.00 (.00; .00)**	**.00 (.00; .00)**	**.00 (.00; .00)**
Religion					
Low attenders	-	-	-	**.34 (.15; .52)**	.13 (-.03; .29)
Other	.15 (-.09; .40)	.21 (-.12; .53)	.21 (-.12; .54)	.31 (-.02; .64)	.27 (-.07; .61)
No religion	-.19 (-.42; .05)	-.21 (-.52; .11)	-.18 (-.41; .06)	-.10 (-.42; .23)	-.12 (-.36; .12)
Religion#Age					
Low attenders	-	-	-	**.05 (.01; .08)**	-.00 (-.03; .03)
Other	-.03 (-.06; .00)	-.00 (-.05; .05)	-.05 (-.11; .01)	.01 (-.05; .06)	-.05 (-.11; .02)
No religion	-.02 (-.05; .02)	-.02 (-.11; .06)	-.01 (-.04; .03)	-.01 (-.10; .07)	-.00 (-.04; .04)
Religion#Age²					
Low attenders	-	-	-	**.00 (.00; .01)**	-.00 (-.00; .00)
Other	-.00 (-.01; .00)	-.00 (-.01; .00)	-.00 (-.01; .00)	-.00 (-.00; .00)	-.00 (-.01; .00)
No religion	.00 (-.00; .01)	.00 (-.00; .01)	.00 (-.00; .00)	.00 (-.00; .01)	-.00 (-.00; .00)
Religion#Age³					
Low attenders	-	-	-	.00 (-.00; .00)	**.00 (.00; .00)**
Other	.00 (-.00; .00)	.00 (-.00; .00)	.00 (-.00; .00)	.00 (-.00; .00)	.00 (-.00; .00)
No religion	.00 (-.00; .00)	.00 (-.00; .00)	.00 (-.00; .00)	-.00 (-.00; .00)	.00 (-.00; .00)
Constant	**9.02 (8.94; 9.10)**	**8.37 (8.07; 8.67)**	**8.34 (8.06; 8.63)**	**8.29 (7.98; 8.59)**	**8.30 (8.01; 8.59)**
Random effects					
Variance (cons)	2.03 (1.88; 2.18)	1.67 (1.11; 2.50)	.95 (.64; 1.41)	1.66 (1.12; 2.47)	.96 (.65; 1.41)
Variance (age)	.02 (.02; .02)	.02 (.01; .03)	.02 (.02; .03)	.02 (.01; .03)	.02 (.02; .03)
Covar (age, cons)	.16 (.15; .17)	.15 (.10; .20)	.10 (.06; .14)	.15 (.10; .19)	.10 (.06; .14)
Resid. variance	3.98 (3.90; 4.07)	4.19 (3.70; 4.75)	3.80 (3.31; 4.35)	4.19 (3.70; 4.74)	3.78 (3.30; 4.33)

Note: Models are adjusted for age, age², height, father's education and baseline CES-D, ADLs, self-rated health, marital status, education, smoking status, number of medications and physical activity. Reference categories for religion are Catholic/High attendance Catholic. Low attenders refers to Catholic low attenders. Estimates with p values <0.05 are in bold. P values are not given for random effects.

Chapter 4: Physical Function

Adjusted grip strength mixed effects models showed that, holding all other variables constant, men had an average grip strength score of 37.0kg at age 62 which declined by about 0.3kg per year, while women scored 24.3kg on average and declined by about 0.1kg per year. The rate of change increased over time for both men and women. Grip strength trajectories by religious category are shown in Figure 7. Examination of these plotted predicted values suggests this may be in part because nonreligious men had slightly (but not significantly) lower grip strength scores at younger ages.

Figure 7. Predicted grip strength scores by religious affiliation and religious attendance, men and women (n=6,122)
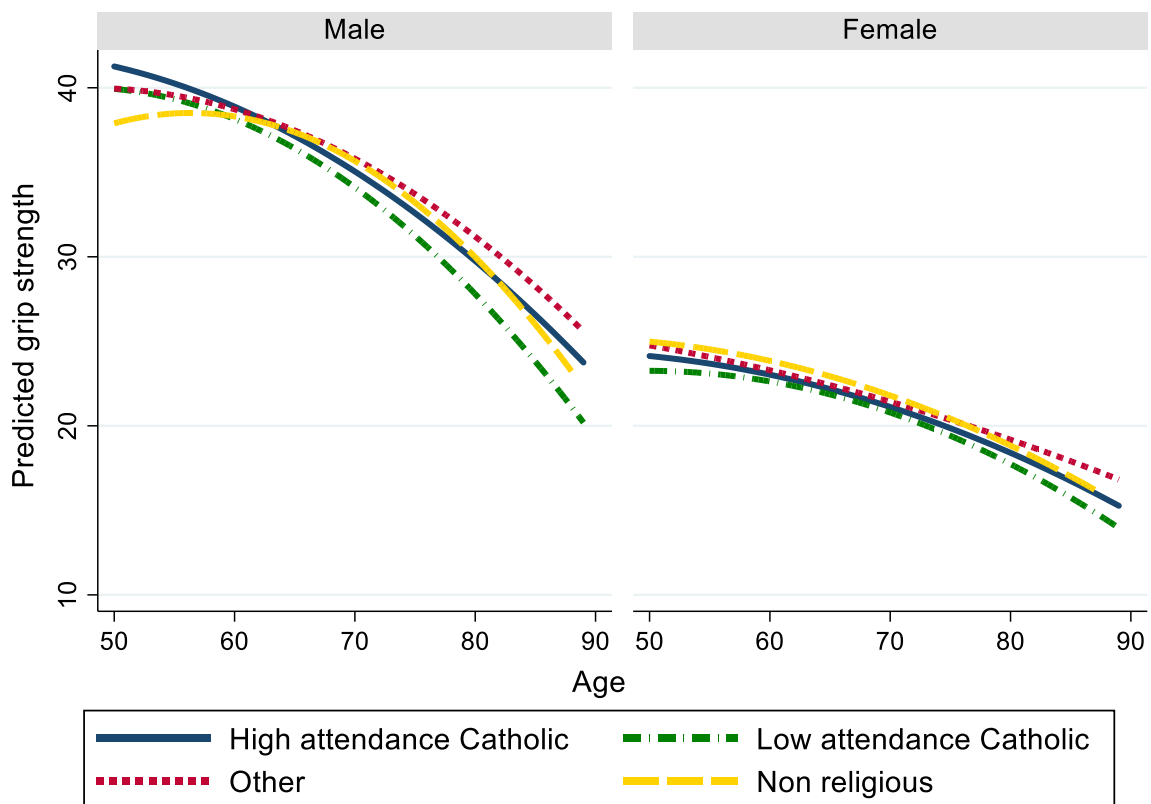
A model adjusting for age and sex only, showed that the nonreligious had slightly stronger grip strength by 0.7kg (95% CI 0.01; 1.41). However, this effect did not remain after stratifying by sex

Chapter 4: Physical Function

and adjusting for covariates. Otherwise, religious affiliation was not associated with grip strength, with the exception that for nonreligious men the change in grip strength was slightly slower (Table 14).

Table 14. Mixed effects multi-level models showing fixed and random effects for grip strength by religious affiliation and religious attendance (n=6,122), by sex (men=2,827; women=3,295)

|	*Model 0*	*Model 3 Religious affiliation* Estimate (95% CI)		*Model 4 Religious attendance* Estimate (95% CI)	
Fixed effects		Women	Men	Women	Men
Sex (Female)	**-14.14 (-14.42; -13.85)**				
Age	**-.22 (-.24; -.20)**	**-.12 (-.13; -.10)**	**-.26 (-.29; -.22)**	**-.12 (-.14; -.10)**	**-.26 (-.30; -.22)**
Age²	**-.01 (-.01; -.01)**	**-.00 (-.00; -.00)**	**-.01 (-.01; -.01)**	**-.00 (-.00; -.00)**	**-.01 (-.01; -.00)**
Religion					
Low attenders	-	-	-	-.17 (-.54; .19)	-.49 (-1.11; .13)
Other	.35 (-.26; .95)	.11 (-.49; .71)	.37 (-.68; 1.42)	.05 (-.56; .66)	.16 (-.91; 1.23)
No religion	**.71 (.01; 1.41)**	.50 (-.33; 1.34)	.15 (-.79; 1.10)	.44 (-.41; 1.28)	-.07 (-1.04; .90)
Religion#Age					
Low attenders	-	-	-	.01 (-.03; .05)	-.01 (-.08; .05)
Other	.04 (-.03; .11)	-.01 (-.08; .06)	.08 (-.05; .20)	-.00 (-.08; .07)	.08 (-.05; .20)
No religion	.05 (-.02; .12)	-.02 (-.11; .06)	.10 (-.00; .21)	-.02 (-.10; .06)	.10 (-.00; .21)
Religion#Age²					
Low attenders	-	-	-	-.00 (-.00; .00)	-.00 (-.01; .00)
Other	.00 (-.00; .00)	.00 (-.00; .01)	-.00 (-.01; .00)	.00 (-.00; .00)	-.00 (-.01; .00)
No religion	-.00 (-.01; .00)	-.00 (-.01; .01)	**-.01 (-.01; -.00)**	-.00 (-.01; .00)	**-.01 (-.01; -.00)**
Constant	**37.11 (36.84; 37.38)**	**24.30 (23.69; 24.91)**	**37.04 (35.98; 38.10)**	**24.35 (23.73; 24.96)**	**37.17 (36.10; 38.23)**
Random effects					
Variance (cons)	25.91 (24.65; 27.24)	11.82 (11.30; 12.35)	31.00 (29.05; 33.08)	11.69 (10.83; 12.61)	30.93 (28.98; 33.02)
Variance (age)	.00 (.00; .00)	.00 (.00; .02)	.00 (.00; .00)	.00 (.00; .02)	.00 (.00; .00)
Covar (age, cons)	-.12 (-.18; -.05)	-.14 (-.20; -.08)	-.15 (-.24; -.05)	-.14 (-.20; -.08)	-.14 (-.24; -.05)
Resid. variance	16.39 (15.85; 16.94)	11.82 (11.30; 12.35)	21.33 (20.39; 22.32)	11.81 (11.30; 12.35)	21.31 (20.37; 22.31)

Note: Models are adjusted for age, age², height, father's education and baseline CES-D, ADLs, self-rated health, marital status, education, smoking status, number of medications and physical activity. Reference categories for religion are Catholic/High attendance Catholic. Low attenders refers to Catholic low attenders. Estimates with p values <0.05 are in bold. P values are not given for random effects.

Chapter 4: Physical Function

DISCUSSION

This study used longitudinal data from a large, nationally representative sample of community-dwelling adults aged 50 and over to explore differences in objective physical function measures by religious affiliation and attendance. I found that physical function does not differ across religious affiliation in the over 50s in men or women. However, I did find that Catholic women who regularly attended religious services had slightly faster TUG speeds than Catholic women who did not attend services in the full sample analysis.

That scores on physical function measures differ only marginally by religious affiliation is in line with the literature on religious affiliation and health. Studies looking at affiliation have often found that being non-affiliated is not associated with self-reported measures of health (73, 76, 204). Studies which differentiated between different types of non-affiliation (atheists, agnostics, nonreligious, etc.) have found that these effects are complex, often with some non-affiliated groups having better health outcomes than other non-affiliates and the religiously affiliated (75, 76).

Recent studies using European population data from the Survey of Health, Ageing and Retirement in Europe (SHARE) found that religious education and participation in a religious organization are associated with lower rates of non-communicable diseases, disabilities, depressive symptoms, health behaviours and poor self-rated health (182, 205-207). These positive associations, in particular those relating to disabilities, somewhat conflict with the current findings. It is plausible that the self-reported nature of the SHARE data on disabilities creates a stronger association between religiosity and disabilities than I found using objective measures; religiosity has been shown to be associated with optimism and positive mental health (208, 209), which may lead more religious respondents to report fewer difficulties with activities of daily living, for example. Further research into differences between religious groups on self-reported and objective measures, and the possible role of optimism and mental health, would be beneficial. Another plausible explanation for these conflicting findings is the differences in the 'nonreligious' category. The SHARE studies defined as nonreligious those who did not pray, did not take part in a religious organization, and were not religiously educated. By this definition, some of the low attendance Catholic sample in TILDA could be considered nonreligious. This highlights the implications of the use of different definitions in the religion-health literature.

The finding that religious attendance, rather than religious affiliation, was a predictor for TUG performance in women is consistent with much of the literature, which has found that attendance is

associated with better physical function (23). It is intuitive that TUG, rather than grip strength, may be associated with attendance; attendance involves physical movement and practice which could be associated with maintaining functional mobility and walking speed (walking to and from church; kneeling and standing during services; etc.) Attendance also involves cognitive and social aspects, which may help maintain cognition (having conversations with other congregation members; singing; following a sermon; etc.) Completion of the TUG requires cognitive processing and has been associated with measures of cognitive function (210). Recent findings from the English Longitudinal Study on Ageing (ELSA) also found that loneliness and social isolation are associated with decreased gait speed (211). Findings from TILDA, presented in the next chapter of this thesis, show that religious attendance is associated with a larger social network, and thus lower social isolation (212). Why these effects should be inconsistent in men is less clear. In contrast, grip strength measures muscular and upper body strength, which may be less directly related to religious attendance.

The religious context is another important latent variable which is not yet well understood in the study of religion and health. It has been hypothesised that the religious do better in more religious contexts (110), however, evidence for this has been mixed (110, 182). Current findings only show weak support for an association between higher religiosity and better physical function, even though Ireland is a relatively religious country. It is important to consider what religious participation looks like in each of these contexts; in Ireland, the majority of the over 50s population attends religious services once a week. This is not true of other European contexts, where most countries have low participation in religious activities even in the over 50s population (213). However, the marked decline in Catholicism in the country could have an unobserved effect on the relationship, weakening the overall position of Catholics, and indirectly impacting on their health.

These findings give further motivation to research which includes the nonreligious; within a population which is experiencing secularization, it is plausible that those who self-describe as religious but who do not attend services may themselves be in a process of secularization. I have seen that the nonreligious generally perform no differently than those who are religiously affiliated, yet Catholics with low religious attendance may be experiencing poorer health. If this population is in the process of secularization, this may have an impact on the health of the nonreligious as a group. More clarity on the different types of nonreligious (including ex-affiliated) would serve to disentangle the religion/health relationship.

This study does have some limitations. While the large percentage of Catholics in the population of interest is conducive for research into differences between levels of religious engagement among Catholics, it is not ideal for researching differences among different affiliations. Low numbers in these groups may mean a lack of power to identify effects. Although the use of longitudinal fixed effects models allowed me to include some respondents who have died and respondents who have not participated in every wave, I was not able to fully account for the effect of death or attrition on the sample. Examining the included and excluded deceased samples showed that there were some differences, including worse health outcomes in the excluded sample; this has probably introduced some bias into the estimates. The use of ADLs and physical activity measures may not sufficiently capture the level of disability or overall physical function at baseline, making it difficult to disentangle the directionality of the effect observed for attendance level and TUG speed in women. Importantly, these results are only generalisable to the Irish population. Research into physical function in other populations could help clarify whether these results are universal or context specific. Finally, it is possible that the use of different assessors at each wave (research nurses or interviewers) could have an unmeasured impact on results. However, this is the largest study of its kind to date in this population, and the nationally representative nature of the data make this a robust contribution to the field.

In conclusion, there is no evidence of differences in TUG or grip strength scores by religious affiliation in the older population in Ireland. On the other hand, I found some evidence that frequent religious service attendance for Catholic women is associated with faster TUG speeds and a slower decline in speed with age.

Chapter 5: Religious attendance, religious importance, and the pathways to depressive symptoms in men and women aged 50 and over living in Ireland

Chapter summary

Having tested two plausible ways in which the religious social context can interact with health, and having found mixed results, I turn to mental health. The relationship between religiosity and mental health, and specifically depression, is fairly well supported. The majority of the evidence points towards an association between some aspect or aspects of religiosity and better mental health outcomes. The majority of this evidence suggests that it is religious attendance that is protective of mental health. However, there is a lack of understanding on the mechanisms behind these relationships, as well as on the direction of causality. This study seeks to answer the third aim of this thesis. I build on the existing knowledge base by testing longitudinal associations between religious attendance and religious importance with depressive symptoms. I further test a social mechanism for the relationship. Through this hypothesised mechanism, higher religious participation (indirectly measured through religious attendance and religious importance) will be associated with a larger religious social network (indirectly measured through the size of the social network) and this will in turn be associated with lower depressive symptoms.

Chapter 5: Depressive Symptoms

Abstract

Background: Research into the link between religion and mental health has found robust evidence of a small positive association. However, there is a lack of understanding of the causality or mechanisms behind this relationship. I aimed to explore the relationship between religiosity and depressive symptoms longitudinally.

Method: I used four waves (2009-2016) of the Irish Longitudinal Study on Ageing (TILDA) to create growth curve models (GCM) of the development of depressive symptoms and religious attendance/importance in a sample aged 50+ in Ireland, and structural models to assess the longitudinal associations between religious attendance/importance and depressive symptoms. I tested whether this relationship was mediated by social connectedness.

Results: GCM showed that higher religious attendance at baseline was associated with lower baseline depressive symptoms, while higher religious importance was associated with higher baseline depressive symptoms. The size of social networks partially mediated the baseline associations between religious attendance and lower depressive symptoms. There were no associations between religious factors and the development of depressive symptoms over time.

Discussion: This study found that the relationship between religion and depressive symptoms is complex, and any protective effect was driven by religious attendance. Religious importance, once accounting for attendance, was linked to higher depressive symptoms. I found that the effect of attendance on depressive symptoms at baseline was partially explained by the social benefits obtained through religious participation.

Chapter 5: Depressive Symptoms

INTRODUCTION

Later life depression is a distressing mood disorder which is in turn a risk factor for a number of other poor health outcomes, including mortality (214). The pathways leading to both late onset and lifetime depression are multifaceted, and have been shown to be complexly associated with age; the prevalence of major depressive disorder appears to be lower in older populations, whereas checklist-of-symptoms measures show an increase in depressive symptoms in older age (215). In Ireland, 10% of adults aged 50 and over show clinically significant depressive symptoms, with women reporting higher depressive symptoms than men (216). This gendered pattern has been consistently shown around the world (217), showing research that differentiates between men and women's mental health pathways is essential.

Protective factors for depression in older age include resources such as social support and coping styles (215). Religious participation has been outlined in many studies of depression as a possible protective factor. In general, the weight of the evidence suggests that some aspect of religious beliefs, values or behaviours are protective of mental health, in particular depressive symptoms (218). Much of the evidence of a religion-mental health link comes from US based samples; multiple studies from the US have found associations between mental health and religiosity, whereas European studies have been less conclusive (219, 220). The US has one of the largest percentages of people practicing religion in the world whereas the European picture is more mixed, indicating that this difference may reflect some effect of living in a largely religious society; it has been argued that 'religious people are happier in religious nations' (221). As a historically religious society, Ireland represents a unique opportunity to study these associations. Women in Ireland, much like women elsewhere, are more likely to be religious (222, 223). Although Ireland is still a predominantly Catholic country, the 2016 Irish census showed that the percentage of Catholics fell sharply between 2011 and 2016 from 84.2% to 78.3% of the population self-identifying as Catholic (224). The Church's social standing has faced challenges in recent years, due to a number of scandals and societal changes. Among these are ongoing revelations of abuse in 'Mother and Baby' homes, and challenges to Catholic doctrine such as recent public votes relating to the legality of same sex marriage and abortion. Therefore, it is not only practical to test these pathways in the Irish context, but also important to discover the mechanisms of the religion-mental health pathway within a secularizing society.

Chapter 5: Depressive Symptoms

Further work is now required to provide evidence for the pathways behind the association between religion and depression (225). Broadly, the literature has identified a number of interconnected pathways through which religiosity, defined as the extent to which individuals practice and value their religion, could have an effect on mental health (35, 226). Psychological explanations of the links between religiosity and mental health suggest that religiosity provides resources that enable increased coping and stress-buffering effects when encountering stressful life events (218). This is in turn related to a sense of meaning or coherence which is derived from religion, which can affect one's ability to cope with stress (227). Older populations have been found to report a higher sense of coherence (228). There is, however, evidence that religious coping can be both positive and negative, and that this affects the psychological adjustment outcome (for a meta-analysis, see Ano, 2005 (27); for a review, see Pargament, 2007 (229)).

Other theorists have emphasized the social role of religious participation. A social mechanism behind the association relates to the receipt of social support and social capital obtained through participation in organized religion. This support can be intangible, such as companionship, friendship or advice, and tangible, such as practical help with tasks of everyday living or financial help (219). Some studies have found that emotional support fully mediates the relationship between intrinsic religiosity and mental health variables (230). Fenelon and Danielsen found that after disaffiliation, continued church attendance mediated any negative affect on wellbeing of disaffiliating (231). However, others have suggested that intrinsic religiosity and spiritual comfort seeking have effects which are independent from social support factors (232, 233). An understanding of why these findings are contradictory is important. If social support and network effects are relevant, these could be particularly important for older people; one study found that older people who attended church services felt that their congregation was more cohesive and this had indirect impacts on their sense of optimism and overall health (234).

Within these mechanisms, confounding or reverse causality are also plausible; negative experiences within religious setting may cause individuals to both move away from their religious practice and develop depressive symptoms. Similarly, those with fewer depressive symptoms may find it easier to maintain religious engagement and practice (235). Beyond the social and psychological mechanisms, there is also the possibility of lifestyle effects. The religious are more likely to have healthier lifestyles, potentially influencing both their physical and mental health (206). Longitudinal evidence is therefore now needed to start to explore the direction of these effects. I sought to test two major hypotheses relating to the association between religious practice and

Chapter 5: Depressive Symptoms

depressive symptoms in middle aged and older women living in Ireland: firstly, I investigated whether religious practice and belief are longitudinally predictive of depressive symptoms, indicating the possibility of a degree of causality in the relationship. Secondly, I investigated a social mechanism, by testing whether the relationship between religious attendance and depressive symptoms is mediated by the size of social network (social connectedness). Finally, I investigated whether religious attendance has more influence over depressive symptoms than religious importance.

I therefore hypothesized:

1. that religious factors will be predictive of lower depressive symptoms over time, reflected in a negative association between the intercept of religious factors and slope of depressive symptoms.

2. that this relationship will be partly or fully mediated by social connectedness.

3. that any relationship will be more strongly driven by religious attendance versus religious importance.

METHOD

This study used data from four waves of the Irish Longitudinal Study on Ageing (TILDA). TILDA is a nationally representative longitudinal study collecting data on social, economic and health circumstances of the population aged 50 and over in Ireland and their partners of any age (122). The current analysis used data from participants with a religious affiliation, aged 50 and over, who had baseline data and participated in a total of two or more waves of data collection. This is possible as latent growth curve models estimate parameters using all available data. Participants who self-reported as not religious were not included in analyses. Data were collected at four waves between 2009 and 2016, with an average of two years between interviews. Ethical approval for each study wave was obtained from the Trinity College Dublin Research Ethics Committee and signed informed consent was obtained from all participants.

Chapter 5: Depressive Symptoms

Measures

Depressive symptoms: Depressive symptoms were measured in TILDA using the Centre for Epidemiologic Studies Depression Scale (CES-D), a validated and widely used measure (201). In TILDA, the full 20 item CES-D was used in Waves 1 and 2, and a short version (CES-D 8) was used in Waves 3 and 4. The CES-D 8 has been found to be a valid short form of the CES-D, with high reliability (0.72) (236). To ensure scales were consistent across all waves, only the eight items which form the CES-D 8 were used at Waves 1 and 2. Items used in the CES-D 8 scale are presented in Appendix 5.1.

Religious attendance: Respondents who had previously reported having a religion were asked about their attendance at each wave with the question 'About how often do you go to religious services?' Possible responses were: Never/almost never; Once or twice a year; Every few months; Once or twice a month; Once a week; More than once a week. Non-religious respondents were routed past this question and were not included in analyses. The item was scored from 0 (never attender) to 5 (more than once a week).

Religious importance: How important each respondent considered religion to be was assessed at each wave with the question 'How important would you say religion is in your life; is it very important, somewhat important, or not too important?' This item was scored from 0 to 2.

Social connectedness: I used a count of close relatives and friends as a measure of social connectedness. Respondents were asked how many of their children (skipped if respondent has no children) and relatives they felt close to, and how many close friends they had. This was included as a total count measure. Social connectedness scores were truncated at 20 to facilitate convergence. The untrimmed measure ranged from 0 to 48. 92% of values at Wave 1, 93% of values at Wave 2, 96% of values at Wave 3 and 98% of values at Wave 4 were between 0 and 20.

Covariates: Control variables were included on theoretical grounds. Due to the power required for analyses within the SEM framework, parsimonious models with few covariates were used. I controlled for age, education (primary or none versus secondary or higher), baseline self-reported health, and baseline marital status (married or cohabiting, single, separated or divorced, or widowed).

Analysis strategy

Chapter 5: Depressive Symptoms

Latent growth curve models were estimated to establish the latent intercept (to be interpreted as the baseline value) and the latent slope (to be interpreted as the development over time) of depressive symptoms, religious attendance, religious importance and social connectedness. Positive and negative slope values imply increases and decreases of the value of the variable over time, respectively. As the relationship of interest concerned the development of depressive symptoms, I estimated the possible effect of two growth factors, the intercept and slope of religious attendance and religious importance on the development of depressive symptoms, as well as the effect of each baseline value on baseline depressive symptoms. The model controlled for important covariates (age, education, baseline marital status, baseline self-rated health). To test the mediating effect of social connectedness I fit a further latent growth curve model of social connectedness over time. The intercept and slope of social connectedness were then tested as putative mediators of the relationship between depressive symptoms and religious factors. An illustration of the mediated model and covariates is presented in Figure 8.

Latent growth curve models were estimated using Maximum Likelihood (ML) estimator for continuous outcomes (depressive symptoms and social connectedness) and weighted least square parameter estimates using a diagonal weight matrix with standard errors and mean and variance adjusted chi-square test statistics estimator (WLSMV) for categorical outcomes (religious attendance and religious importance). For the structural equation models, WLSMV was used. I present parameters and their standard errors, as well as standardized parameters using StdYX standardization. This uses the variances of continuous latent variables as well as those of outcome and background variables, and shows the change in y standard deviation units for a standard deviation change in x (237).

Estimated intercept and slopes are given for models with continuous outcomes (depressive symptoms and social connectedness). For models with ordered categorical outcomes (religious attendance and importance) the intercept of the latent variable is fixed at zero, as the outcomes are modelled by thresholds, eliminating the need for estimating an intercept parameter (237). Therefore, only a slope parameter is presented for these models. Due to uncertainty as to the likely shape of the slope of depressive symptoms, the model was initially estimated in two ways; a linear growth curve, estimated when the parameters for the slope at each time point are specified as 0, 1, 2 and so on; and a freely estimated parameter model, which specifies the first two time points as 0 and 1, and allows the subsequent time points to be freely estimated. After examining goodness of fit statistics, the most compelling model was chosen. This is useful for when the growth trajectory is

not known or expected to be non-linear. Religious attendance was expected to remain stable with a slight decline over time as the sample age and encounter mobility difficulties, whereas religious importance was expected to remain stable, or increase slightly. Social connectedness was expected to decline over time, as older persons tend to reduce their social networks with age (238).

Analyses were run grouped by gender to obtain separate estimates within the same model. Conditional growth models were estimated, and predictors and covariates were added to the conditional latent growth model. This determined whether components of religiosity explain initial differences in depressive symptoms and influence changes in depressive symptoms over time, after controlling for covariates. Root mean square error of approximation (RMSEA), comparative fit index (CFI) and Tucker-Lewis Index (TLI) are presented for assessment of model fit. Good fitting models are expected to have a RMSEA value lower than 0.7 (239) and CFI and TLI close to 0.95 (240). All analyses were conducted using Mplus 6.12 (241).

Chapter 5: Depressive Symptoms

Figure 8. Mediation model plus covariates
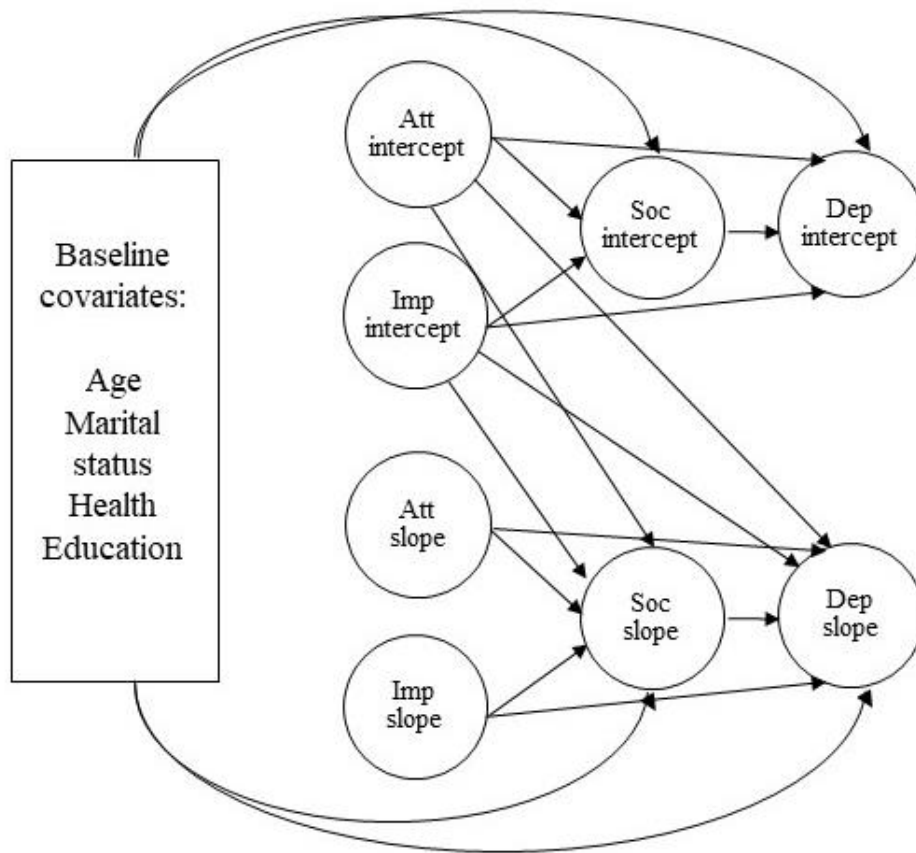
Robustness checks

Sensitivity analyses were carried out using a sample of respondents who participated at all four waves, using longitudinal weights to account for attrition. A sensitivity analysis excluding non-Catholic affiliated respondents was also conducted. A final sensitivity analysis used a dichotomized measure of depression using recommended cut off scores for the CES-D 8 (242).

RESULTS

Descriptive statistics are given in Table 15. The final sample consisted of 6,759 men and women aged between 50 and 94 at baseline (mean (SD): 63.48 (9.48)). The sample were on the most part in good health, a majority had secondary education or higher and a majority were married. The sample

were predominantly Catholic, and the majority also attended religious services regularly and considered their religion to be important to them. Depressive symptoms were low and relatively stable, although there was some evidence of a small increase in depressive symptoms over time. There was large variability in depressive symptoms within the sample, and women reported higher depressive symptoms on average.

Growth curve models

Results for growth curve models are given in Table 16. Positive slopes for depressive symptoms for both men and women show that these increased over time. Negative slopes for religious attendance and social connectedness for both men and women, and for religious importance for women, show that these decreased over time. Estimated covariance between the slope and intercept is also presented. This was negative and significant for depressive symptoms and social connectedness for both men and women indicating that individuals with higher initial depressive symptoms developed further depressive symptoms at a slower rate. For those with higher than average initial social connectedness this meant a slower decline in the size of their social networks.

Chapter 5: Depressive Symptoms

Table 15. Descriptive statistics of the sample (n=6,759)

Measure	Female (n=3,737)				Male (n=3,022)			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
Age (mean (SD))	63.33 (9.50)	-	-	-	63.66 (9.46)	-	-	-
Secondary or higher education	73.2%	-	-	-	67.0%	-	-	-
Self-reported health								
Excellent	16.9%	14.4%	13.3%	13.7%	15.3%	13.4%	13.6%	12.0%
Very good	29.1%	32.9%	34.0%	34.7%	29.7%	32.5%	32.4%	34.6%
Good	32.3%	34.0%	34.3%	35.0%	32.7%	35.7%	34.8%	37.1%
Fair	16.9%	15.2%	15.1%	13.7%	18.0%	15.4%	15.5%	14.3%
Poor	4.8%	3.5%	3.3%	2.9%	4.4%	3.1%	3.6%	2.0%
Marital status								
Married/Cohabiting	66.0%	64.0%	62.6%	61.5%	75.7%	74.6%	74.6%	74.3%
Single (never married)	7.7%	7.5%	7.5%	7.6%	11.5%	11.1%	10.4%	9.9%
Separated/Divorced	7.8%	8.3%	8.3%	8.0%	5.0%	5.4%	5.2%	5.4%
Widowed	18.6%	20.2%	21.6%	23.0%	7.8%	9.0%	9.8%	10.4%
Religious affiliation								
Catholic	92.6%	91.5%	91.3%	91.1%	92.2%	90.1%	89.6%	89.4%
Religious attendance								
Never/Almost never	9.1%	9.2%	10.0%	10.6%	11.1%	12.9%	12.3%	12.6%
Once or twice a year	9.1%	10.1%	11.0%	11.3%	12.1%	11.5%	13.5%	13.5%
Every few months	8.6%	8.9%	8.7%	9.9%	8.8%	9.5%	9.5%	9.9%
Once or twice a month	8.6%	10.3%	9.5%	9.4%	8.8%	9.4%	9.0%	9.7%
Once a week	48.5%	46.1%	45.4%	43.5%	49.8%	47.2%	46.3%	44.3%
More than once a week	16.0%	15.4%	15.5%	15.3%	9.4%	9.6%	9.4%	10.1%
Religious importance								
Not important	13.9%	14.3%	14.8%	14.4%	23.7%	24.1%	24.9%	24.6%
Somewhat important	29.5%	27.1%	29.5%	30.7%	33.3%	32.3%	31.6%	33.2%
Very important	56.6%	58.6%	55.7%	55.0%	43.1%	43.6%	43.5%	42.2%
Social connectivity (mean (SD))	10.46 (5.75)	10.02 (5.65)	9.17 (4.89)	8.45 (4.26)	11.54 (7.36)	10.21 (6.96)	9.62 (6.27)	8.58 (5.25)
CES-D 8 (mean (SD))[*]	3.39 (4.08)	3.20 (3.96)	3.64 (4.04)	3.58 (3.83)	2.37 (3.39)	2.35 (3.40)	2.77 (3.50)	2.73 (3.36)

[*]Details of CES-D 8 scale are provided in Appendix 5.1.

Chapter 5: Depressive Symptoms

Table 16. Growth curve models

		Estimates					Model fit		
		Intercept (90%CI)	StdYX	Slope (90%CI)	StdYX	I/S covariance (90%CI)	RMSEA (90%CI)	CFI	TLI
Depressive symptoms	Female	3.309 (3.189; 3.430)	1.093	0.119 (0.072; 0.165)	0.163	-0.806 (-1.111; -0.501)	0.037 (0.028; 0.047)	0.987	0.984
	Male	2.318 (2.209; 2.428)	0.884	0.183 (0.140; 0.226)	0.239	-0.651 (-0.904; -0.399)			
Religious attendance	Female	0.212 (0.160; 0.263)[1]	0.213	-0.035 (-0.045; -0.024)	-0.259	-0.010 (-0.022; 0.002)	0.026 (0.020; 0.032)	1.000	1.000
	Male	0.000[1]	-	-0.023 (-0.034; -0.013)	-0.187	-0.006 (-0.017; 0.006)			
Religious importance	Female	0.355 (0.299; 0.412)[1]	0.401	-0.021 (-0.034; -0.007)	-0.174	-0.020 (-0.039; -0.001)	0.022 (0.012; 0.032)	1.000	1.000
	Male	0.000[1]	-	-0.007 (-0.020; 0.006)	-0.057	-0.012 (-0.032; 0.009)			
Social connectedness	Female	10.172 (10.034; 10.310)	2.967	-0.613 (-0.665; -0.561)	-0.804	-1.128 (-1.477; -0.780)	0.032 (0.023; 0.042)	0.991	0.989
	Male	10.622 (10.439; 10.805)	2.828	-0.774 (-0.846; -0.702)	-0.867	-1.226 (-1.725; -0.727)			

Note. *p < .05. **p < .01. ***p < .001. †p < .10.
[1]No intercept value is calculated for the reference group (male) in growth models for ordered categorical variables.

Chapter 5: Depressive Symptoms

Structural models

Fit statistics and model results are presented in Table 17. A first unmediated model suggested that once both religious attendance and religious importance are accounted for, religious attendance was associated with lower initial (intercept) depressive symptoms, while religious importance was associated with higher initial depressive symptoms. The association for initial attendance was consistent for men and women. The association with importance did not reach significance for women but was strong for men. There was no evidence of an association between either initial or development (slope) religious attendance or importance on the development of depressive symptoms for men or women.

A second model to test for mediation through social connectedness was fitted. Initial social connectedness was associated with lower initial depressive symptoms. When accounting for social connectedness within the models, the associations between initial attendance and initial depressive symptoms were reduced. The association between initial social connectedness and initial attendance was also significant in men and women. This provides evidence for initial social connectedness partially mediating the association between initial religious attendance and initial depressive symptoms. Initial or development social connectedness did not impact on the development of depressive symptoms in the models.

Including social connectedness in the model also marginally increased the association between initial importance and initial depressive symptoms, for both men and women. However, as there was no effect of initial importance on initial social connectedness, it was not deemed to be a mediator in this relationship.

Chapter 5: Depressive Symptoms

Table 17. Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness.

	Female				Male			
	Unmediated	StdYX	Mediated	StdYX	Unmediated	StdYX	Mediated	StdYX
Depressive symptoms intercept								
Attendance intercept	-0.628 (0.110)***	-0.202	-0.570 (0.108)***	-0.184	-0.776 (0.121)***	-0.271	-0.688 (0.122)***	-0.240
Importance intercept	0.261 (0.146)†	0.071	0.312 (0.146)*	0.085	0.692 (0.130)***	0.232	0.709 (0.130)***	0.238
Social intercept	-	-	-0.167 (0.021)***	-0.190	-	-	-0.140 (0.018)***	-0.203
Depressive symptoms Slope								
Attendance intercept	0.069 (0.051)	0.086	0.069 (0.050)	0.086	0.012 (0.079)	0.014	0.007 (0.079)	0.009
Attendance slope	-0.547 (0.608)	-0.102	-0.491 (0.619)	-0.091	-0.475 (1.099)	-0.088	-0.464 (1.064)	-0.087
Importance intercept	0.015 (0.086)	0.016	0.025 (0.093)	0.027	-0.111 (0.132)	-0.128	-0.125 (0.136)	-0.144
Importance slope	-0.755 (0.803)	-0.135	-0.766 (0.801)	-0.143	0.576 (1.209)	0.106	0.609 (1.112)	0.119
Social intercept	-	-	-0.003 (0.010)	-0.013	-	-	0.004 (0.009)	0.018
Social slope	-	-	-0.024 (0.062)	-0.025	-	-	-0.058 (0.055)	-0.073
Social connectedness intercept								
Attendance intercept	-	-	0.334 (0.153)*	0.095	-	-	0.613 (0.205)**	0.148
Importance intercept	-	-	0.302 (0.198)	0.073	-	-	0.136 (0.226)	0.032
Social connectedness Slope								
Attendance intercept	-	-	-0.017 (0.063)	-0.020	-	-	-0.135 (0.110)	-0.130
Attendance slope	-	-	0.966 (0.631)	0.171	-	-	1.956 (1.450)	0.294
Importance intercept	-	-	-0.063 (0.098)	-0.063	-	-	0.081 (0.203)	0.075
Importance slope	-	-	0.271 (0.836)	0.048	-	-	-1.043 (1.619)	-0.164

Model fit	Unmediated	Mediated
RMSEA [90% CI]	0.062 (0.060, 0.063)	0.054 (0.052, 0.055)
CFI	0.986	0.984
TLI	0.984	0.981

Note. *p < .05. **p < .01. ***p < .001. †p < .10

Chapter 5: Depressive Symptoms

Robustness checks

Results for models using a weighted sample for whom data was available at all waves (n=4,946) are presented in Appendix 5.2. Appendix 5.3 shows results for analyses using a Catholic sample only (n=6,356). Finally, models using cut off points for depression instead of CES-D score results are included in Appendix 5.4. These analyses showed largely consistent results, except where the positive relationship between initial attendance and initial social connectedness fell short of statistical significance for women in the weighted all waves sample and the Catholic only sample.

DISCUSSION

The current study used a large dataset in a population with high historic religiosity to assess the associations between religiosity and mental health. Growth curve models showed that there was a moderate negative association between initial religious attendance and initial depressive symptoms, showing that those with more frequent attendance had lower depressive symptoms at the time of the first measure. However, contrary to my first hypothesis, when accounting for both measured religious factors (attendance and importance), higher initial religious importance was associated with higher initial depressive symptoms. This provides some evidence for my third hypothesis, namely that any protective relationship between religious factors and depressive symptoms is driven by active religious participation. Further, these effects were stronger for men than for women. I found no associations between initial or development religious factors with the development of depressive symptoms.

I hypothesized that the relationship between baseline religiosity and depressive symptoms could be explained through the social benefits gained through religious involvement. Models showed a small partial mediation of the association between religious attendance and depressive symptoms through social connectedness, suggesting that the relationship between attendance and mental health can in part be explained by the social benefits of being part of a religious group. Nevertheless, substantial variation could not be explained through social connectedness, indicating there may be other mechanisms through which religiosity is related to mental health. These mechanisms likely include lifestyle and psychological factors and would be an important area of future research as they may indicate specific areas where public health interventions could be targeted to improve the mental health of the older ageing population.

Many contemporary studies of the religion-mental health link have highlighted the complexity of these effects. Maselko and colleagues found convincing evidence of bidirectional relationship between religious attendance and major depression (235). A large number of these

Chapter 5: Depressive Symptoms

studies have found comparable associations between religious factors and better mental health at one point in time (243-245). Holt and colleagues (246) found that the longitudinal relationship between religious behaviours and lower depressive symptoms was mediated by positive religious social support in a sample of African Americans. Another study using a sample of older African Americans found that church-based social support is positively associated with lower depressive symptoms and psychological distress (247). Both these studies concentrate on the importance of social support and specifically church-based social support. The current findings of the partial mediation of social network on the association of religious attendance and mental health provide initial evidence for the possibility that social support and social networks are part of the causal mechanism in these relationships.

I posited that social support obtained through religious participation may be particularly important for Irish women, as before the 1970s and 1980s many would have had fewer opportunities for acquiring social roles and social networks through the labour market (248). However, the data from TILDA shows that these associations were in fact similar and somewhat stronger for men, indicating that religious social participation is at least as important for men as women. Gender differences that suggested a stronger protective effect for men have been previously reported (249). There is growing evidence suggesting that religious attendance is the most consistent predictor of positive mental health (231, 250-252). I build on these findings and provide evidence that this relationship may be in part, explained by the social benefit accrued through religious involvement for both men and women.

Results from this study which showed an association between higher initial religious importance and higher initial depressive symptoms were more surprising. There have been few studies linking religious behaviour to depressive symptoms, although a number of studies have found that different types of religious behaviour, belief or coping are associated with different mental health outcomes (182, 229, 253). The current findings would suggest that, for men in particular, attributing high importance to religion is associated with increased depressive symptoms, once religious attendance is accounted for. It is plausible that a distressing change in life circumstance, accompanied by depressive symptoms could also be accompanied by an increase in the attributed importance of religion as a coping behaviour. However, if this were the case, I would expect to see a relationship between the slopes of religiosity factors and depression, which was not the case in this study. Without longitudinal effects, both associations between religious attendance and importance with depressive symptoms could plausibly be explained by reverse causation.

Chapter 5: Depressive Symptoms

The changing status of the Catholic Church in Ireland and the scrutiny it has come under due to abuse scandals of the past decades could also have a role in any possible detrimental effects of religiosity (80, 254). Older Irish individuals, who have lived with the certainty of the status of the Church their entire lives, may find their views of their own roles within society challenged in this changing context. In particular, strong religious belief without the accompanying social support gained from attendance could be related to feelings of isolation in a society perceived as hostile to the religious. Further qualitative research may be beneficial in exploring these possibilities.

This study does have some limitations; even though the longitudinal cohort brings with it many strengths, it is still an observational study and, as such, it can be difficult to attribute causality. It is plausible that the measures of attendance and importance are not able to capture subtleties of religious feeling and participation. Religious attendance encompasses a number of factors, such as religious social participation and community, worship, and commitment. In research that does not consider both importance and attendance, it is possible that attendance is confounded by other, more negative, aspects of religious beliefs and behaviours. Further, the use of size of social network does not distinguish between social support gained through religious participation and other types of social support. Social support rather than social network size has been shown to be important in other studies (255). I were unable to make this distinction. Another limitation, which could be further explored in future research, is the exclusion of the non-religious. This is a small but growing population in the over 50s in Ireland. Previous research on the non-religious has shown that their mental health is not linearly associated with religiosity (231, 256).

The strengths of the study include the use of a nationally representative, longitudinal dataset, from a population which has not been studied in this context in the past. The large size of the dataset allowed complex analyses and robustness checks. The data come from a historically Catholic country, which has undergone large scale social change in recent decades, with religion at the centre of these changes. The majority of studies investigating the link between religion and health have come from the US. The current work adds to the literature by presenting evidence from an understudied, non-US based population, which has a unique profile of religious affiliation and practice.

Although I did not find longitudinal evidence for a causal effect between religiosity and mental health, I found a robust association between religious attendance and lower depressive symptoms at baseline. The association between religious importance and depressive symptoms was not as robust, however, it appears that certainly for men, higher initial religious importance

Chapter 5: Depressive Symptoms

is associated with higher initial depressive symptoms. I also found evidence that any modest protective effects of religious attendance on depressive symptoms are at least partly attributable to the social benefits afforded from regular religious participation. I add to the discussion around religion and health by demonstrating that, in this historically religious sample, the relationship is complex and is, in part, tied to the social benefits of being religiously active.

Chapter 6: Mini-Mental State Examination trajectories at age 50 and over: the role of religion and possible mediation through depressive symptoms, social network and smoking

Chapter summary

Having explored and tested hypotheses related to religion and mortality, physical and mental health, I turned to cognitive function. Maintaining cognitive function is a fundamental aspect of ageing independently. Although this question has been explored in the religion-health literature, it is unclear whether religion is associated with cognition, and if so, which aspects of religion are beneficial. Further, when positive associations have been observed, the mechanisms behind these are not yet well understood. Some studies have found that cognition is protected in religiously engaged women, but not men. Building on the previous work in this thesis, I first test whether religious affiliation is associated with different cognitive ageing trajectories. I then test religious attendance and three possible mechanisms for a relationship with cognitive trajectories. The first two possible mechanisms are depressive symptoms and social network and are based on previous findings in this thesis showing that mental health and the size of the social network are associated with religious attendance. A third possible mediator is tested based on the literature; religiosity has been shown to be associated with some better health behaviours. I tested whether smoking behaviour could help explain the relationship between religious attendance and cognitive trajectory.

Chapter 6: Cognitive Function

Abstract

Background: Religious attendance is associated with better outcomes in various health domains in older age. The link between religion and cognitive ageing is inconclusive. There is also a lack of evidence on mechanisms around this relationship, and what the implications are for those who are not religious. I aimed to assess differences in the probability of following a high, medium or low performing cognitive trajectory by religious affiliation and religious attendance. I further sought to test possible mechanisms for an association.

Methods: Data from the Irish Longitudinal Study on Ageing (TILDA), a nationally representative study of the over 50s population in Ireland, was used. I identified latent class trajectories of Mini-Mental State Examination (MMSE) performance over five waves using Latent Growth Class Analysis (LGCA) on data from 7,336 individuals. Multinomial logistic regression was used to estimate the likelihood of membership to each trajectory class by religious affiliation or non-affiliation, and by religious attendance. Finally, I tested possible behavioural, psychological and social mechanisms.

Results: LGCA identified three trajectory classes, High Start class, a Mid Start class and a Low Start class. There were no differences in class membership by religious affiliation or non-affiliation. Women who attended religious services were less likely to be in the Low Start MMSE class (relative risk ratio=0.73, 95% CI=0.55; 0.96). This effect was fully mediated by depressive symptoms, social network and smoking. No effects were found for men.

Conclusions: The cognitive trajectories of the over 50s in Ireland vary. Variation is not influenced by religious affiliation or non-affiliation but appears to be influenced by level of religious attendance in women. Better mental health, more social participation and lower rates of smoking seem to explain this relationship.

Chapter 6: Cognitive Function

INTRODUCTION

Small changes to cognitive performance in later life are accepted as a normal part of ageing, however, more substantial changes in cognition can have a large impact on individuals' abilities to live independently and maintain good quality of life. Religious participation has been suggested as a possible protective factor for various aspects of health. The weight of the evidence suggests that religiosity (religious beliefs, behaviour and attitudes) has a small positive association with better health, though results have been mixed, and differ by health domain and measure of religiosity (219).

The link between religion and cognition has received less attention than the link between religion and other health domains. Previous work on religion and cognition has found that being religious is associated with higher dementia mortality (257), higher risk of dementia (258), and slightly higher cognitive decline when comparing the religious to the non-religious (259), but lower in the highly religious compared to the less religious (30, 259-263). A recent review of the association between religiosity and cognitive function found that 82% of the seventeen studies reviewed reported positive associations. The review largely drew evidence from Christian samples, and therefore was not able to assess the implications of religiosity in other affiliations or the non-affiliated (264).

Studies have also begun to explore the mechanisms behind the religion-cognition relationship. Both religiosity and cognition have been shown to be associated with depressive symptomatology; two recent studies using European samples have found associations between religiosity and lower depressive symptoms (207, 212), and this is supported by the wider literature (218). Depression has often been discussed as a potentially modifiable risk factor for cognitive decline and dementia, however, it remains unclear whether depression is a risk factor or an early symptom of cognitive decline (265-267). Corsentino and colleagues found a three-way interaction between gender, age and depressive symptoms in the effects of follow up cognitive function. They found that women, but not men, with high depressive symptoms and low religious attendance had worse cognitive scores (268). Similarly, Foong and colleagues found that intrinsic religiosity moderates the negative effect of depression on cognition (269). In a study of older Mexican-Americans, Reyes-Ortiz and colleagues found that, for participants with high depressive symptoms, high church attendance was associated with a slower decline in cognition (262). However, none of these studies fully explained the association between cognitive health and religion.

Chapter 6: Cognitive Function

Other mechanisms could be implicated in this association. The religion and health literature have often posited three main pathways through which religion can have a positive impact on health; firstly, religion is associated with better mental health and lower depression in most studies (as discussed above). Secondly, religion is also associated with social benefits, for example increased social participation and lower isolation and loneliness (270, 271). Finally, religion is linked to certain health behaviours. Smoking, drinking and risk-taking are all lower in the religious, and also highly associated with health (272-276). All three mechanisms outlined (mental health, social connectedness, health behaviours) also have demonstrated links to cognitive function (59, 265, 277, 278). Further, these three domains are highly correlated.

A further complicating factor in the disentanglement of the religion-cognition relationship is cognition itself. Normal age-related cognitive decline, and the form it takes, are complex and may include a number of pathways (279). The majority of older adults only experience mild cognitive decline, which progresses slowly over time and has a minimal impact on their wellbeing. However, some older adults experience a much faster onset of symptoms and decline. This has been shown to be in part related to cognitive reserve and level of education (279). Little has been done to understand the probability of experiencing rapid cognitive decline by religious affiliation or involvement.

The current study takes advantage of a large dataset to analyse the cognitive trajectories of adults aged 50 and over. I then test the probability of experiencing rapid cognitive decline or maintaining cognition by religious affiliation and religious attendance. Finally, I test three main mechanisms for the association between religious involvement and cognitive trajectories, namely mental health (depressive symptoms), social connectedness (number of close family and friends), and health behaviours (smoking status).

METHODS

Sample

This study uses data from 7,336 adults aged 50 and over participating in The Irish Longitudinal Study on Ageing (TILDA). TILDA is a nationally representative, longitudinal study of the older population in Ireland. TILDA has collected data on the social, economic and health characteristics of 8,174 participants aged 50 and over. TILDA participants were randomly sampled using a two-stage sampling design, which is described in detail elsewhere (122). The first wave of data collection was completed in 2010, with new waves of data collection approximately every two years. The statistical methods used in the current study allowed all available data to be used. Participants with observations on the cognitive measure of interest

Chapter 6: Cognitive Function

(Mini-Mental State Examination - MMSE) at any wave were included. Participant numbers per wave were: Wave 1=5,723; Wave 2=6,743; Wave 3=5,970; Wave 4=5,334; Wave 5=4,644. Participants with doctor diagnosed Parkinson's disease, Alzheimer's disease, dementia, organic brain syndrome or senility, or severe memory impairment at baseline were excluded from the current analyses (n=94). I further excluded participants with missing data on the measures of interest (full details given in Appendix 6.1).

Measures

Cognitive measure: Cognitive function is measured in TILDA using a battery of tests. The MMSE is a test of global cognition, used as a screening instrument to detect cognitive impairment (280). In TILDA, the MMSE was measured at Wave 1 by a research nurse during an in-centre or at-home health assessment, and at subsequent waves by a social interviewer during the Computer Assisted Personal Interview (CAPI) at home. The MMSE consists of a test which includes different tasks. On completion of the MMSE, participants are given a score from 0 to 30, with 0 representing no correct answers given, and 30 representing all correct answers given.

Religious measures: All respondents were asked at Wave 1 about their religious affiliation, importance and practice. Religious affiliation was obtained through the question "What is your religion?" Responses included Catholic, Anglican/Church of Ireland/Episcopalian, Methodist, Presbyterian, Other Christian, Other religion, No religion. For the current analysis, I included all the religious in one group, and compared them to all those who reported to have no religion. Those with no religion were then routed past questions on religious practice and belief. Religious attendance was collected through the question "About how often do you go to religious services?" (Never/almost never; Once or twice a year; Every few months; Once or twice a month; Once a week; More than once a week). I recoded this item into a two-category item indicating the level of religious attendance, with those who attended at least once a month categorised as 'high attenders' and those who attended less frequently (including those who never attended, but not including the nonreligious) categorised as 'low attenders.'

Mediator variables: I selected three putative mediator variables. These represent three separate, but interrelated mechanisms hypothesised to underlie the religion-health relationship. First, I tested whether depressive symptoms, which have been shown to be a part of the religion and cognition relationship in the past, mediated the relationship. Depressive symptoms are measured using the CES-D measure (201). Secondly, I tested whether the size of the social network, measured as the number of close relatives and friends, had a mediating impact.

Chapter 6: Cognitive Function

Finally, I tested a behavioural pathway, by including smoking status as a putative mediator. Smoking status was categorised as 'Never smoker', 'Past smoker' and 'Current smoker.' Smoking is the health behaviour most consistently associated with religiosity and was therefore chosen to test this mediation pathway. Other health behaviours are more complexly associated with religion (219). All mediator variables were measured at baseline.

Covariates: Control variables were selected on a theoretical basis. Included variables were age and age^2 (to account for any possible non-linear association between age and cognitive decline), as well as a number of socio-demographic (sex, education (none/primary; secondary/higher), marital status (married or cohabiting; never married; separated or divorced; widowed)) and health (doctor diagnosed stroke, high cholesterol, diabetes; self-rated health (excellent; very good; good; fair; poor)) variables. Some covariates were not included due to statistical concerns. These include any substance abuse problem, which was not included due to small numbers reporting substance abuse problems (n=132), and transient ischemic attack, again due to small numbers (n=177).

Analysis strategy

I initially conducted a Latent Class Growth Analysis (LCGA) to identify different latent trajectory classes for MMSE performance among sub-groups of the sample. These LCGA models were fit using Mplus version 6.12 (281). This approach allows for different groups of individual growth trajectories to vary around different means and results in separate growth models for each latent class. For this analysis, the variance and covariance estimates for growth factors within each class are set to zero, meaning that individual growth trajectories within each class are assumed to be homogeneous (282). The following criteria were used to assess model fit: comparison of the Bayesian and adjusted Bayesian information criteria (BIC and aBIC; (283)); higher entropy and posterior class membership probabilities (284); statistically significant Lo-Mendell-Rubin likelihood ratio test (LMR-LRT), which compares the fit of the k-class model against the k-1 class model (285); the proportion of cases in each class exceeds at least 5% of the sample; and the emergence of distinctive and theoretically relevant classes (286).

Multinomial logistic regression was then used to test whether there were differences in the probability of being in each MMSE class for the religious compared to the nonreligious. I then used multinomial logistic regression to examine the religious only and examined differences in probability of being in each MMSE class by level of religious service attendance. I obtained and presented relative risk ratios for model effects, and plotted predicted probabilities using the

margins and marginsplots commands. Finally, I use the khb command (available in Stata (287)) which implements the decomposition of effects method developed by Karlson, Holm and Breen to test mediation effects for the three putative mediators. This method compares the estimated coefficients of two nested nonlinear probability models and decomposes the effect of a putative mediating variable on an outcome variable through its relationship with the main variable of interest (288). I used the disentangle command available in khb to retrieve individual mediation variable contributions to the total mediation effect.

Supplementary analysis

I used an ordered categorical version of the attendance variable in an adjusted multinomial regression model for MMSE class to assess whether there were dose-response effects.

RESULTS

Table 18 presents fit statistics for LGCA. These indices informed the selection of the three-class solution, as moving from three to four classes returned a non-significant result for the LMR-LRT and increased BIC and aBIC coefficients.

Table 18. Growth mixture model fit indices

	LMR-LRT	**BIC**	**aBIC**	**Entropy**	**PMP**
2 classes	7833.6***	103809.1	103764.6	0.74	0.92-0.94
3 classes	1427.7**	102393.8	102333.4	0.60	0.80-0.91
4 classes	1522.0	106269.6	106218.7	0.90	0.86-0.96

*** $p<0.001$; **$P<0.05$; LMR –LRT = Lo-Mendell-Rubin likelihood ratio test; BIC = Bayesian Information Criterion; aBIC = sample size adjusted BIC; PMP = range for the posterior membership probabilities.

Final LGCA results identified three latent classes for MMSE trajectories. MMSE trajectories over the first five waves of TILDA are illustrated in Figure 9. The largest class represented over half of the participants (53%) and was characterised by high baseline MMSE scores and a small increase in scores over time (High Start class). The second class included a third of the sample (34%) and was characterised by slightly lower MMSE scores at baseline, and a slow decline over time (Mid Start class). Finally, the smallest class included 13% of respondents and was characterised by low baseline scores, a small initial increase in scores, and a decline in scores after Wave 3. The characteristics of class members are presented in Table 19.

Chapter 6: Cognitive Function

Figure 9. MMSE latent trajectory classes from 2009 to 2017. High Start class is indicated in red, Mid Start class is indicated in blue, and Low Start class is indicated in green
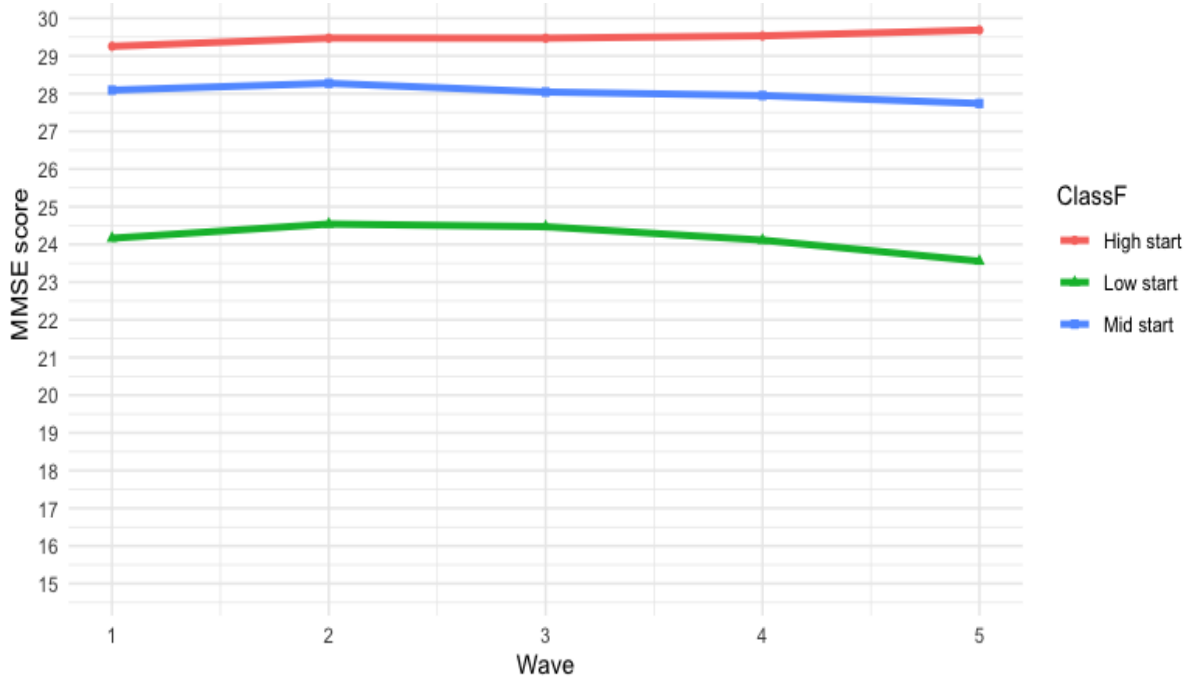
Chapter 6: Cognitive Function

Table 19. Sample characteristics by MMSE latent class

	Class 1 (High Start) n=3,876	Class 2 (Mid Start) n=2,524	Class 3 (Low Start) n=936
MMSE Wave 1	29.3 (0.9)	28.1 (1.4)	24.2 (3.3)
MMSE Wave 2	29.5 (0.8)	28.3 (1.4)	24.5 (3.4)
MMSE Wave 3	29.5 (0.8)	28.0 (1.4)	24.5 (3.2)
MMSE Wave 4	29.5 (0.7)	28.0 (1.5)	24.1 (3.6)
MMSE Wave 5	29.7 (0.5)	27.7 (1.3)	23.6 (3.7)
Age (baseline)	60.2 (7.9)	65.3 (9.2)	71.5 (10.3)
Religious attendance (%)			
High attender	62.5	70.2	71.4
Low attender	30.7	25.7	26.6
Nonreligious	6.7	4.1	2.0
Sex (%)			
Men	42.2	50.4	48.2
Women	57.8	49.6	51.8
Marital status (%)			
Married	76.1	68.5	51.2
Never married	8.0	9.9	14.1
Separated/Divorced	7.5	5.8	6.0
Widowed	8.5	15.8	28.9
Education (%)			
Primary/None	13.8	38.5	66.1
Secondary	43.6	42.2	26.4
Third level	42.7	19.3	7.5
Self-rated health (%)			
Excellent	20.1	14.0	7.2
Very good	33.0	26.0	23.0
Good	31.7	33.6	33.0
Fair	12.7	21.0	27.1
Poor	2.6	5.4	9.7
High blood pressure (%)	32.4	40.6	45.2
High cholesterol (%)	39.5	39.7	33.8
Stroke (%)	0.6	1.7	4.3
Diabetes (%)	5.5	9.0	12.0
Mediator variables			
CES-D (mean (SD))	5.2 (6.7)	5.9 (7.0)	7.7 (8.7)
Close relatives and friends (mean (SD))	10.9 (5.9)	11.3 (7.2)	10.1 (6.8)
Smoking status (%)			
Never	46.8	41.4	40.9
Past	37.6	39.6	36.5
Current	15.7	19.0	22.5

Note: Due to the collection method for MMSE (see Methodology) MMSE scores have different sample sizes at each wave. These are: Wave 1 = 5,723; Wave 2 = 6,743; Wave 3 = 5,970; Wave 4 = 5,334; Wave 5 = 4,644.

Chapter 6: Cognitive Function

Multinomial logistic regression

I found no evidence of differences in probability of MMSE class membership by religious affiliation or non-affiliation, although women who were religious had a larger, nonsignificant, relative risk ratio (RRR) of being in the Low Start class than women who were nonreligious, relative to the High Start class (Table 20).

Table 20. Multinomial logistic regression for MMSE class by religious vs nonreligious affiliation, relative risk ratios (n=7,336)

	Women (n=3,978)	Men (n=3,358)
Class 1: High Start		
Class 2: Mid Start		
Religious (vs. Nonreligious)	1.14 (0.76; 1.72)	1.27 (0.92; 1.75)
Class 3: Low Start		
Religious (vs. Nonreligious)	2.88 (0.99; 8.35)	1.20 (0.66; 2.19)

Note: Models are adjusted for age, age^2, marital status, education, self-rated health, high blood pressure, high cholesterol, diabetes and stroke.

After excluding the nonreligious, adjusted multinomial logistic regression results for the effect of the level of religious attendance showed that men with high and low attendance had equal probabilities of being in the Mid Start class (RRR=0.99 95% CI 0.82; 1.18) and the Low Start class (RRR=0.88 95% CI 0.66; 1.18) relative to the High Start class (Figure 10). For women, high attendance was associated with a lower probability of being in the Low Start class (RRR=0.73 95% CI 0.55; 0.96). There was a nonsignificant indication that high attendance might be associated with a higher probability of being in the Mid Start class relative to the High Start class for women (RRR=1.17 95% CI 0.98; 1.41) (Figure 11).

Chapter 6: Cognitive Function

Figure 10. Predicted probabilities of MMSE class membership by religious attendance level, men (n=3,127)
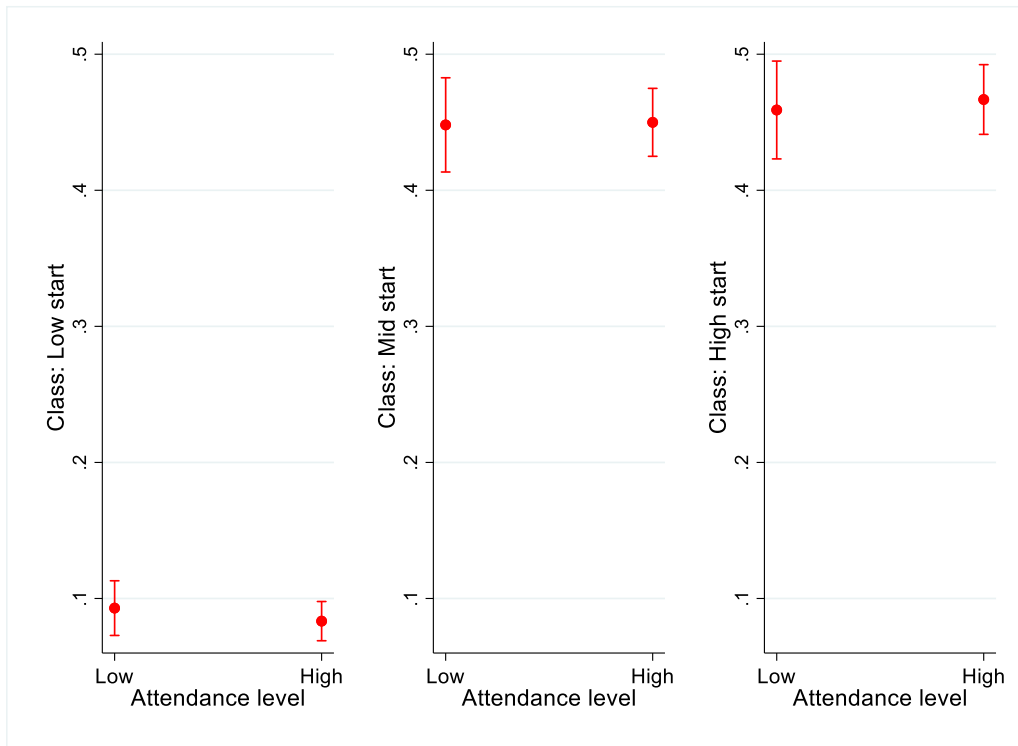
Figure 11. Predicted probabilities of MMSE class membership by religious attendance level, women (n=3,826)
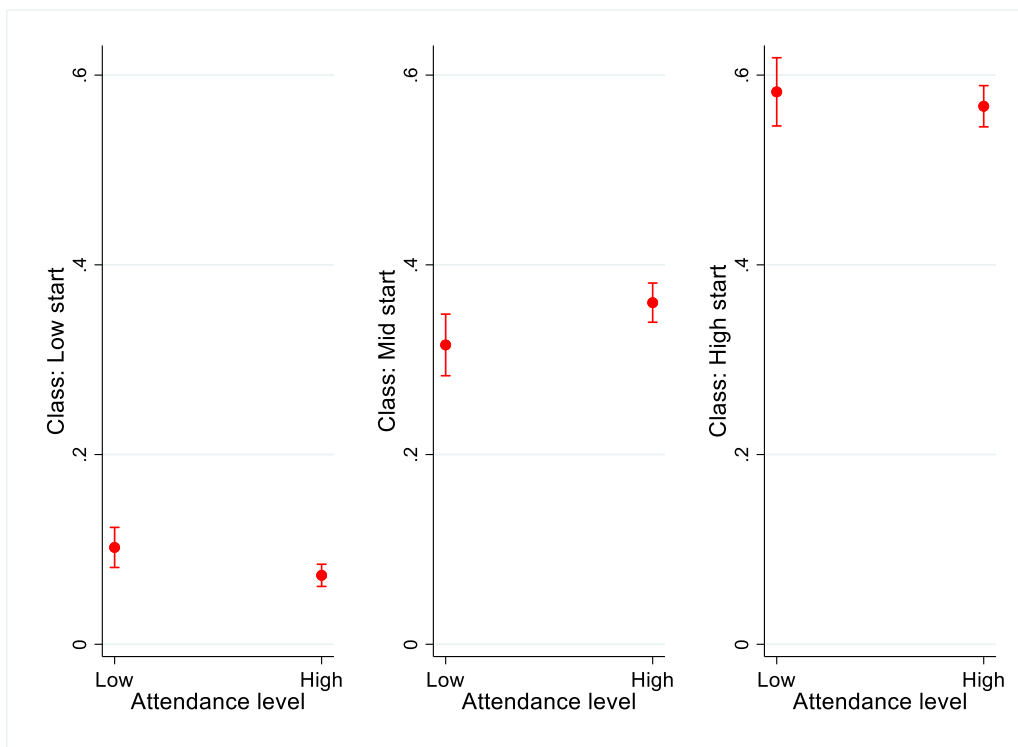
Chapter 6: Cognitive Function

Mediation models

Because there was no observed effects for men, I tested mediation pathways for women only. Results for mediation effects models are given in Table 21. The breakdown of the components of indirect effects, by mediating variable, are given in Table 22. I present the results for mediation models by class outcomes.

Mid Start class

The probability of being in the Mid Start class relative to the High Start class was higher in those who attended religious services at least once a month, although this did not reach significance. This effect was not mediated by CES-D, number of relationships, or smoking status; however, the probability of high attenders being in the Mid Start class increased and became significant when CES-D, number of relationships and smoking status were added to the model. Examining the components of the difference showed that this confounding was fully explained by the inclusion into the model of current smoking status.

Low Start class

The probability of being in the Low Start class relative to the High Start class was lower for high attender women. A mediation model showed that the effect of attendance was fully mediated by CES-D, count of close relatives and friends, and smoking status. These variables mediated 38.5% of the total effect. Examination of the components of difference showed that all three mediators contributed to the total mediation effect, with the most important contributions coming from CES-D and current smoking.

Table 21. Attendance and mediation effects, women

	Total effect	p value	Direct effect	p value	Indirect effect	p value	% mediated
High Start class (base outcome)	-		-		-		-
Mid Start class	.16 (-.02; .35)	0.081	.21 (.02; .40)	0.028	-.05 (-.09; -.01)	0.017	-29.3
Low Start class	-.30 (-.58; -.02)	0.036	-.18 (-.47; .10)	0.209	-.12 (-.18; -.05)	<0.001	38.5

Chapter 6: Cognitive Function

Table 22. Components of indirect effects

	Coefficient	SE	Individual contribution	% mediated
Mid Start class				
CES-D	-.00	.01	10.38	-3.05
Relatives and friends	-.00	.01	-1.91	0.56
Smoking: Never (ref)	-	-	-	-
Smoking: Past	.00	.00	-3.29	0.97
Smoking: Current	-.05	.02	94.82	-27.81
Low Start class				
CES-D	-.06	.02	50.43	19.42
Relatives and friends	-.03	.01	22.40	8.63
Smoking: Never (ref)	-	-	-	-
Smoking: Past	.01	.01	-9.68	-3.73
Smoking: Current	-.04	.02	36.85	14.19

Supplemental analysis

I also tested the probabilities of membership to MMSE classes by including religious attendance as an ordered categorical variable. There were no significant effects for men, and no trends were observed. There were no significant effects or trends for women's probability of membership to the Mid Start class. However, I observed that women who attended once a week or more than once a week were significantly less likely to be in the Low Start class than women who never or almost never attended services. I observed a trend in these results, with higher religious attendance being associated with lower probabilities of belonging to the Low Start class (Table 23).

Chapter 6: Cognitive Function

Table 23. Religious attendance as an ordered categorical variable (n=6,953). Nonreligious respondents are not included in this analysis

	Women (n=3,826)	Men (n=3,127)
Class 1: High Start		
Class 2: Mid Start		
Religious attendance (ref: never)		
Once or twice a year	0.93 (0.64; 1.35)	0.87 (0.63; 1.20)
Every few months	1.24 (0.86; 1.80)	0.80 (0.55; 1.15)
Once or twice a month	1.13 (0.78; 1.65)	0.99 (0.69; 1.43)
Once a week	1.25 (0.93; 1.67)	0.86 (0.66; 1.12)
More than once a week	1.23 (0.88; 1.72)	0.93 (0.63; 1.35)
Class 3: Low Start		
Religious attendance (ref: never)		
Once or twice a year	0.79 (0.47; 1.33)	1.02 (0.59; 1.76)
Every few months	0.72 (0.41; 1.26)	0.98 (0.54; 1.78)
Once or twice a month	0.72 (0.42; 1.25)	1.04 (0.57; 1.88)
Once a week	**0.62 (0.41; 0.92)**	0.88 (0.58; 1.35)
More than once a week	**0.59 (0.37; 0.94)**	0.74 (0.41; 1.31)

DISCUSSION

These results show that in a nationally representative sample of the Irish population aged 50 and over, cognitive performance, as measured by the MMSE, was high and maintained high after eight years of follow-up for over half of respondents. However, over a third had medium high scores at baseline but experienced a slow decline over time, and over 10% had low scores at baseline and also experienced some decline. I found that there were no differences between the religiously affiliated and the non-affiliated in the probability of belonging to each of these classes. However, women's probabilities of belonging to each class varied by their level of religious attendance. Religious women with high religious attendance had a lower probability of being in the Low Start class. There was also somewhat conflicting evidence that high attendance women were more likely to be in the Mid Start class relative to the High Start class.

I tested whether these effects for women were mediated by CES-D, the count of close relatives and friends or smoking status. I found that the lower probability of being in the Low Start class was fully mediated by these factors. This suggests that religious attendance is protective of cognitive function through multifactorial pathways. The strongest mediating factor was CES-D; the positive association between religious attendance and mental health in part explains the lower probability of lower cognitive scores. The second strongest mediating factor was current

smoking. The lower likelihood of smoking in the high attenders lowered their probability of being in the Low Start class. Finally, the size of the social network had a small effect. Those with high religious attendance had larger social networks, and this was associated with lower probability of being in the Low Start class.

The results for probability of membership of the Mid Start class were less straightforward. Women with high religious service attendance had a higher probability of being in the Mid Start class compared to those with low attendance, however, this did not reach significance. Mediation models showed that this effect was confounded by current smoking status. The effect of high religious attendance on probability of being in the Mid Start class was increased and became significant when smoking status was accounted for. This suggests the high attenders have an independently higher probability of being in the Mid Start class, which was confounded by the effect of being a current smoker. As high attenders were less likely to be current smokers, this was not initially evident in the model.

There therefore appear to be two separate mechanisms underlying the relationship between religion and cognition for women. First, high religious attendance is associated with a number of areas of life which are in turn associated with better health. Older persons with better mental health, better health behaviours and larger social networks are less likely to have lower cognitive performance and cognitive decline (Low Start class). Conversely, there was some evidence that highly religiously involved women were more likely to have medium high scores but experience a slow decline in these scores over time (Mid Start class). The fact that smoking confounded this relationship suggests that behavioural factors again may be protective against being in this Mid Start class. There is a body of research which has found lower cognitive performance (289, 290), but not faster cognitive decline (31), among the religious. Among the posited explanations for these effects are higher non-conformity in individuals who are more intelligent, analytical as opposed to intuitive thinking style among the more intelligent, and a lower need for religion in the more intelligent (289). I did not find definite evidence of poorer cognition among the religious; however, there were some indications that religious women may be at slightly higher risk of lower cognition. A slightly lower start point in cognitive scores associated with higher religiosity could help explain these discrepancies.

I only found effects for MMSE class membership by religious attendance in women. This has been the case in other studies (268). A study using TILDA data found that men's social network and depressive symptoms are equally, if not more, associated with their religious attendance as women's, suggesting these mediators are not behind the gender difference (212). The significant effects for women may be reflecting women's higher religious participation. When

thinking of the protective effect seen against the probability of being in the Low Start class in particular, it is plausible women gain some form of cognitive reserve from religious participation (268, 291). Women in Ireland in this age group are less likely to have participated in the labour market (248, 292), and religion has been suggested as a mechanism for women to gain resources such as social networks, intellectual stimulation and access to opportunities, which men may in turn gain from their participation in the labour force. The nonsignificant direct effect of religious attendance on women's MMSE class probabilities after adjusting for indirect mediating effects was larger than men's, and this could be reflecting a small unobserved effect of religious practice on women's cognitive reserve. The positive effect of religious attendance on women's probability of being in the Mid Start class cannot be explained through this mechanism, however.

The detailed examination of behavioural measures other than smoking was beyond the scope of this study. Smoking is the health behaviour most consistently associated with religiosity, with the religious being less likely to smoke in most religions and contexts (219, 293). In contrast, for health behaviours such as diet, weight and physical activity both negative and positive associations have been found (206, 219, 294, 295). This area of research deserves further attention.

This study has some limitations. Although the use of LGCA enables us to examine different cognition trajectories, the use of the MMSE measure has some disadvantages. The MMSE was developed to detect cognitive impairment and is therefore not sensitive to minor cognitive changes in healthy populations. The MMSE is vulnerable to ceiling effects, and this has caused difficulty with its use to assess cognition in healthy populations (296). However, the use of LGCA is able to somewhat address this by not relying on analysis of changes to an overall mean and grouping individuals by their baseline as well as trajectories over time. The current analyses are also limited by the fact that I only use one measure of global cognition; it is likely that observed results are more complex, and that the cognition-religiosity relationship may vary according to cognitive domain. However, use of other, more specific measures of cognitive function was beyond the scope of this study, and will be a useful contribution in the future. Another limitation is the possibility of bias in the sample. Although I was able to include a large proportion of the TILDA sample in the analysis, 9% were excluded due to having no MMSE observations at any wave. These missing observations are largely due to the collection of the MMSE during the health assessment at Wave 1. Many older and frailer respondents did not complete the health assessment and therefore do not have MMSE data. This may bias the sample, as those who were healthier were more likely to be included. However, I was able to

conduct sophisticated analyses using a wide range of control variables and data observed over time, which should help adjust for any bias introduced by missing data.

Conclusion

I found no differences in the cognitive trajectories by being religious or nonreligious for men or women. Once only high and low religious attendance was considered, women with high attendance were less likely to be in the low cognitive performance class. This was fully mediated by depressive symptoms, smoking status and social network, suggesting that a protective effect of religious attendance can be explained by psychological, behavioural and social factors. Further research into specific cognitive domains, as well as research into the mechanisms behind gender differences would be beneficial. Policies which enable those who are religious to maintain religious engagement may help protect both mental and cognitive health. Policies which seek to improve rates of smoking cessation, mental health and social engagement in secular as well as religious populations are likely to have positive impacts on population cognitive health.

Chapter 7: Religiosity and quality of life in older Christian women in Ireland. A mixed methods analysis

Chapter summary

The final chapter of this thesis uses both quantitative and qualitative data to explore one of the most prevalent theories of the relationship between religion and health. Many researchers suggest that the religion-health association can be partly explained through the way religion enables psychological coping. For older people in particular, religion is hypothesised to provide comfort, meaning and a framework for understanding difficult life events such as bereavement and illness. In this chapter, I first test whether quantitative data from TILDA supports the hypothesis that religion enables coping by looking at differences in quality of life by religiosity after recent widowhood or cancer diagnosis. I then use qualitative findings to help explain the observed relationship and expand and illustrate the way women aged 65 and over conceptualise the role of religion in their health and wellbeing.

Chapter 7: Quality of Life

Abstract

Background: Religion and quality of life (QoL) have been linked in several studies. Among possible mechanisms is religious coping with life events that threaten QoL in older age, such as illness and bereavement. Querying both quantitative and qualitative data can help understand the importance of coping and other ways in which religion and QoL are associated.

Methods: I used a convergent mixed methods approach to assess differences in QoL by religiosity, to test whether religiosity is an effective coping strategy in the face of threats to QoL, and to qualitatively contextualise and further explore the religion-QoL association. I used quantitative data from the first five waves of the Irish Longitudinal Study on Ageing (TILDA) to fit mixed effects models of the longitudinal associations of the CASP-12 measure of QoL with religious attendance, recent cancer diagnosis and recent widowhood. I then investigated whether cancer or widowhood effects were moderated by religious attendance. I used qualitative data from semi-structured interviews on religious practice from 11 Christian women aged 65 and over alongside the quantitative data to explore the relationship between religion and QoL in Ireland, and to further contextualise any quantitative associations observed.

Results: Quantitative findings did not show that recent cancer diagnosis or widowhood were associated with CASP-12, or that these effects were moderated by religious attendance. However, they did confirm that religious attendance was positively associated with CASP-12 scores. I did not find evidence of religious attendance affecting the change in CASP-12 scores over time. Qualitative data supported a general positive effect of religious involvement, although certain aspects of being religious in Ireland today were accompanied by distress.

Discussion: Qualitative data suggested the relationship between religious attendance and QoL could be explained by psychological benefits, such as feelings of peace and tranquillity, and by access to community, activities and resources. There was less evidence, both quantitative and qualitative, of a moderating effect of religious attendance on the negative effect of life events on QoL.

Chapter 7: Quality of Life

INTRODUCTION

A majority of studies on the relationship between religion and wellbeing, positive emotions and happiness have reported positive associations, while a smaller number of studies presented mixed findings, often varying depending on the measure of religion or religiosity used (219). There remains a need to uncover mechanisms behind the association between religiosity, quality of life (QoL), and mental health more generally. The integration of quantitative and qualitative methods to explore the link between religious practice and wellbeing, as well as the effectiveness of religious practice to cope with bereavement and illness has, to date, not been conducted. Using a mixed methodology with two samples of Irish women aged 65 and over will shed light on these underlying mechanisms within the social context of high but declining religiosity in Ireland.

The Irish context

Women aged 65 and over today in Ireland were born and raised in the twentieth century. The second half of the century was a time of enormous social and economic change in the country, even though the processes of social change in Ireland lagged behind those of its closest European counterparts. A key process of change in Ireland which began later than in the rest of Europe was the decline of religious influence (79). Throughout the 20th Century and even today, Ireland remains one of the most religious countries in Europe, and the most religious country in Western Europe. However, religious belief and practice are currently in decline. The proportion of those declaring themselves not to have a religion has grown at each census since 1971, while the proportion of Catholics, the majority religion, has declined from 94.9% in 1961 to 78.3% in 2016 (178). The role of the Church in Irish society throughout the century cannot be overstated. The Catholic Church was directly involved in running education, healthcare and other social provisions. Catholic ethos influenced marriage, childrearing and women's role in society (79). Both coming of age in a homogenous religious context, as well as experiencing a seismic change in social values, values which probably shaped one's own moral compass and worldview, could potentially impact on a person's wellbeing. Further, the decline of the Catholic Church in Ireland has been marked by abuse scandals, which have the potential of making the process more painful for those who value the Church's role in their lives. There is no research to date which explores these effects in Ireland.

Quality of life

QoL is a concept which encompasses a large number of positive human emotions and circumstances. In the Irish Longitudinal Study on Ageing (TILDA), QoL is measured using the

Chapter 7: Quality of Life

CASP-19 scale and, in recent waves, the shorter CASP-12 scale (297, 298). The CASP-19 scale was developed for use in older people, and goes beyond the satisfaction of basic needs, to include higher needs (mastery, creativity, etc) (297, 299, 300). The CASP-19 was devised using four domains of need, which are treated as equal and inseparable. These domains are Control, or the ability to control one's environment; Autonomy, or the freedom from the unwanted interference from others; Self-realisation; and Pleasure. These domains have been found to form a single latent QoL factor (297).

Previous analysis from TILDA has found that in the over 50s, QoL tends to increase and then peak around age 67, declining thereafter (301). As QoL is a multidimensional construct, it is influenced by a number of social, economic and health determinants. Health declines which impact physical function, and the ability to carry out one's usual activities, have direct impacts on QoL (302). These health and functionality characteristics are associated with autonomy and control components of QoL. Health deteriorations encountered by most in later life mean that the older population are vulnerable to declines in their QoL. Other life domains which are linked to QoL include mental health, personality and genetics, social activity, and resources such as education and income (219, 301). These characteristics and resources might be seen as protective of QoL in large part through their influence over domains of self-realisation and pleasure.

Religion and QoL

Koenig and colleagues' review of the relationship between religion and QoL found that 78% of studies published between 2000 and 2010 reported positive associations between religion and QoL (219). In a more recent review, Tay and colleagues outlined how religion can help fulfil the higher order needs required for wellbeing at the individual level, such as purpose and meaning, social support, and coping strategies (303). They also found that religion-wellbeing associations hold across cultural contexts, although they are strongest in more religious countries. This assessment is partially supported by a large-scale analysis of cross-sectional, multi-country Gallup Poll data for the years 2005-2011 (304). This analysis suggested that religious attendance was associated with hedonic happiness and evaluative satisfaction with life, while religious importance was only associated with hedonic happiness. The worldwide data presented gave rise to many questions on a perceived paradox; although the religious reported higher wellbeing, countries where the majority were religious had lower wellbeing overall (305, 306). Recent work has expanded on this, showing that in countries where the state was responsible for important aspects of QoL, such as health and education, religion was no longer as strong a predictor (307). This suggests that religion is, at least in part, a means for fulfilling

certain needs, in particular in contexts where these are difficult to attain in other ways (304, 308). A meta-analysis of the wellbeing literature showed that religion is related to wellbeing through religious freedom and religious participation (309). A review of the current state of the science behind happiness concluded "it appears that religiosity is a frequent but not a universal predictor of higher SWB [subjective well-being], and its effects and mediators depend to some degree on culture and the life circumstances of respondents"(310).

Another important area in the field of religion and wellbeing has been the ability of religion to enable coping in the face of adverse life circumstances. Several studies have looked at this link, both quantitative and qualitative. Many of these concentrate on religious coping during a life-threatening illness. A recent review of the QoL literature in patients with congenital heart disease found that being religious was positively associated with QoL (311). Another review looked specifically at the literature around religiosity, spirituality and QoL in dialysis patients, and again found a positive association (312). A review of religion, spirituality and QoL in cardiovascular disease patients found a majority of positive associations, although there were also a substantial number of null and negative associations (313). Religion as a coping tool in bereavement is well supported by the literature; reviews of the effectiveness of religion/spirituality in coping with bereavement have found mostly positive, though inconsistent, associations between religion and adjustment. These have often varied depending on the measure of religion used (314, 315). Brown and colleagues found that widowhood was bidirectionally associated with religiosity; loss of a spouse was accompanied by increased religiosity, and increased religiosity was accompanied by decreased grief (316). However, increased religiosity did not impact on other measures of mental health such as depression.

Pargament and colleagues' ground-breaking work on religious coping showed that there are positive and negative religious coping styles, and that these predict the subsequent effect these can have on adjustment (317). They also found, however, that most of those coping with major life stressors rely on positive religious coping. Others have found that positive religious coping can buffer the negative effects of negative religious coping (318). Studies looking at religious coping in patients going through cancer treatment have found similar patterns; an assessment of multidimensional spirituality found effects for peace and meaning, but not faith (319). A number of studies of breast cancer patients have differentiated between religious comfort and religious fear-guilt, or positive and negative religious coping, and found the effects on QoL were modified largely by the religious coping style (320-322). This suggests that results are not necessarily straightforward. This is further supported by findings that prayer, in lieu of other types of religious participation or practice, was associated with worse psychological and pain

outcomes in chronic pain patients (323). Finally, there is an important area of research into caregiving and religious coping; dementia caregivers have been found to have decreased anger when receiving support from religious communities, as well as finding meaning through spiritual beliefs (324).

I used a convergent mixed methods approach (325) to compare and integrate the results from a longitudinal analysis of a large nationally representative study of adults aged 50 and over with the results of a small qualitative study on religious participation and practice in older Irish women aged 65 and over. I used quantitative data to investigate whether QoL differs between women who have experienced recent cancer and recent widowhood and those who have not. I tested whether these effects were moderated by the level of church attendance. Qualitative data was used to explore the ways in which religious engagement throughout the life-course and in later life help shape women's wellbeing. Finally, the mixed-method analysis examined whether contexts and narratives from the qualitative data help to provide a deeper understanding of the patterns and consequences of church attendance on wellbeing seen in the quantitative data.

METHODS

Quantitative data

TILDA, a nationally representative study, has longitudinally surveyed adults aged 50 and over approximately every two years since 2009. The current study used data from the first five waves of TILDA, completed between 2009 and 2018. Ethical approval for each wave of TILDA was granted by the Trinity College Dublin Faculty of Health Sciences Research Ethics Committee. Respondents were interviewed using a computer-assisted personal interview (CAPI), as well as a pen and paper self-completion questionnaire (SCQ), which respondents completed alone and returned by post. Detailed descriptions of the TILDA methodology are given elsewhere (122, 123). For comparability with the qualitative data, I focused on Christian women (including Catholic, Church of Ireland and other Christian) aged 57 years and over. The age of 57 was chosen as women aged 57 and over during Wave 1 of TILDA were aged 65 and over during Wave 5. Wave 5 of TILDA was completed between January and December 2018. Qualitative interviews of women aged 65 and over were carried out concurrently with TILDA Wave 5 (between February and June 2018), therefore this age criteria most closely matches the age criteria of the qualitative sample. Respondents with missing data at baseline were removed, leaving a final sample size of 2,017 (full details on missingness are given in Appendix 7.1).

Measures. QoL was measured in TILDA using the Control, Autonomy, Self-actualisation and Pleasure scale (CASP) (297). Waves 1 and 2 of TILDA used the full CASP scale, which

includes 19 items (CASP-19). Subsequent waves used a shorter 12 item scale, validated for use with TILDA data (298). To standardize data at each of the five waves, only items available in the CASP-12 at Waves 1 and 2 were used. CASP-12 items were collected at each wave as part of the SCQ which was completed and returned by post. The SCQ had a lower response rate at each wave than the CAPI interview, therefore the sample for participants with CASP-12 data is smaller than the main sample. SCQ response rates were 85% at Wave 1, 85% at Wave 2, 85% at Wave 3, 86% at Wave 4 and 86% at Wave 5.

To examine whether religiosity can impact on QoL, I examined three religiosity variables. These were religious attendance ("About how often do you attend religious services?" Never/almost never; Once or twice a year; Every few months; Once or twice a month; Once a week; More than once a week), which was recoded into high and low religious attendance (attends at least once a month vs attends less than once a month including those who never attend); religious importance ("How important would you say religion is in your life?" Very important; Somewhat important; Not too important/Not at all important), which was recoded into any importance and no importance (very and somewhat important vs not too important); and religious comfort and strength ("Do you find that you get comfort and strength from religion or not?" Yes; No).

To assess whether religiosity could moderate the effects of adverse life circumstances on CASP-12, I included two life events, as well as their interactions with religiosity measures, in separate models. Recent widowhood was defined as those having become widowed in the past two years. Recent cancer diagnosis was defined as any cancer diagnosis in the past five years. The time period used for the definition of recent cancer diagnosis was longer than that of widowhood due to the heavy toll cancer treatment can have on physical and mental health, and the long duration of treatment and treatment side effects (326).

Covariates were chosen according to the QoL research literature, in particular, Ward and colleagues' work on QoL in TILDA (301). Age and age^2 were used as the time-variable in all models. Age^2 was included to account for the likely curvilinear relationship of CASP-12 with time. All models were further adjusted for socio-demographic characteristics (education, marital status (Married; Never married; Separated or divorced; Widowed), home ownership, social network (number of close family and friends), social participation ("Do you participate in any groups such as a sports or social group?"), and health and disability characteristics (limitations in activities of daily living (ADL), limitations in instrumental activities of daily living (IADL), self-rated health, self-rated mental health, fear of falling, chronic pain and episodes of incontinence at least once a month).

Chapter 7: Quality of Life

Analysis strategy. I analysed the first five waves of TILDA by fitting linear mixed effects models of the trajectories of CASP-12 over time. Random slopes were allowed for age, and all models were adjusted for covariates. I used an unstructured random-effects covariance which allows for variances and covariances between all covariates, and does not assume any particular covariance structure (327). I then included religiosity measures one by one, and then as a group. Initial analyses showed that, once all religiosity measures were included, only religious attendance had any effect on CASP-12 (see Appendix A). I therefore chose to continue to analyse only religious attendance. I included interactions between attendance and age, and attendance and age^2 to assess whether CASP-12 score trajectories varied over time by religious attendance. Finally, I included life events in individual models. I included three-way interactions between life event, religious attendance and age, and life event, religious attendance and age^2 to assess moderation of the life event by religious attendance over time. Fitted predicted scores, which take both fixed and random effects parameters into account, were plotted for each model by religious attendance and life event to aid the interpretation of results.

Qualitative data

The qualitative data for this study was collected as part of this thesis between February and June 2018. The aim of this data collection phase was to gain an understanding of the experiences of women living in Ireland and their health, wellbeing and religious participation in the context of getting older. I recruited women aged 65 and over from various church congregations in north inner-city Dublin. Administrators of 14 churches (11 Catholic, two Church of Ireland, and one Presbyterian) were contacted seeking permission to advertise to the congregation. Seven of these churches ran recruiting advertisements for the study (notices in church newsletters or recruitment posters on church noticeboards). Nine participants were recruited from five churches. Two of these participants were friends and contacted the study together, although they were interviewed individually. A further two participants were recruited into the study by friends who were congregants of the targeted churches. The final sample of 11 women were aged between 67 and 89 and lived in North Dublin and Dublin commuter towns, with the exception of one respondent who travelled from another large Irish city to participate. I completed an individual semi-structed interview with each participant. Interviews lasted between 50 minutes and two hours and were conducted in Trinity College Dublin, apart from one which was conducted in the participant's own home. The interview instrument was developed to explore the women's experiences of health, ageing, and religion in Ireland, but was also flexible enough to allow for further themes to emerge. Interviews were coded and analysed using thematic analysis in NVivo 12. In the current study, themes emerging from the

qualitative data were used to illustrate and seek explanations for some of the results identified in the quantitative data analysis. I present quotes from participants whose words best illustrate broader processes discovered inductively in the data.

RESULTS

Quantitative data

Preliminary analyses showed that all religiosity measures were positively associated with CASP-12. However, in models simultaneously adjusting for attendance, importance and comfort, only attendance maintained an association with CASP-12 (Table 24). I therefore concentrated on attendance as the main driver of any relationship between religiosity and CASP-12. Examination of CASP-12 scores over time by level of religious attendance showed that QoL appeared to decline slightly after Wave 1, and that those with higher attendance had slightly higher QoL (Table 25).

Table 24. Fixed and random effects results for CASP-12 by religious attendance, religious importance, and religious comfort and strength, and life events

	Model 1. Religious attendance		Model 2. Religious importance		Model 3. Religious comfort		Model 4. All religiosity		Model 5. Widowhood		Model 6. Cancer	
	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Fixed effects												
Event	-	-	-	-	-	-	-	-	-.87†	-1.78; .04	.22	-.80; 1.23
High attendance	**.77*****	**.36; 1.18**	-	-	-	-	.60*	.14; 1.07	.61*	.14; 1.07	.60*	.14; 1.06
Any importance	-	-	**.79****	**.29; 1.29**	-	-	.21	-.42; .85	.21	-.42; .85	.22	-.42; .85
Comfort and strength	-	-	-	-	**.67****	**.21; 1.14**	.28	-.31; .87	.28	-.31; .87	.29	-.30; .88
Constant	**28.15 *****	**27.20; 29.09**	**28.01 *****	**27.03; 29.00**	**28.17 *****	**27.19; 29.16**	**27.97 *****	**26.96; 28.98**	**27.95 *****	**26.95; 28.96**	**27.97 *****	**26.69; 28.98**
Random effects												
Variance (age)	.00	.00; .04	.00	.00; .04	.00	.00; .04	.00	.00; .04	.00	.00; .04	.00	.00; .04
Variance (constant)	10.38	9.53; 11.31	10.40	9.54; 11.33	10.31	9.46; 11.24	10.29	9.44; 11.22	10.28	9.43; 11.21	10.29	9.44; 11.22
Covariance (age, constant)	.05	-.01; .12	.06	-.00; .12	.05	-.01; .12	.05	-.01; .11	.05	-.01; .11	.05	-.01; .11
Residual variance	9.01	8.67; 9.38	8.99	8.68; 9.39	9.00	8.67; .9.40	9.01	8.66; 9.37	9.01	8.66; 9.37	9.00	8.66; 9.37

Note: Event refers to recent widowhood in Model 5 and, recent cancer in Model 6. Models do not include interactions.
Model sample sizes vary; Model 1 includes the full sample (n=2,017). Model 2 includes sample with no missing data on religious importance (n=2,014). Model 3 includes sample with no missing data on religious comfort (n=1,989). Models 4, 5 and 6 include sample with no missing data on religious importance and religious comfort (n=1,988).
*p<0.05, **p<0.01, ***p<0.001, †p <0.1.

Chapter 7: Quality of Life

Table 25. Longitudinal CASP-12 for sample of Christian (Catholic or other) women aged 57 and over (n=2,017)

	Religious attendance		Total
	Less than monthly Mean (SD)	At least monthly Mean (SD)	Mean (SD)
CASP-12 Wave 1	27.5 (5.7) (n=368)	28.8 (4.9) (n=1,367)	28.5 (5.1) (n=1,735)
CASP-12 Wave 2	26.5 (5.9) (n=374)	27.8 (5.1) (n=1,395)	27.5 (5.3) (n=1,769)
CASP-12 Wave 3	26.6 (5.8) (n=336)	27.3 (5.1) (n=1,251)	27.2 (5.3) (n=1,587)
CASP-12 Wave 4	26.6 (6.0) (n=291)	27.9 (5.1) (n=1,110)	27.6 (5.4) (n=1,401)
CASP-12 Wave 5	27.1 (5.6) (n=252)	27.8 (4.9) (n=926)	27.7 (5.0) (n=1,178)

Descriptive statistics for baseline religion, CASP-12 and covariates by level of attendance are given in Table 26. A large majority of the sample was Catholic. Most of the sample reported attending religious services at least monthly at baseline, with Catholics being most likely to attend regularly. CASP-12 scores at each wave were on average around 1 point higher for those who attended religious services regularly. Monthly attenders were also older on average, although they also reported lower levels of ADLs and IADLs. Monthly attenders also had a larger number of close relatives and friends, were more likely to belong to a social group, and were more likely to be married and less likely to be separated or divorced. Both groups had similar levels of education. Monthly attenders were more likely to own their homes outright and less likely to own with a mortgage or rent. Monthly attenders were more likely to self-report their health as excellent, and less likely to self-report as poor, were less likely to suffer from chronic pain, and reported their mental health as better. The groups did not differ in their levels of incontinence or fear of falling. The numbers of respondents experiencing life events were small; 81 respondents were recently widowed and 54 had a recent experience of cancer. Monthly attenders were more likely to be recently widowed but less likely to have a recent cancer diagnosis.

Chapter 7: Quality of Life

Table 26. Descriptive statistics for the sample of Christian (Catholic or other) women aged 57 and over (n=2,017)

Measures Mean (SD) / %	Religious attendance		Total
	Less than monthly (n=428) (21%)	At least monthly (n=1,589) (79%)	Mean (SD) / %
Religion			
Catholic	89.7	95.0	93.9
Church of Ireland	6.1	3.3	3.9
Other Christian	4.2	1.7	2.2
CASP-12 Wave 1	27.5 (5.7)	28.8 (4.9)	28.5 (5.1)
	(n=368)	(n=1,367)	(n=1,735)
Age	64.0 (6.4)	67.6 (7.5)	66.9 (7.4)
ADLs	0.2 (0.7)	0.1 (0.5)	0.1 (0.5)
IADLs	0.2 (0.6)	0.1 (0.4)	0.1 (0.5)
Close relatives / friends	10.0 (6.0)	11.1 (6.0)	10.8 (6.0)
Education			
Primary/None	30.8	26.9	27.7
Secondary	37.9	41.9	41.1
Third level/Higher	31.3	31.2	31.2
Home ownership			
Owns outright	74.5	88.9	85.8
Owns with mortgage	14.3	6.0	7.7
Renting	11.2	5.2	6.5
Self-rated health			
Excellent	13.6	15.6	15.2
Very good	25.9	29.5	28.7
Good	34.4	34.4	34.4
Fair	18.2	17.1	17.4
Poor	7.9	3.4	4.4
Marital status			
Married	61.7	65.0	64.3
Never married	7.2	7.7	7.6
Separated/Divorced	12.4	4.2	5.9
Widowed	18.7	23.2	22.2
Chronic pain	46.0	38.9	40.4
Monthly incontinence	15.0	13.3	13.6
Fair/poor self-rated mental health	12.2	8.4	9.2
Fear of falling	33.4	32.7	32.8
Participation in social or sports group	34.8	57.5	52.7
Events			
Widowed (in past 2 years)	3.0	4.3	4.0
Cancer diagnosis (in past 5 years)	3.0	2.6	2.7

Note: CASP-12 scores are presented for Wave 1 only. Not all respondents had CASP-12 data at Wave 1.

Chapter 7: Quality of Life

Table 27 shows results for linear mixed effects models of the relationship of religious attendance, life events and CASP-12. Model 0 includes religious attendance and all covariates but does not include life events. Results show that high attenders had scores that were 0.7 points higher on average than low attenders. Model 1a is adjusted for covariates and includes recent widowhood and the interactions between recent widowhood and age/age^2. The effect of recent widowhood on CASP-12 scores was negative, although it did not reach significance. Neither of the interactions between recent widowhood and age were significant. Model 1b additionally included attendance level. There were no significant interactions between attendance, age and recent widowhood. I plotted the predicted values of CASP-12 to further examine the direction of potential effects which may not reach significance due to low numbers experiencing life events (Figure 12). These showed that, for those who had not experienced recent widowhood, high attendance was associated with slightly higher scores at all ages. Recently widowed low attenders also had a steeper increase in CASP-12 scores after age 50, accompanied by a steeper decrease in CASP-12 scores after about age 70, compared to the high attenders.

Table 27 also shows the results for models including recent cancer diagnosis. Model 2a shows that following adjustment for potential confounders, a recent cancer diagnosis had no significant effect on CASP-12 scores. Further, there was no interaction between age and recent cancer diagnosis. Including attendance level did not change the relationship between cancer and CASP-12 scores. There were no interactions between attendance level, recent cancer and age. Again, these non-significant interaction effects were further examined through plotted predicted values (Figure 13). These showed that those with a recent cancer diagnosis and low attendance experienced a steeper decrease in CASP-12 scores.

Chapter 7: Quality of Life

Table 27. Fixed and random effects results for CASP-12 by religious attendance and life events, and interactions with time (n=2,017)

Measures	Model 0. Religious attendance		Model 1a. Recently widowed		Model 1b. Recently widowed + attendance		Model 2a. Recent cancer		Model 2b. Recent cancer + attendance	
	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Fixed effects										
Life event	-	-	-.95†	-2.04; .15	-.86	-1.98; .26	.37	-.75; 1.49	.42	-.70; 1.54
High attendance	.74**	.30; 1.18	-	-	.74**	.29; 1.18	-	-	.74**	.30; 1.19
Interaction with age										
Age #	.03	-.02; .07	.11	-.04; .25	-	-	-.04	-.17; .09	-	-
No event # High attendance	-	-	-	-	.03	-.02; .08	-	-	.02	-.03; .07
Event # Low attendance	-	-	-	-	.15	-.12; .41	-	-	-.13	-.35; .10
Event # High attendance	-	-	-	-	.10	-.07; .28	-	-	.00	-.15; .16
Interaction with age^2										
Age^2 #	.00	-.00; .00	-.01	-.01; .00	-	-	-.00	-.01; .01	-	-
No event # High attendance	-	-	-	-	-.00	-.00; .00	-	-	-.00	-.00; .00
Event # Low attendance	-	-	-	-	-.02	-.04; .00	-	-	-.02†	-.04; .00
Event # High attendance	-	-	-	-	-.00	-.01; .01	-	-	-.00	-.01; .01
Constant	28.15	27.19; 29.10	28.56	27.64; 29.48	28.14	27.18; 29.09	28.58	27.67; 29.50	28.16	27.20; 29.11
	***		***		***		***		***	
Random effects										
Variance (age)	.00	.00; .04	.00	.00; .04	.00	.00; .04	.00	.00; .04	.00	.00; .05
Variance (constant)	10.38	9.53; 11.31	10.42	9.56; 11.35	10.37	9.52; 11.29	10.44	9.58; 11.37	10.41	9.56; 11.34
Covariance (age; constant)	.06	-.01; .12	.06	-.00; .12	.06	-.01; .12	.06	-.00; .12	.06	-.01; .12
Residual variance	9.02	8.67; 9.38	9.01	8.66; 9.37	9.02	8.67; 9.38	9.01	8.66; 9.37	9.01	8.66; 9.37

Note: Interaction reference categories are no event # low attendance. Event refers to recent widowhood in Model 1 and recent cancer in Model 2. In Models 0, 1a and 2a only two interaction coefficients are presented, showing the interaction between age and age^2 and attendance, widowhood and cancer.

*p<0.05, **p<0.01, ***p<0.001, †p <0.1.

Chapter 7: Quality of Life

Figure 12. Plotted predicted values for models of CASP-12 by religious attendance and widowhood
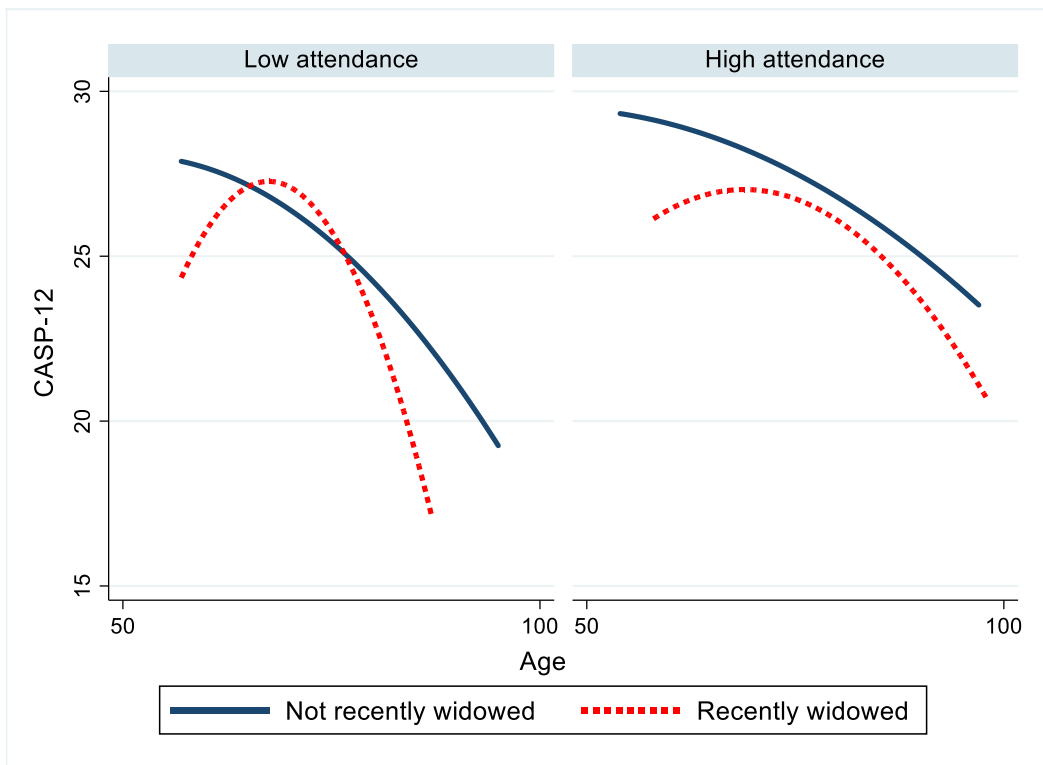
Figure 13. Plotted predicted values for models of CASP-12 by religious attendance and cancer
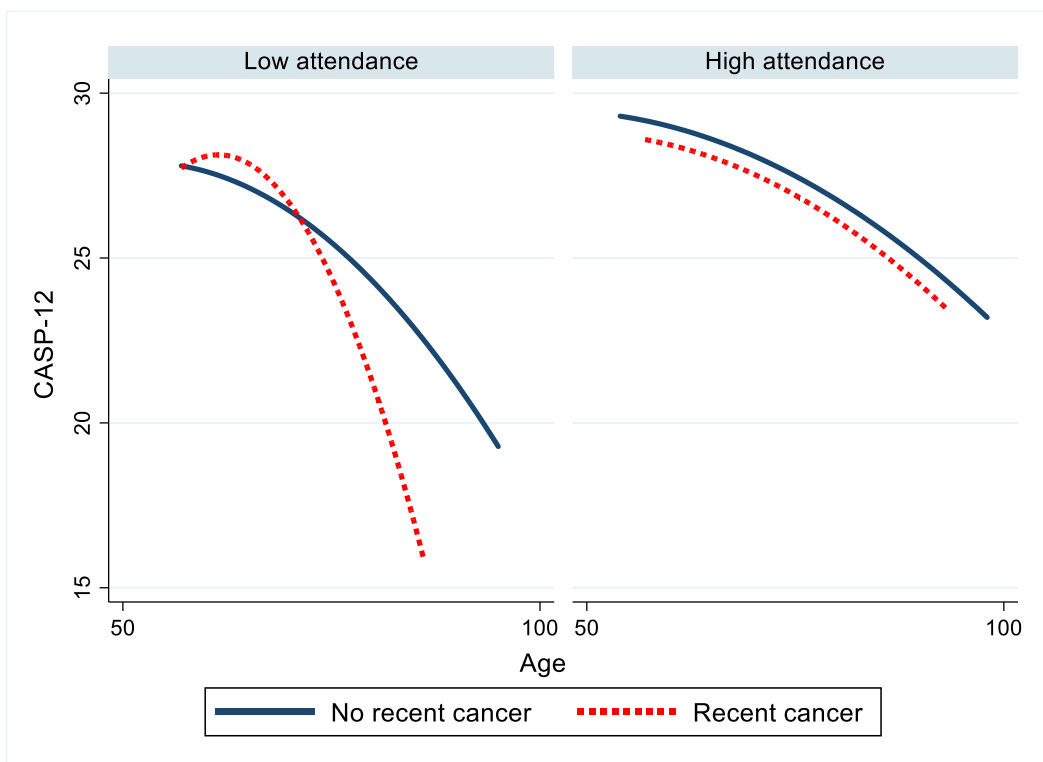
Chapter 7: Quality of Life

Qualitative data

Participant details are given in Table 28. Participants were aged 67 to 89 years. All but one participant were Catholic. Most participants were married or widowed, although three had never been married and one was divorced. Participants were given pseudonyms to protect their personal information. Themes salient to religious coping developed in the interviews are outlined below.

Table 28. Qualitative study participant characteristics.

Participant	Age	Marital status	Affiliation
Fiona	67	Divorced	Catholic
Bernie	77	Married	Catholic
Teresa	89	Widowed	Catholic
Anne	71	Married	Catholic
Kathleen	69	Never married	Catholic
Eileen	85	Married	Catholic
Brigid	74	Widowed	Catholic
Patricia	82	Never married	Catholic
Mary	81	Never married	Catholic
Geraldine	81	Widowed	Catholic
Margaret	80	Widowed	Church of Ireland

Religious practice as a source of wellbeing

In-depth interviews uncovered various ways in which religion was a facilitator for QoL. The respondents discussed spiritual and religious feelings and practice which led to inner peace, calm and wellbeing. These feelings were for most associated with attendance at religious services, although they were also related to being in church, and attributing religious feeling to other events in their lives.

> *It's peaceful and it flows over me. It's like music. It flows over you and you absorb some but not others, you know? Suddenly mass would be over and I'd think oh my God I didn't say a prayer all through that mass. But those things happen.*

> Geraldine, 81

Chapter 7: Quality of Life

Some, like Anne, had complex thoughts on how religion can impact on health. While she acknowledged the sense of wellbeing that religion can bring, she felt that religion was more important to her in other ways.

> *Now, I'm useless at meditation, I know this, I have tried it a few times, not for me […] Erm, again my version of religion is to be helping people, doing things. Not sitting in a church on your own, pretending to have a conversation with God. […] I mean there are people who are very devout, and I don't knock that, you know, and they get tremendous, erm, kind of, self-fulfilment from it…*

Anne, 71

The previous passage from Anne highlights that, even though some may not experience feelings of religious or spiritual wellbeing, there may be other ways in which they gain from religious practice. For Anne, this includes 'helping people, doing things.' Community, activities and the simple act of 'getting out and about' were important to many of the women. Anne felt that religious attendance was useful in 'putting her in the way of opportunities.' Many community resources did not come directly from the church, but access to them was facilitated through church engagement. Examples of these include social clubs such as ladies' clubs or active retirement clubs and resources such as meals on wheels. These may not be directly organized by the church, but borrow space from the church, are comprised of church parishioners and volunteers, and advertise within the church space. The sense of belonging to a community which can be gained from religious engagement was summarized by an anecdote from Eileen.

> *Well, when I was at the bus stop today coming in, and a girl says to me, oh Mrs […], I haven't seen you in ages, were you sick?*

Eileen, 85

Chapter 7: Quality of Life

<u>Religion and coping</u>

However, the evidence was mixed for religion as a way of coping with adverse life circumstances. For many, a health or family crisis prompted a return to faith. For others, faith was a constant which provided comfort in the face of these crises.

> *I was 50 years of age and I went back in earnest. I had a big operation. And I had problem breathing […] And then I started praying to God, and telling God that I'd be back for sure, and I'd never miss again. That's when I was 50, that was 30 years ago. So, I really made up for it, then.*
>
> Margaret, 80

Illness and crises were not always catalysts for further religious involvement. At times, poor health and crises were interpreted as impeding religious engagement, like the following example from Brigid.

> *I suppose there for some time […] I wouldn't, I wasn't very religious in going to church every Sunday. […] I think that was while my husband was sick, that I couldn't be going anywhere, and then I picked all of the things that suited me, my sister, she would never miss mass, whereas I wasn't committed.*
>
> Brigid, 74

<u>Religion through the life course</u>

I turned to the women's narratives surrounding the life course of their religious involvement to understand why religious practice may be related to wellbeing at one point in time but not appear to predict better wellbeing in the future. Most of the respondents described their families of origin as religious or very religious. The narratives described religious practice which was habitual, at times even described as a 'training'; something set up in early life and continued through the life course. Several of the women discussed how the religion of their youth was based on fear; fear of God, of the nuns, of their parents. However, they also clarified that while religion was fearful in youth, it had 'matured' as they had become older.

Yes, it has always been a part of my life, I mean I would always I would, even when I was at my busiest, I would, if it was just one minute in the morning, I would just get up and I would say thank God for bringing me safe through the night, bring me through this day and guide and direct me, and that's all I would say, but I was going out with God helping me, God somewhere there walking with me. And then at night I would always thank God for my day, for the people I'd met, etc. etc., but I would always, and always have, try to get in daily mass, because I love the Eucharist.

Kathleen, 69

By many, this was carried through in life. For those who did not marry or married later in life, religion provided a way to achieve community and close social connections.

Oh yes. Oh yes, I joined the legion of Mary when I came to Dublin. That's what we all did, it was the norm as well. And we had a great social life and everything, as well as help in doing a bit of work.

Mary, 81

Others, however, felt anger at the control exercised by the Church in their lives:

I was very angry with the Church about, you know, I have five children. My husband just said, God, he got told to increase and multiply, but he didn't say by how many. He thought the ideal family would be two children. But anyhow, we ended up with five. Now I wouldn't give any of them back, but, it just was, it made life very difficult. And you know, then it's not fair to the children either.

Geraldine, 81

Chapter 7: Quality of Life

<u>Religion as source of conflict</u>

The homogenous nature of religiosity in the Ireland of the women's youth is evidenced by the previous narratives. While this appears to have set up a system of habitual practices and beliefs which supported some's mental (and physical, to an extent) wellbeing, there were ways in which this was not exclusively beneficiary. The very normative nature of religiosity during their early years made societal changes in religiosity more difficult for many of the women. For some, there was a definite feeling of losing a majority place in society. Some faced this with defensiveness of the Church, while others experienced feelings of exclusion.

> *And I hear it on [the radio], this is atheist Ireland. A little group of people. Probably a 0.1% and they get airtime, and the Catholics are definitely discriminated against in the media. […] Now, I think we're actually being discriminated against, for being Catholics.*
>
> Teresa, 89

> *Ah, yes, you say a prayer at all, you're a holy Joe. Ah yeah, yeah. No laugh, no fun at all, holy Joe.*
>
> Patricia, 82

Although many would comment on the change in religious practice and belief in the country, and frame it as a negative, this did not appear to have a substantial impact on the wellbeing of the majority. However, one respondent was affected by the abuse scandals personally, and the effect on her self-esteem and happiness was profound. Brigid discussed finding out that a priest who she had been close with and greatly admired had been implicated in the sexual abuse of young boys.

> *And that, that… all those happy [memories]… I wouldn't, even if my husband was alive and in very good health, I wouldn't have told him. He wouldn't know, you know, he wouldn't know about it. But, being terrible disappointment and upset for me. […] So they're the kind of things, it dents your faith you see, when you see things gone on.*
>
> Brigid, 74

Chapter 7: Quality of Life

Generational rift

The change in the religious context in which the participants were living was evidenced by a perceived growing rift between themselves and younger generations. The participants noticed this most starkly in their own families. The disconnect between the participant's own religious practice and that of their children was at times painful. For example, the religious upbringing of grandchildren was often a point of contention:

> *The next big milestone is the first communion, so this would have been the year for the first communion for the eldest grandchild. [...] And she [participant's daughter] said no, she wasn't going to be a hypocrite. And I got very upset. I thought, you know? It's a bit like going to university [a milestone]. I said in the moment, you're missing a link here. And I get upset when I think about it. I kind of... but I can't live someone else's life. [...] And... what I, what I do now is I... I avoid like the erm, first communions and Sunday masses, I don't go near the church. It's too upsetting. And I probably won't for a long time.*

> Anne, 71

A particularly important difference in the practice of the participant's generation and that of younger generations was church attendance. Many participants expressed sadness at the thought of their children and grandchildren not attending mass regularly. It was often acknowledged that this was part of a cultural shift.

> *[...] you see they all have football, and tennis, and hurling and all that on a Sunday. And they have nearly taken over, like a religious thing, where you have to be there with your children.*

> Geraldine, 81

Most participants coped with this by ignoring it. Various participants spoke of avoiding conversations on religious practice with their children, implying they would not like the answers. For many, as long as the grandchildren were receiving their religious sacraments this was sufficient. However, as in Anne's narrative above, this was not always the case.

> *And incidentally, I don't know how many out of the five of them are regular mass goers,*
> *I don't know, and I don't ask. […] And as long as they present the children, their*
> *children, for their sacraments, I'm happy that their background is there. And that they*
> *won't, they won't abandon it. You know? And I accept that religious practice is*
> *changing. You know? I accept that, it's not a static thing.*
>
> Bernie, 77

Like Bernie, most accepted that their children's religiosity would be different to their own.
Many talked about the fact that their children and grandchildren were 'good Christians' even if
they were not devout Catholics, and this helped them come to terms with the differences
between their own and their children and grandchildren's religiosity:

> *My children meditate. They believe, they know there's a God, they may not go to mass,*
> *but they practice through who they are as people. They are very conscientious. And*
> *caring.*
>
> Fiona, 67

DISCUSSION

Quantitative and qualitative data on the relationship between religiosity and wellbeing in
Ireland presented differing but complementary findings. Qualitative data suggested the
relationship between religious attendance and QoL could be explained by psychological
benefits, such as feelings of peace and tranquillity, and by access to community, activities and
resources. There was less evidence, both quantitative and qualitative, of a moderating effect of
religious attendance on the negative effect of life events on QoL. I did not find an association
between recent cancer diagnosis and widowhood and CASP-12 scores after adjustment for
several variables important to QoL. When including the level of religious attendance, I found
independent effects of religious attendance on CASP-12 scores in both models (including
cancer and widowhood). High religious attenders had higher QoL as measured by the CASP-12.
The inclusion of the level of religious attendance did not change the coefficients for life events
in either model, and there were no interaction effects between attendance, life events and age.

Chapter 7: Quality of Life

This showed that attendance level did not moderate the effect of recent widowhood or recent cancer on CASP-12 scores. Qualitative results showed that, while participants did use religion to cope with adverse life circumstances, they also described other ways in which religion, religious practice, and religious change, had a direct impact on their QoL, positive and negative.

The integration of quantitative findings, showing higher QoL in high attenders, and qualitative findings, showing the ways in which religious attendance can be supportive of wellbeing, strengthens the validity of both results. In particular, these findings suggest that the differences between high and low attenders observed in the quantitative analysis arise from the way religious practice can be a source of inner peace and tranquillity for some, as well as the way habitual religious behaviour can be a source of opportunities for others, all of which are conducive to health. The fact that religious practice does not seem to influence the change in CASP-12 scores over time suggests that the level of wellbeing afforded by religious practice is already set earlier in the life course. The qualitative data supported the idea of life-long religious practice as a 'habit' or even a 'training'. If there is a protective effect of religious practice, it could be established and practiced from an early age, and rather than influence wellbeing, it could be protective of it through gratitude, meditative practice and habitual activities, albeit to a small extent.

The quantitative data found mixed results when comparing outcomes of high and low attenders and those who have experienced a life event. Integrating this with the qualitative data enriched my understanding of the phenomena and the combined evidence suggests that sometimes women use their religious practices, developed over a lifetime, to cope with life events; other times, however, life events prompt a return to religious practice, which may not have been continuous, or habitual, through life; or, as I also saw, life events could prompt a questioning, distancing, or discontinuity of religious practice. I also observed from the qualitative data that the change in the role of the Catholic Church in Ireland in the women's lifetimes has been difficult for many of them; the Church abuse scandals and criticisms could have helped to undermine religion's role as a constant in the women's lives. The women expressed worry for younger generations and their religious wellbeing, as well as feelings of disconnect between generations regarding religious practice. However, many of the women had strategies for coping with these feelings.

Evidence from other studies supports some of these findings. Previous research has shown that religious attendance is associated with lower depressive symptoms in older Irish adults (212). The religion and wellbeing literature has also often looked at whether religion can help buffer the negative effects of illness. However, a review found that in studies of religion and

depression, religion was less protective for those with a physical illness (328). Similarly, a review of religiosity and outcomes after trauma did not find conclusive evidence that religion can influence outcomes (329). Europe-wide data has provided evidence of an effect of religious education; Ahrenfeldt and colleagues found that much of the variance in health outcomes for the religious could be explained by religious education; those who were religiously educated fared better, and those who were religiously educated and took part in religious organizations had the best health outcomes (182). They make the argument that this sets up individuals to have religiosity which is either 'restful' or 'crisis', of which restful religiosity is conducive to better mental health. This mirrors Pargament's early ideas on negative and positive religious coping (317). The observations within the current data fit within these frameworks. The quantitative data shows that, while there is an association between religious attendance and QoL, this appears to be set by age 57, and does not influence the change in QoL over time from this age onwards. The women's own experiences show that, for many, religion was constant and habitual, although others did experience 'crisis religiosity'.

Another important insight afforded by the qualitative data was an illustration of being religious within a society in which religious values are changing. There was a range of experiences of changing societal attitudes towards religion, from righteous defiance, feelings of exclusion, betrayal as well as a sense of divide with younger generations and loss of tradition. These narratives reflect the wider social change which Ireland has been undergoing in the women's lifetimes. It is plausible that this social change, and in particular the decline in the social position of the Church, may have left many of these women in a less stable social position. Religiosity as a social value has been declining, and this has the potential to impact on the culture-person match for religious people (330). There is evidence that religious people are happier in religious countries (331). Graham and colleagues' analysis of an international dataset only found two exceptions to this rule: indigenous and Druze religions were not happier than their counterparts. This was not discussed in the paper by the authors but could be reflecting a minority position of these religious groups within their wider societies (304). In Ireland, as the country becomes less religious, this may plausibly have an impact on the wellbeing of those who are religious.

This study has some limitations; it is possible that because of the low numbers of adverse events in this sample it lacked power to observe statistically significant effects, in particular in interactions. The impact of life events is not likely to be uniform, and is likely to vary by the circumstances surrounding it; for example, the effect of widowhood may depend on the length of illness prior to bereavement, whether the participant had caring responsibilities for their

spouse before bereavement, or the quality of the spousal relationship. Cancer outcomes are likely to vary by the severity of cancer at diagnosis, and other resources for dealing with poor health, such as wealth and social support. The severity of cancer at diagnosis may potentially be associated with religious service attendance, but this information was not available. I accounted for this through adjusting for self-rated health and other health characteristics such as chronic pain, however, it is plausible that residual confounding may remain. I also did not interview women who have experienced institutional abuse through the Church. Therefore, I was not able to discuss how religious practice or belief may be associated with the QoL of this vulnerable group. Because of the way QoL data was collected, there were substantial missing observations. This has a potential to bias results. The number of participants in the qualitative study was also small. However, this study also has many strengths; the use of longitudinal, nationally representative data, which includes several health and social measures has allowed me to adjust these effects and minimize bias. In addition, the combination of this with in-depth interviews with women provided a unique perspective on the life experience and motivations surrounding religious practice and belief of women in Ireland.

Conclusion

I find evidence that those with religious practice in the form of frequent church attendance have better QoL. Qualitative evidence suggests this may be related to religious practice's association with peaceful and calm feelings for some. Religious practice also provides opportunities for social engagement, physical activities, as well facilitating access to resources. The evidence for religion as a coping mechanism is less conclusive. The qualitative data suggests that many women do use religion to cope with adverse life events; however, the quantitative data does not provide conclusive evidence for this type of coping being effective in protecting QoL. The qualitative data also provides insights into why religious engagement appears to influence the level of QoL, but not its change over time; societal changes in the importance of religion represent a challenge to the women's own sense of position within society, belonging and security, which, in turn, impacts their wellbeing. The consistent association between religious practice and higher QoL provides incentive for ensuring that older adults have the opportunities and support to maintain their religious practices as desired.

Chapter 8. Conclusion

Chapter summary

This thesis has sought to address how the religious social context in Ireland has helped shape the population aged 50 and over, using a mixed methods research design. A large, nationally representative longitudinal dataset was used to test a number of hypotheses related to individual religiosity and health, and a small qualitative dataset was used to illustrate and further expand on findings. This chapter will address the research questions posed by this thesis and will summarize findings. I also seek to draw some general conclusions from these findings and address the limitations of this thesis. Finally, I outline some possible policy implications and future research directions.

Chapter 8: Conclusion

Conclusion

This thesis has sought to explore how the social context in Ireland can have an impact on older people's ageing trajectories and outcomes. The demographic changes in the Irish population in the last decades have meant an increasingly older population as well as a population which is less religious. These changes provide a rationale for the study of religion-health effects in Ireland. I tested hypotheses related to the religious context in Ireland, and how this may have impacted on women and men's health after the age of 50. I sought to explore these questions using data from two sources; one, a large nationally representative study, to quantitatively test these effects in the Irish population; and the second, a small qualitative sub-study of women aged 65 and over used to better understand and explain the quantitative results observed. I find a number of ways in which the religious context and personal religiosity are associated with physical, cognitive, and mental health, and social wellbeing in later life. These effects are rarely direct, and do not necessarily influence health in consistent ways. Results showed both positive and negative associations between the religious context, individual religiosity and health trajectories and outcomes.

I first aimed to assess how an important aspect of the religious *habitus*, namely high parity and low use of contraception among women, could have an impact on health and mortality. Initial bivariate analyses of the relationship between parity, religiosity and other social and health characteristics shed light on how high parity manifested in Ireland, and what its superficial health correlates were. The data showed that women in the older age groups had higher parity, with parity declining with age. I used religious attendance, which has been found in other studies to be associated with mortality, as a proxy for religiosity. Parity was strongly univariately associated with religious attendance, with those with more children having higher religious attendance.

In multivariate survival analyses I found that each subsequent child afforded a lowered risk of mortality, and that this link was particularly strong in women aged 60 to 69. While health characteristics independently impacted on mortality risk, they did not appear to affect the relationship between parity and mortality. Mental health characteristics were not associated with mortality. However, social characteristics appeared to partially mediate the relationship between parity and mortality. Supplementary analyses of a non-imputed, non-weighted sample suggested that religious attendance was a partial mediator for the parity-mortality relationship. The finding that parity is negatively associated with mortality contradicts most of the existing evidence in similar samples (332). There are two possible main explanations for the conflicting evidence from Ireland versus the rest of Europe; the first is that this is a selection effect. In a

Chapter 8: Conclusion

population where there is limited fertility control, women who are healthier at baseline may be expected to have a higher number of children, and these women are also likely to live longer. On the other hand, a hormonal effect on longevity and cell ageing has been hypothesised. The way this effect may operate is unclear, and the evidence on the effects of reproductive factors have been inconsistent, however this is a promising area of research (333-335). Beyond these direct mechanisms, we should also consider possible social mechanisms, mediations and moderations. The partial mediation observed by religious attendance was the only mediation effect observed. Sociologists have often noted that religiosity is reproduced within families, and that for many individuals who distance themselves from religion during their youth family formation is a time of return to organized religion. Having a larger number of children could plausibly be linked to having stronger church connections and religious participation in Ireland, and this could partly explain the link between parity and mortality. Another mechanism for this Irish effect could be person-culture fit. Irish society today, and especially in the late 20th century when most of the women in the sample were of childbearing age, valued large families and high parity (99). Normative behaviour and 'fitting in' has strong support as health promoting in the wellbeing and health literature (109). Both religious and reproductive behaviours could influence mortality within these frameworks. Further, a large family in later life can be a form of insurance, whereby grown children are able to care for and if needed provide for their older parents. It is plausible that both biological mechanisms and social mechanisms which are not yet well understood could be behind the relationship.

Having seen that the religious context is associated with high parity and indirectly affects the risk of mortality through complex pathways, a more specific hypothesis around the possible direct impacts of religious affiliation, religious practice and physical function was formulated. Although the literature around religion and health is substantial, this is a question which has not been thoroughly explored. Further, the literature around religious affiliation and non-affiliation and health is limited. I found no evidence that being religiously affiliated or not had any impact on two measures of physical function, or their development over eight years of follow-up. Once I accounted for the level of religious attendance, Catholic women with high religious attendance had faster Timed-Up-and-Go scores than Catholic women with low religious attendance. This small effect for women was not surprising. There is little evidence that religious belief or behaviour affects physical function. This work adds to this evidence. This finding is interesting in the wider context of the literature of religion and physical health. Studies have found persuasive evidence that religiosity is associated with lowered risk of cardiovascular disease and immune system function (23). As already discussed, religious attendance is associated with lower mortality risk. Immune system function and cardiovascular health have both been linked

Chapter 8: Conclusion

to mental health. It is possible that the link between religion and physical health functions through a mental health mechanism, which has less of an impact on physical function. Why it might have some impact on women's mobility, but not men's, is another important question.

Considering the importance of a possible mental health mechanism behind the religion-health association in Ireland, I next turned to an examination of depressive symptoms. Unlike physical health, there has been a large amount of literature linking religion and depression. There remain questions around the temporal causality of this association (does religious attendance protect people from depression? Or do depressed people not go to church?) Any mechanisms linking religiosity and mental health are also unclear. I used longitudinal data from TILDA to look at the change over time of religious attendance, religious importance and depressive symptoms. I used complex models to test the effects of religious attendance on depressive symptoms at baseline and over time. Results showed that while higher religious attendance was associated with lower depressive symptoms at baseline, it was not associated with the change in depressive symptoms over time. Further, higher religious importance was associated with higher depressive symptoms at baseline, once religious attendance was adjusted for in the model. I also sought to see if this relationship was mediated by the size of an individual's social network. I found evidence that higher religious attendance was associated with a larger social network, and that this in turn was associated with lowered depressive symptoms. Surprisingly, all these effects were stronger for men. These findings illuminate some of the possible pathways connecting religion and health in Ireland. It appears to be religious attendance which drives a positive relationship between religion and mental health; religious importance, in the absence of attendance, was associated with poorer mental health. The social mediation effect outlined is suggestive of a plausible real-life mechanism; regular church attendance may provide greater opportunities to establish and maintain a strong community and social bonds. This is protective of mental health. Religious importance, in contrast, when not accompanied by attendance, suggests religiosity without religious community. Other studies have shown a religiosity which is arrived at during a crisis is not protective of mental health (182). This may help explain the contradictory effects of religious importance and religious attendance.

The next aim of this thesis was to assess the role of religion in cognitive decline. Cognition is key to maintaining independence in ageing, and the link between religion and cognition has not been well established. While many studies suggest religious belief and behaviour are protective of cognitive decline, others find that the religious perform worse in cognitive assessments (31). There is also little knowledge of the mechanisms behind any link between religion and cognitive ageing. I built on the results of the previous studies to assess three mechanisms which

Chapter 8: Conclusion

could possibly explain a religion-cognitive decline link. These are mental health, using depressive symptoms as a proxy, social connectedness, using the size of the social network, and behavioural factors, using smoking as a proxy. Both depressive symptoms and size of the social network were shown to be associated with religious attendance in the previous study. Religious people have also been shown to have healthier behaviours across many (if not all) domains. To test this pathway, I used smoking, a variable which has been shown to be associated with religiosity and also an important variable in the development of cognitive decline. Results showed that the nonreligious and the religious do not perform differently on the MMSE test of global cognition. When testing differences by religious attendance, I found that there were no differences in men, but women who had higher attendance were less likely to be in the worst performing cognitive group. Mediation models showed that this was fully jointly mediated by smoking, depressive symptoms, and to a lesser extent, the size of the social network. These findings show that religion and cognition are complexly associated and raise the question of why they appear to be associated in women but not men. It does seem, however, that modifiable factors are behind the association in women, suggesting there are ways for both religious and nonreligious women to lower their risk of cognitive decline.

Finally, I looked at wellbeing, which in many ways encapsulates all aspects of health in later life. Having quality of life, or wellbeing, in later life depends not simply on having physical health resources, but possibly even more so on having mental health resilience to cope with physical health difficulties. Independence, autonomy and self-realisation are important aspects of quality of life, and these are difficult to maintain in the face of cognitive decline. Quality of life also encompasses socioeconomic aspects in later life which have only lightly been touched upon in this thesis; having access to resources, such as activities, family and friends, services and secure finances are as important in maintaining quality of life as physical, mental and cognitive health. One hypothesis behind the religion-health relationship is that religion enables coping in the face of adversity. I tested this framework quantitatively using the impact of two major life events experienced by many older people on wellbeing (cancer and widowhood). I also used qualitative data to further understand how religion is related to wellbeing, which in turn further illustrates and illuminates the results from the previous studies in this thesis.

Surprisingly, results showed that recent widowhood and recent cancer diagnosis did not have measurable impacts on quality of life. However, religious attendance had an independent association with quality of life, with those with high attendance having higher quality of life. This included those who had experienced recent cancer diagnosis or widowhood. Qualitative results helped understand some of the possible pathways for this association. Some of the

Chapter 8: Conclusion

women interviewed reported that religious practice, and church attendance in particular, were a source of comfort, tranquillity and calm, suggesting a direct pathway between religiosity and mental health. Other women reported various ways in which church attendance was linked to community participation; regularly attending church forged strong connections with other members of the congregation, as well as facilitating access to resources such as clubs, activities and services. This suggests at least two further possible mechanisms; a social connectedness mechanism, and a social resources or social capital mechanism. Finally, the participants also outlined some ways the religious context has changed and how that might have a negative effect on their wellbeing. The Church scandals, and the subsequent growing criticism of the Catholic Church in the media was distressing for some of the participants. Further, younger generation's distancing from religion was painful for many as they experienced strained relationships and mourned the loss of a way of life.

A summary of findings is presented in Figure 14, with associations with strong evidence presented in blue and associations with weak evidence presented in green. Associations in red illustrate unanswered future questions. Overall, there is evidence that the unique Irish context has helped shape men and women's lives in later life. Quantitative and qualitative data suggests that these effects are both positive and negative. These could be broken down into structural and individual effects. Structural effects involve the 'religious context', or as Tom Inglis describes it, the religious *habitus.* This is the social context in which religious rules, culture and behavioural expectations are maintained by the group and embodied individually (79). Examples of the structural religious context are the ban on contraception as well as the cultural expectation of high childbearing and limited fertility control. It also includes the expectation of weekly mass attendance and following of the other sacraments. Also part of the structural context are the religious running of schools and influence in political life. Individual effects include individual belief and practice, beyond what is prescribed by the Church and the *habitus.* It includes one's own relationship with a personal God. At this stage, it is also important to acknowledge that these paradigms do not have hard borders, and necessarily influence each other; for example, one's relationship with one's local religious community is both shaped by structural factors (the expectation that one attends church, how important church attendance and religious 'keeping up appearances' is at the given time and place), and individual factors (one's own faith and the faith of others, the relationships one can forge with others and the ways these are shaped by one's own religious values, for example tolerance, forgiveness, charity).

Chapter 8: Conclusion

Figure 14. Summary of findings. Based on Koenig et al's Theoretical model of causal pathways to physical health, for Western monotheistic religions (Christianity, Islam, Judaism). (23)
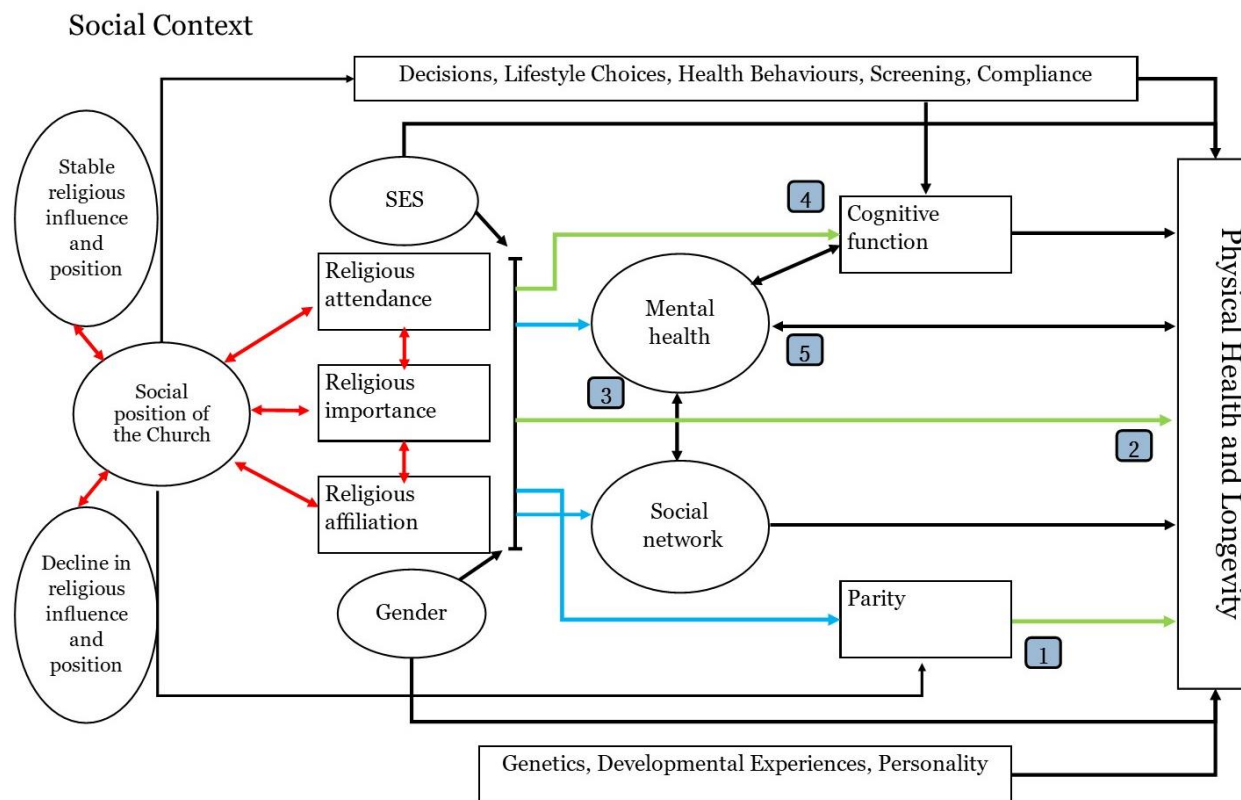
Note. Red arrows indicate unanswered future directions for research. Green arrows indicate associations with only weak evidence. Blue arrows indicate associations with strong evidence.

Chapter 8: Conclusion

There is evidence for both positive and negative effects stemming from both structural and individual factors; for example, while the religiously prescribed high parity prevalent in the sample appears to be positively associated with health and longevity, aspects of Church social control were qualitatively negatively perceived. For example, the Church's prescribing of high parity was described by one participant as a source of anger and regret in her life. The changing, declining role of the Church in society was also qualitatively shown to have an impact on the participant's wellbeing. Individually, both quantitative and qualitative data showed that religious attendance was related to better mental health (depressive symptoms, quality of life) and physical health outcomes (lowered mortality risk). Effects were small for physical and cognitive function and shown only in women. Qualitative interview participants described a number of ways in which their religious attendance was a positive force in their lives. However, religious importance in the absence of religious attendance appeared to be negatively associated with mental health, suggesting that individual religiosity without community or active engagement is not supportive of health in the older population in Ireland.

There has been much work done on individual religiosity and its pathways to health. The work in this thesis supports individual religiosity as a multi-domain factor which is complexly associated with health. The main pathways linking religion and health in the literature are supported by the current work: a psychological pathway, a social pathway and a behavioural pathway. These pathways are complexly interrelated however, and they may not always be positively associated with health. For example, I found evidence both for a social mechanism behind the religion-mental health association (Chapter 5), and for a direct psychological mechanism (Chapter 7). The literature has also largely found that a key factor in the religion-health relationship is religious attendance. This is supported by both the quantitative and qualitative data used.

The social, or structural, context of religiosity in Ireland can be interpreted within a person-culture fit theoretical framework (331). This theory postulates that how well an individual embodies the cultural norms within their given context affects their wellbeing, including their physical health. Evidence has been found to show that religiosity's association with physical health and mortality is dependent on the religiosity of the wider society (110). However, newer research using data from the Study of Health and Ageing in Europe (SHARE) has somewhat contradicted this, by showing robust associations between religious education and participation in religious organizations with various domains of physical and mental health in various European countries, including many which are generally considered to be highly secular (182, 336). Findings from this thesis support the idea of person-culture fit; religious participation

remains an important part of life for older adults in Ireland, with very high attendance in this age group in particular compared to other European countries. However, the decline in religious affiliation and practice in recent years has started to change these social norms. Although any evidence of how this might affect the older population is difficult to discern from the quantitative data, the qualitative data did provide some new insights. Within the framework of person-culture fit the question of what happens once the culture starts to shift around the person has not yet been addressed. Although I have argued that the changing religious context does have some negative effects on individual women, religion appeared to have a positive role in their lives overall.

In summary, this thesis has found that religion and health in Ireland are complexly associated. However, the relationship between religious attendance and mental health in particular, appears to be positive, although conclusive evidence for causality is still required. Quantitative and qualitative data showed that religious attendance is associated not only with the size of the social network, but with social capital, in the form of access to resources, friendships, community and physical and social activity. Religious attendance is one of the most important aspects of Irish Catholicism. This may be part of the reason why attendance emerges as the most important aspect of the religion-health relationship in Ireland; religious attendance encompasses much more than just attendance. It also represents social network, social position, and community.

Strengths and limitations

Missingness

This study has some limitations. Like all prospective studies there are issues with data missingness, attrition and selection bias. Variables in many cases rely on participant recall, which makes the assessment of the impact of events in childhood or early life difficult. These issues are nearly inevitable in studies of this kind, and without careful handling they can introduce bias into estimates. The TILDA dataset is part of the HRS-SHARE family of longitudinal ageing studies, and as such, much has been learnt and incorporated into the design of the TILDA study, which has meant that the quality of the data collected is high and continues to improve over time. These issues are also addressed individually in each research study; techniques such as the use of population weights, data imputation, and longitudinal analysis techniques which make use of all available data are used. Even with all these adjustments and considerations, data missingness on some variables was large and estimates are therefore less

Chapter 8: Conclusion

robust. Linked to these issues are the fact that, overall, the TILDA sample is relatively healthy. We therefore have only seen a small proportion of deaths, and very low cognitive decline.

Data missingness and attrition have the potential to introduce bias into analyses. Although most analyses used techniques able to utilise all available data, and therefore those who dropped out of the study were in most cases still included in analyses, there are still potential bias problems. If attrition is systematic, even though we include initial observations for those who eventually dropped out, we cannot have certainty that those who dropped out did not follow different paths after dropping out than those that remained. For depressive symptoms measures, for example, it is possible that many suffering from poor mental health may have dropped out from the study. Even though we include their initial observations, we cannot account for their specific depressive symptoms at later waves. How this may have specifically affected results of this study is merely speculative. However, we can say, for example, that those with poorer mental health are more likely to leave mental health questions unanswered and are therefore not observed. In the same way, those with a poor historic relationship with the church due to abuse or negative experiences may also refuse to answer questions on religiosity.

The same is true of deaths, with those with poor physical or mental health more likely to leave the study due to dying. Although it is likely that there is some level of systematic attrition related to poor physical, mental or cognitive health by being lost to follow up, withdrawing from the study or dying, it is very difficult to know to what extent and in what direction this might have biased these results. We cannot know what the trajectories of the respondents who died would have been had they not died. It is not possible to know whether the relationships observed would have been weaker or stronger had the dataset not experienced attrition. However, the use of all available data somewhat makes up for this; an analysis of the deceased sample showed that the sample who were included and the sample who were excluded were more similar to each other than to the main (non-deceased) sample (Appendix 4.1). This shows that the use of data from respondents who then went on to die is at least relatively useful in representing all respondents who were deceased.

It is unfortunately impossible to understand how a 'survivor effect' may also bias these results. TILDA observed respondents aged 50 and over at baseline. In the oldest age groups, these respondents may be considered 'survivors.' This means that although the TILDA sample is nationally representative, those in older age groups are generally healthier than their contemporaries who may have already died before being observed. This has the potential to bias results, in particular those looking at historic factors, such as parity, and when looking at

Chapter 8: Conclusion

mortality as an outcome. This was partly addressed in the parity and mortality chapter through analysis strategies, such as left truncation and stratified analyses by age group.

Measures

Although, as mentioned above, TILDA has a wide range of validated measures used in many longitudinal studies of ageing, some of the measures used in this thesis had certain limitations. Religiosity measures, in particular measures of affiliation, might not accurately capture some of the important specific circumstances in Ireland. Religious affiliation in Ireland is complexly and deeply tied in to social and economic differences. For many Irish people, religious affiliation was an extension of their nationality and an expression of loyalty, either to the Republic of Ireland (Catholics) or to Britain (Protestants). Although this is less salient in the Irish Republic today, it would have certainly been important to many of the respondents in the TILDA sample. Further, the measure of affiliation does not capture the phenomenon of 'lapsed Catholics.' These are persons who no longer practice but were raised Catholic. The literature shows that these more minute differences in religious affiliation can have an impact on the way the religion/health link works. This thesis partially addressed these limitations by using affiliation alongside other measures of involvement (for example high and low attendance in Catholics).

The use of the Mini-Mental State Examination (MMSE) is useful in assessing global cognition. However, it has limitations in terms of uncovering differences in a healthy population. The measure is designed to screen for cognitive decline, and therefore suffers from ceiling effects. This means that the results of this thesis might have not been able to observe more subtle differences in cognitive decline which may have been apparent with the use of another cognitive measure. However, the MMSE was available at each wave of TILDA and was a measure of overall cognition, and the benefits of its use therefore outweighed its limitations.

Design and analyses

The mixed methods component of this thesis is a strength, however, the use of two separate (if parallel) datasets impacts how well data can be integrated. We cannot assume that the data from qualitative interviews represents experiences or views from the wider population. This is true of all qualitative data, however, when qualitative and quantitative data are linked this is somewhat attenuated. The possibility of conducting qualitative sub-studies within large quantitative datasets is important to assess going forward.

The statistical techniques and analyses used were suitable for the hypotheses tested and largely took advantage of the longitudinal nature of the data and were able to minimize issues from loss of data due to attrition and item non-response. However, some analysis strategies have

Chapter 8: Conclusion

limitations. A range of strategies to determine mediation were used within this thesis, as there is currently no mediation strategy that is suitable for all types of analysis. Further, mediation requires a number of assumptions are met. Beyond the standard assumptions needed for each type of analysis (linear regression, survival models, etc.), mediation requires that there is minimal measurement error in the mediator variable, that there are no important confounder variables omitted, and that reverse causality is unlikely. These assumptions were generally supported in the analyses; however, the final assumption of no reverse causality is difficult to determine and may represent an important limitation to these findings.

The question of causality is central when seeking to understand the impact of social factors on health. Designing models using variables which temporally precede outcomes as predictors went some way in addressing this problem. For example, in this sample, parity temporally precedes both the outcome variable (death), and many of the mediation variables tested (current health status). Unfortunately, this was not possible for many of the analyses, which looked at concurrently occurring measures (for example, depressive symptoms, religious attendance, and size of the social network). This limits the interpretation of these analyses as causal. The potential for reverse causation is large; in the analysis of depressive symptoms, for example, it is plausible that those who are not depressed are more likely to continue to attend religious services and have more social connections.

Context and sample

The use of the Irish context to explore these relationships presents both strengths and weaknesses. The most important weakness of the use of this specific sample is the lack of generalizability of these findings in an international setting. The findings in relation to, for example, a limited role of religiosity in cognitive or physical change cannot be generalised to the rest of Europe or the world, where religious belief and practice are different in prevalence and expression. The evidence on religious attendance and mental health (depressive symptoms and quality of life) is consistent with the majority of existing international knowledge, and therefore adds to that body of literature. For example, the positive effects often seen in the literature emerging out of the US could reflect the slightly less religious context, where those who do choose to be religious are more different than those who do not. The negative effect of religious importance on mental health once controlling for attendance is less consistent, and highlights that this is an area of knowledge still in development. It is possible that this effect might be seen in the Irish context because of the declining role of the Church, but this was not tested in this thesis.

Chapter 8: Conclusion

On the other hand, the use of this Irish sample has been useful in terms of the ability to test mechanisms behind the relationship between religion and health. Due to the large prevalence of religious persons in the 50 and over age group in Ireland, confounding from factors such as social class, health, and education. The fact that most of the Irish population in this age group was inducted into Catholicism and practiced in at least some form during childhood means there is less variability in these early life religious factors. Although there are socioeconomic differences between Irish Catholics and Irish Protestants (Church of Ireland and others), the Irish Catholic sample was large, providing statistical power to detect differences between different levels of religious involvement within Catholics. The use of the Irish context was also proposed to help understand gender differences in the religion/health relationship. However, results from this thesis did not provide clear evidence of a gendered effect. While women who were more religious appeared to have a small advantage over less religious women in cognitive and physical function, more robust results for depressive symptoms suggested effects were stronger in men. Further study is required to fully understand whether and to what extent effects differ between men and women.

Finally, this thesis has not been able to specifically consider the experiences of people who may be particularly vulnerable. I did not set out to assess the circumstances of members of the older population who may have distanced themselves from the Church for specific reasons. Older persons who are members of the LGBTQ+ community, for example, may have had different experiences with religion in their early life and during the present, which might be complex and associated with wellbeing in more than one way. Other groups which may have differing effects include those affected by religious institutional abuse or those with experiences of group homes such as Magdalene laundries. Adverse life experiences associated with religious institutions may impact upon the relationship between religion and health. It was not within the scope of this thesis to include these, and this is an important caveat to my findings.

Implications

The findings from this thesis have implications for social policy. Primary among these is the need for support for older adults to remain socially engaged. For religious older adults, policies which facilitate continued church attendance could potentially help maintain mental health and wellbeing. Secular forms of social engagement, and ways to facilitate access to these, should also form part of social policies for wellbeing in ageing. These could form an alternative for older persons who are not religious and should be accessible to the nonreligious and religious alike. The Covid-19 pandemic of early 2020 has further raised questions of how older persons in particular can avoid isolation in times of social distancing. Technological solutions to these

Chapter 8: Conclusion

questions should be considered alongside policies which seek to maintain physical health. Religious persons who gain psychological benefit from church attendance may find virtual or televised mass or other religious ceremonies comforting. The continued development of social connectivity technologies, as well as growing technological skills in older age groups, present opportunities for developing virtual social participation in church services and secular activities.

The results of this thesis raise a number of further questions. The nonreligious are a growing demographic in Ireland, and in many other places around the world. Characterising and describing the change in religious practice and belief in Ireland is an important next step. A better understanding of how being nonreligious can affect health is necessary as this demographic grows. Other studies have found that there are many different types of nonreligious, and that some have better health outcomes than others (73). This may offer some explanation for some of the results seen, in particular in Chapter 4 on physical function and Chapter 6 on cognition; I found no differences between the religious and the nonreligious, but once religious attendance was accounted for those with higher frequency of religious attendance appeared to fare better. It is possible that some of these low religious attenders are 'cultural Catholics' and in fact, nonreligious themselves (depending on the definition of 'religious' used). Finding out what differentiates all these groups from each other could help further understand the religion-health link.

Causality has been difficult to establish to date in research into a religion-health link. Novel research approaches to this relationship may be able to further clarify the possible link. The continued use of longitudinal data and new statistical developments make this a stronger possibility in the future. The use of natural experiments should also be encouraged, where the differing effects of policies or natural disasters can be observed by religiosity. Why much of the research into religion and health finds disparate effects by gender is also to date unclear. Interdisciplinary research into these effects would be beneficial in not only better understanding the religion-health link, but also in understanding health differences between men and women. Research with a focus on vulnerable minorities and groups which may have been disproportionally impacted by institutional abuse should also be prioritized in future.

Conclusion

This thesis has demonstrated that the religious social context in Ireland played and plays an important part in the lives of older adults living in the country today. Religious attendance emerges as a factor with largely positive associations with health, and while causality is still undetermined, there is some evidence that religious attendance could foster community, social participation, social resources and mental health.

References

1.   Pew Research Centre. *The Gender Gap in Religion Around the World*. Available from: https://www.pewforum.org/2016/03/22/the-gender-gap-in-religion-around-the-world/ [Accessed 20th January 2020].

2.   Beale J. *Women in Ireland: Voices of Change*. Macmillan International Higher Education; 1986.

3.   Curtin C, Jackson P, O'Connor B (eds). *Gender in Irish Society.* Galway University Press; 1987.

4.   Beery AK, Zucker I. Sex bias in neuroscience and biomedical research. *Neuroscience & Biobehavioural Reviews*. 2011;35(3):565-72. doi:10.1016/j.neubiorev.2010.07.002.

5.   Engel GL. The need for a new medical model: a challenge for biomedicine. *Science*. 1977;196(4286):129-36. doi:10.1126/science.847460.

6.   Share P, Corcoran MP, Conway B (Eds). *A Sociology of Ireland. 4th Edition*. Dublin: Gill & Macmillan; 2012.

7.   Borrell-Carrio F, Suchman AL, Epstein RM. The biopsychosocial model 25 years later: principles, practice, and scientific inquiry. *The Annals of Family Medicine*. 2004;2(6):576-82. doi:10.1370/afm.245.

8.   Wilkinson RG, Marmot M (eds). *Social determinants of health: the solid facts. 2nd Edition*. World Health Organization; 2003. Available from: https://apps.who.int/iris/handle/10665/108082 [Accessed 11th February 2020].

9.   National Transport Authority. *Rural Transport Programme 2020*. Available from: https://www.nationaltransport.ie/public-transport-services/rural-transport-programme/. [Accessed 30th January 2020].

10.   Donoghue O, Orr J, Leahy S, Kenny RA. *Transport patterns in community-dwelling adults aged 50 years and over in Ireland.* The Irish Longitudinal Study on Ageing (TILDA); 2017.

11.   Breen C. *Public and Community Transport for Older People in Rural Ireland, North and South*. Centre for Ageing Research and Development Ireland (CARDI); 2014.

12.   Kamiya Y, Sofroniou N. Socio-Demographic Characteristics of Older People in Ireland. In Barrett A., Savva G., Timonen V. Kenny RA. (eds) *Fifty Plus in Ireland 2011: First Results from the Irish Longitudinal Study on Ageing (TILDA)*. Dublin, Ireland: The Irish Longitudinal Study on Ageing; 2011. p.23-36.

References

13. Pardue M-L, Wizemann TM. (eds) *Exploring the biological contributions to human health: does sex matter?* Washington (DC): National Academies Press; 2001.

14. Melloni C, Berger JS, Wang TY, Gunes F, Stebbins A, Pieper KS, et al. Representation of women in randomized clinical trials of cardiovascular disease prevention. *Circulation, Cardiovascular Quality and Outcomes*. 2010;3(2):135-42. doi:10.1161/CIRCOUTCOMES.110.868307.

15. Rogers PA, D'Hooghe TM, Fazleabas A, Gargett CE, Giudice LC, Montgomery GW, et al. Priorities for endometriosis research: recommendations from an international consensus workshop. *Reproductive Sciences*. 2009;16(4):335-46. doi: 10.1177/1933719108330568.

16. World Health Organization. *Healthy Life Expectancy (HALE) Data by country*. Available from: https://apps.who.int/gho/data/node.main.HALE?lang=en [Accessed 30th January 2020].

17. Mosca L, Barrett-Connor E, Kass Wenger N. Sex/gender differences in cardiovascular disease prevention: what a difference a decade makes. *Circulation*. 2011;124(19):2145-54. doi:10.1161/CIRCULATIONAHA.110.968792.

18. Central Statistics Office. *National Disablity Survey 2006: First Results*; 2008. Available from: www.cso.ie › documents › otherreleases › nationaldisability [Accessed 31st January 2020].

19. Barrett A (ed), Burke H, Cronin H, Hickey A, Kamiya Y, Kenny R, et al. *Fifty Plus in Ireland 2011: First Results from the Irish Longitudinal Study on Ageing (TILDA)*. Dublin: The Irish Longitudinal Study on Ageing; 2011.

20. Davey DA. Alzheimer's disease, dementia, mild cognitive impairment and the menopause: a 'window of opportunity'? *Womens Health*. 2013;9(3):279-90. doi: 10.2217/whe.13.22.

21. Turner N, Donoghue O, Kenny RA (eds). *Wellbeing and Health in Ireland's over 50s 2009-2016. The Irish Longitudinal Study on Ageing*; Dublin: The Irish Longitudinal Study on Ageing; 2018.

22. O'Mahony E. *Practice and Belief among Catholics in the Republic of Ireland.* Irish Catholic Bishops' Conference; 2011.

23. Koenig HG (ed), King D, Carson VB. *Handbook of Religion and Health*. 2nd Edition. New York: Oxford University Press; 2012.

24. Durkheim E. *Suicide: A Study in Sociology*. London: Routledge; 1951.

25. Chida Y, Steptoe A, Powell LH. Religiosity/spirituality and mortality. A systematic quantitative review. *Psychotherapy and Psychosomatics*. 2009;78(2):81-90. doi:10.1159/000190791.

References

26.   Seeman TE, Dubin LF, Seeman M. Religiosity/spirituality and health. A critical review of the evidence for biological pathways. *The American Psychologist*. 2003;58(1):53-63. doi:10.1037/0003-066x.58.1.53.

27.   Ano GG, Vasconcelles EB. Religious coping and psychological adjustment to stress: a meta-analysis. *Journal of Clinical Psychology*. 2005;61(4):461-80. doi:10.1002/jclp.20049.

28.   Ellison CG, Boardman JD, Williams DR, Jackson JS. Religious Involvement, Stress, and Mental Health: Findings from the 1995 Detroit Area Study. *Social Forces.* 2001;80(1):215-49. doi:10.1353/sof.2001.0063.

29.   Strawbridge WJ, Shema SJ, Cohen RD, Kaplan GA. Religious attendance increases survival by improving and maintaining good health behaviors, mental health, and social relationships. Annals of Behavioral Medicine. 2001;23(1):68-74. doi:10.1207/s15324796abm2301_10.

30.   Van Ness PH, Kasl SV. Religion and cognitive dysfunction in an elderly cohort. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 2003;58(1):S21-9. doi:10.1093/geronb/58.1.s21.

31.   Ritchie SJ, Gow AJ, Deary IJ. Religiosity is negatively associated with later-life intelligence, but not with age-related cognitive decline. *Intelligence*. 2014;46:9-17. doi:10.1016/j.intell.2014.04.005.

32.   Ferraro KF, Kim S. Health benefits of religion among Black and White older adults? Race, religiosity, and C-reactive protein. *Social Science and Medicine*. 2014;120:92-9. doi:10.1016/j.socscimed.2014.08.030.

33.   Krause N. Church-based social support and health in old age: Exploring variations by race. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 2002;57(6):S332-S47. doi:10.1093/geronb/57.6.s332.

34.   Debnam K, Holt CL, Clark EM, Roth DL, Southward P. Relationship between religious social support and general social support with health behaviors in a national sample of African Americans. *Journal of Behavioral Medicine*. 2012;35(2):179-89. doi:10.1007/s10865-011-9338-4.

35.   George LK, Ellison CG, Larson DB. Explaining the Relationships between Religious Involvement and Health. *Psychological Inquiry*. 2002;13(3):190-200. doi:10.1207/S15327965PLI1303_04.

36.   Bengtson VL, Silverstein M, Putney NM, Harris SC. Does Religiousness Increase with Age? Age Changes and Generational Differences Over 35 Years. *Journal for the Scientific Study of Religion*. 2015;54(2):363-79. doi:10.1111/jssr.12183.

References

37.   Pew Research Centre. *The Age Gap in Religion Around the World*. Available from: https://www.pewforum.org/2018/06/13/the-age-gap-in-religion-around-the-world/ [Accessed 30th January 2020].

38.   Krause N. Religion, aging, and health: Current status and future prospects. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 1997;52B(6):S291-S293. doi:10.1093/geronb/52B.6.S291.

39.   Levin J, Chatters LM. Religion, aging, and health: Historical perspectives, current trends, and future directions. *Journal of Religion, Spirituality & Aging*. 2008;20(1-2):153-72. doi:10.1080/15528030801922103.

40.   Mindel CH, Vaughan CE. A multidimensional approach to religiosity and disengagement. *Journal of Gerontology*. 1978;33(1):103-8. doi:10.1093/geronj/33.1.103.

41.   Saler B. Conceptualizing religion: Some recent reflections. *Religion*. 2008;38(3):219-25. doi:10.1016/j.religion.2008.03.008.

42.   Svob C, Wong LYX, Gameroff MJ, Wickramaratne PJ, Weissman MM, Kayser J. Understanding self-reported importance of religion/spirituality in a North American sample of individuals at risk for familial depression: A principal component analysis. *PLoS ONE*. 2019;14(10):e0224141. doi:10.1371/journal.pone.0224141.

43.   Hill PC, Pargament KI. Advances in the conceptualization and measurement of religion and spirituality. Implications for physical and mental health research. *The American Psychologist*. 2003;58(1):64-74. doi:10.1037/0003-066x.58.1.64.

44.   Pargament KI. The psychology of religion and spirituality? Yes and no. *The International Journal for the Psychology of Religion*. 1999;9(1):3-16. doi:10.1207/s15327582ijpr0901_2.

45.   Koenig HG. Research on religion, spirituality, and mental health: A review. *The Canadian Journal of Psychiatry*. 2009;54(5):283-91. doi:10.1177/070674370905400502.

46.   Moreira-Almeida A, Lotufo Neto F, Koenig HG. Religiousness and mental health: a review. *Brazilian Journal of Psychiatry*. 2006;28(3):242-50. doi:10.1590/s1516-44462006000300018.

47.   G. Koenig H, Larson DB. Religion and mental health: evidence for an association. *International Review of Psychiatry*. 2001;13(2):67-78. doi:10.1080/09540260124661.

48.   Hackney CH, Sanders GS. Religiosity and mental health: A meta–analysis of recent studies. Journal for the Scientific Study of Religion. 2003;42(1):43-55. doi:10.1111/1468-5906.t01-1-00160.

References

49.   Harrison MO, Koenig HG, Hays JC, Eme-Akwari AG, Pargament KI. The epidemiology of religious coping: a review of recent literature. *International Review of Psychiatry*. 2001;13(2):86-93. doi:10.1080/09540260124356.

50.   Pargament KI, Falb MD, Ano GG, Wachholtz AB. The religious dimension of coping: Advances in theory, research, and practice. In: Paloutzian RF, Park, CL (eds). *Handbook of the psychology of religion and spirituality.* 2nd ed. New York: The Guilford Press; 2013. p. 560-79.

51.   Koenig HG, Cohen HJ, George LK, Hays JC, Larson DB, Blazer DG. Attendance at religious services, interleukin-6, and other biological parameters of immune function in older adults. *The International Journal of Psychiatry in Medicine*. 1997;27(3):233-50. doi:10.2190/40NF-Q9Y2-0GG7-4WH6.

52.   Koenig HG, Cohen HJ. *The link between religion and health: Psychoneuroimmunology and the faith factor*. New York: Oxford University Press; 2002.

53.   Aukst-Margetic B, Margetic B. Religiosity and health outcomes: review of literature. *Collegium Antropologicum*. 2005;29(1):365-71.

54.   Thune-Boyle IC, Stygall JA, Keshtgar MR, Newman SP. Do religious/spiritual coping strategies affect illness adjustment in patients with cancer? A systematic review of the literature. *Social Science & Medicine*. 2006;63(1):151-64. doi:10.1016/j.socscimed.2005.11.055.

55.   McCullough ME, Hoyt WT, Larson DB, Koenig HG, Thoresen C. Religious involvement and mortality: a meta-analytic review. *Health psychology*. 2000;19(3):211. doi:10.1037//0278-6133.19.3.211.

56.   Idler E, Blevins J, Kiser M, Hogue C. Religion, a social determinant of mortality? A 10-year follow-up of the Health and Retirement Study. *PLoS ONE*. 2017;12(12). doi:10.1371/journal.pone.0189134.

57.   Powell LH, Shahabi L, Thoresen CE. Religion and spirituality. Linkages to physical health. *The American Psychologist*. 2003;58(1):36-52. doi:10.1037/0003-066x.58.1.36.

58.   Hosseini S, Chaurasia A, Oremus M. The effect of religion and spirituality on cognitive function: A systematic review. *The Gerontologist*. 2019;59(2):e76-e85. doi:10.1093/geront/gnx024.

59.   Peters R, Poulter R, Warner J, Beckett N, Burch L, Bulpitt C. Smoking, dementia and cognitive decline in the elderly, a systematic review. *BMC Geriatrics*. 2008;8(1):36. doi:10.1186/1471-2318-8-36.

60.   Jorm AF. Is depression a risk factor for dementia or cognitive decline? *Gerontology*. 2000;46(4):219-27. doi:10.1159/000022163.

References

61. Zuckerman M, Silberman J, Hall JA. The relation between intelligence and religiosity: a meta-analysis and some proposed explanations. *Personality and Social Psychology Review*. 2013;17(4):325-54. doi:10.1177/1088868313497266.

62. Hayford SR, Morgan SP. Religiosity and fertility in the United States: The role of fertility intentions. *Social Forces*. 2008;86(3):1163-88. doi:10.1353/sof.0.0000.

63. Peri-Rotem N. Religion and fertility in Western Europe: Trends across cohorts in Britain, France and the Netherlands. *European Journal of Population*. 2016;32(2):231-65. doi:10.1007/s10680-015-9371-z.

64. Ehrlich S. Effect of fertility and infertility on longevity. *Fertility and Sterility*. 2015;103(5):1129-35. doi:10.1016/j.fertnstert.2015.03.021.

65. Gagnon A. Natural fertility and longevity. *Fertility and Sterility*. 2015;103(5):1109-16. doi:10.1016/j.fertnstert.2015.03.030.

66. Jaffe D, Kogan L, Manor O, Gielchinsky Y, Dior U, Laufer N. Influence of late-age births on maternal longevity. *Annals of epidemiology*. 2015;25(6):387-91. doi:10.1016/j.annepidem.2014.12.002.

67. Ossewaarde ME, Bots ML, Verbeek AL, Peeters PH, van der Graaf Y, Grobbee DE, et al. Age at menopause, cause-specific mortality and total life expectancy. *Epidemiology*. 2005:556-62. doi:10.1097/01.ede.0000165392.35273.d4.

68. Câmara SMA, Pirkle C, Moreira MA, Vieira MCA, Vafaei A, Maciel ÁCC. Early maternal age and multiparity are associated to poor physical performance in middle-aged women from Northeast Brazil: a cross-sectional community based study. *BMC Womens Health*. 2015;15:56-. doi:10.1186/s12905-015-0214-1.

69. Hanson HA, Smith KR, Zimmer Z. Reproductive history and later-life comorbidity trajectories: A Medicare-linked cohort study from the Utah Population Database. *Demography*. 2015;52(6):2021-49. doi:10.1007/s13524-015-0439-5.

70. Pirkle CM, de Albuquerque Sousa AC, Alvarado B, Zunzunegui MV. Early maternal age at first birth is associated with chronic diseases and poor physical performance in older age: cross-sectional analysis from the International Mobility in Aging Study. *BMC Public Health*. 2014;14:293. doi:10.1186/1471-2458-14-293.

71. Grundy E, Tomassini C. Fertility history and health in later life: a record linkage study in England and Wales. *Social Science & Medicine*. 2005;61(1):217-28. doi:10.1016/j.socscimed.2004.11.046.

72. Sun F, Sebastiani P, Schupf N, Bae H, Andersen SL, McIntosh A, et al. Extended maternal age at birth of last child and women's longevity in the Long Life Family Study. *Menopause*. 2015;22(1):26-31. doi:10.1097/GME.0000000000000276.

References

73.   Hayward RD, Krause N, Ironson G, Hill PC, Emmons R. Health and Well-Being Among the Non-religious: Atheists, Agnostics, and No Preference Compared with Religious Group Members. *Journal of Religion and Health*. 2016;55(3):1024-37. doi:10.1007/s10943-015-0179-2.

74.   Cohen AB, Koenig HG. Religion, religiosity and spirituality in the biopsychosocial model of health and ageing. *Ageing International*. 2003;28(3):215-41. doi:10.1007/s12126-002-1005-1.

75.   Baker JO, Stroope S, Walker MH. Secularity, religiosity, and health: Physical and mental health differences between atheists, agnostics, and nonaffiliated theists compared to religiously affiliated individuals. *Social Science Research*. 2018;75:44-57. doi:10.1016/j.ssresearch.2018.07.003.

76.   Speed D, Fowler K. What's God Got to Do with It? How Religiosity Predicts Atheists' Health. *Journal of Religion and Health*. 2016;55(1):296-308. doi:10.1007/s10943-015-0083-9.

77.   Speed D, Fowler K. Good for All? Hardly! Attending Church Does Not Benefit Religiously Unaffiliated. *Journal of Religion and Health*. 2017;56(3):986-1002. doi:10.1007/s10943-016-0317-5.

78.   Storm I. Does Economic Insecurity Predict Religiosity? Evidence from the European Social Survey 2002–2014. *Sociology of Religion*. 2017;78(2):146-72. doi:10.1093/socrel/srw055.

79.   Inglis T. *Moral Monopoly: The Rise and Fall of the Catholic Church in Modern Ireland.* 2nd Edition. Dublin: University College Dublin Press; 1998.

80.   Central Statistics Office. *Census 2016 Profile 8 - Irish Travellers, Ethnicity and Religion.* 2017. Available from: https://www.cso.ie/en/releasesandpublications/ep/p-cp8iter/p8iter/ [Accessed 28th January 2020].

81.   Office for National Statistics. *How religion has changed in England and Wales*. 2015. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/religion/articles/howreligionhaschangedinenglandandwales/2015-06-04 [Accessed 28th January 2020].

82.   Breen MJ, & Erbe Healy, A. Secularization in Ireland: Analyzing the relationship between religiosity and demographic variables in Ireland from the European Social Survey 2002-2012. *The International Journal of Religion and Spirituality*. 2014;3(4):113-125.

83.   Davie G. Believing without Belonging: Is This the Future of Religion in Britain? *Social Compass*. 1990;37(4):455-69. doi:10.1177/003776890037004004.

References

84.   Smith TW. *Beliefs about God across time and countries*. NORC/University of Chicago Chicago; 2012. Available from: www.norc.org › pdfs › beliefs_about_god_report [Accessed 4th February 2020].

85.   Walsh T. *Primary Education in Ireland, 1897-1990: Curriculum and Context*. Oxford: Peter Lang; 2012.

86.   Griffin M. Catholic Schools in Ireland Today–a Changing Sector in a Time of Change. *Studies: An Irish Quarterly Review*. 2019;108(429):55-63.

87.   Cunningham J. *Unlikely radicals : Irish post-primary teachers and the ASTI, 1909-2009*. Cork, Ireland: Cork University Press; 2009.

88.   Kiely E, Leane M. *Irish Women at Work, 1930-1960: An Oral History*. Ireland: Irish Academic Press; 2012.

89.   Hornsby-Smith M, Whelan C. Religious and Moral Values. In: Whelan C (ed). *Values and Social Change in Ireland*. Dublin: Gill & Macmillan; 1994. p.7-44.

90.   New York Times. *Irish Catholic Church Lifts Trinity College Ban*. New York Times Archives Online. 28th June 1970. Available from https://www.nytimes.com/1970/06/28/archives/irish-catholic-church-lifts-trinity-college-ban.html [Accessed 5th February 2020].

91.   Libreri S. *Site for new maternity hospital still under religious control - Boylan*. RTE News. 9th November 2019. Available from https://www.rte.ie/news/ireland/2019/1109/1089729-national-maternity-hospital/ [Accessed 5th February 2020].

92.   Ryan L. Church and Politics: The Last Twenty-five Years. *The Furrow*. 1979;30(1):3-18.

93.   Ward C. 'Intimations of Immorality: An Analysis of the International Social Survey Programme (ISSP) 1998'. In Cassidy EG. (ed.) *Measuring Ireland: Discerning Values and Beliefs*. Ireland: Veritas; 2002. p.67-93.

94.   Punch A. Marriage, fertility and the family in Ireland-a statistical perspective. *Journal of the Statistical and Social Inquiry Society of Ireland*. 2007; vol.XXXVI:193-227.

95.   Whewell T. *Births out of wedlock 'pass 40%'*. BBC News. 21st February 2006. Available from http://news.bbc.co.uk/2/hi/uk/4733330.stm [Accessed 20th January 2020].

96.   Conlon C. *Concealed pregnancy: a case-study approach from an Irish setting*. Department of Health. 2006.

97.   World Bank Data. *Fertility rate, total (births per woman)*. Available from https://data.worldbank.org/indicator/sp.dyn.tfrt.in. [Accessed 5th February 2020].

References

98.   Hilliard B. The Catholic Church and married women's sexuality: Habitus change in late 20th century Ireland. *Irish Journal of Sociology*. 2003;12(2):28-49. doi:10.1177/079160350301200203.

99.   Fahey T, Field CA. *Families in Ireland an analysis of patterns and trends*. Department of Social and Family Affairs. 2008. Available from https://www.lenus.ie/handle/10147/234297 [Accessed 30th January 2020].

100.   Goode H, McGee HM, OḂoyle CA. *Time to listen: Confronting child sexual abuse by Catholic clergy in Ireland.* Dublin: Liffey Press; 2003.

101.   Swatos WH, Olson DVA. *The Secularization Debate*. Lanham: Rowman & Littlefield Publishers; 2000.

102.   Inglis T. *Meanings of life in contemporary Ireland: Webs of significance*. New York Basingstoke; Palgrave Macmillan; 2014.

103.   Ganiel G. *Transforming post-Catholic Ireland: Religious practice in late modernity.* New York: Oxford University Press; 2016.

104.   Edlund J. Understanding Variation in Religious Beliefs 1991-2008.: The Impact of Modernization and Social Inequality. In Bechert I (ed.), Quandt M. *ISSP Data Report: Religious Attitudes and Religious Change*. Koln: GESIS; 2013.

105.   Marks L. Religion and bio-psycho-social health: A review and conceptual model. *Journal of Religion and Health*. 2005;44(2):173-86. doi:10.1007/sl0943-005-2775-z.

106.   Tajfel H, Turner J. An integrative theory of intergroup conflict. In Hogg MA & Abrams D (Eds). *Key readings in social psychology. Intergroup relations: Essential readings*. New York: Psychology Press; 2001:94-109.

107.   Berjot S, Gillet N. Stress and Coping with Discrimination and Stigmatization. *Frontiers in Psychology*. 2011;2(33). doi:10.3389/fpsyg.2011.00033.

108.   Greenfield EA, Marks NF. Religious social identity as an explanatory factor for associations between more frequent formal religious participation and psychological well-being. *The International Journal for the Psychology of Religion*. 2007;17(3):245-59. doi:10.1080/10508610701402309.

109.   Stavrova O. *Fitting in and getting happy: How conformity to societal norms affects subjective well-being*. Frankfurt: Campus Verlag; 2014.

110.   Stavrova O. Religion, self-rated health, and mortality: whether religiosity delays death depends on the cultural context. *Social Psychological and Personality Science*. 2015;6(8):911-22. doi:10.1177/1948550615593149.

References

111.   Hardy R, Potischman N, Kuh D. Life Course Approach to Research in Women's Health. In: Goldman MB, Troisi R, Rexrode KM (eds). *Women and Health.* 2nd Edition. San Diego: Academic Press; 2013. p. 119-29.

112.   Kuh D, Hardy R. *A Life Course Approach to Women's Health.* Oxford: Oxford University Press; 2002.

113.   Ben-Shlomo Y, Cooper R, Kuh D. The last two decades of life course epidemiology, and its relevance for research on ageing. *International Journal of Epidemiology.* 2016;45(4):973-88. doi:10.1093/ije/dyw096.

114.   Muka T, Oliver-Williams C, Kunutsor S, Laven JSE, Fauser BCJM, Chowdhury R, et al. Association of Age at Onset of Menopause and Time Since Onset of Menopause With Cardiovascular Outcomes, Intermediate Vascular Traits, and All-Cause Mortality: A Systematic Review and Meta-analysis. *JAMA Cardiology.* 2016;1(7):767-76. doi:10.1001/jamacardio.2016.2415.

115.   Gong D, Sun J, Zhou Y, Zou C, Fan Y. Early age at natural menopause and risk of cardiovascular and all-cause mortality: A meta-analysis of prospective observational studies. International Journal of Cardiology. 2016;203:115-9. doi:10.1016/j.ijcard.2015.10.092.

116.   Grundy E, Kravdal O. Fertility history and cause-specific mortality: a register-based analysis of complete cohorts of Norwegian women and men. *Social Science and Medicine.* 2010;70(11):1847-57. doi:10.1016/j.socscimed.2010.02.004.

117.   Henretta JC, Grundy EM, Okell LC, Wadsworth ME. Early motherhood and mental health in midlife: a study of British and American cohorts. Aging & Mental Health. 2008;12(5):605-14. doi:10.1080/13607860802343084.

118.   MacMahon B, Cole P, Lin TM, Lowe CR, Mirra AP, Ravnihar B, et al. Age at first birth and breast cancer risk. *Bulletin of the World Health Organization.* 1970;43(2):209-21.

119.   Kelsey JL, Gammon MD, John EM. Reproductive factors and breast cancer. *Epidemiologic Reviews.* 1993;15(1):36-47.

120.   Creswell JW, Clark VLP. *Designing and Conducting Mixed Methods Research.* Thousand Oaks, California: SAGE Publications; 2011.

121.   Kenny RA, Whelan BJ, Cronin H, Kamiya Y, Kearney P, O'Regan C, et al. *The design of the Irish longitudinal study on ageing.* Dublin: The Irish Longitudinal Study on Ageing; 2010.

122.   Whelan BJ, Savva GM. Design and methodology of the Irish Longitudinal Study on Ageing. *Journal of the American Geriatrics Society.* 2013;61 Suppl 2:S265-8. doi:10.1111/jgs.12199.

References

123.   Donoghue OA, McGarrigle CA, Foley M, Fagan A, Meaney J, Kenny RA. Cohort Profile Update: The Irish Longitudinal Study on Ageing (TILDA). *International Journal of Epidemiology*. 2018;47(5):1398-l. doi:10.1093/ije/dyy163.

124.   Cronin H, O'Regan C, Finucane C, Kearney P, Kenny RA. Health and aging: development of the Irish Longitudinal Study on Ageing health assessment. *Journal of the American Geriatrics Society*. 2013;61:S269-S78. doi:10.1111/jgs.12197.

125.   Yin RK. *Qualitative Research from Start to Finish*. New York: The Guilford Press; 2010.

126.   Castleberry A, Nolen A. Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in Pharmacy Teaching and Learning*. 2018;10(6):807-15. doi:10.1016/j.cptl.2018.03.019.

127.   Pope C, Ziebland S, Mays N. Qualitative research in health care: Analysing qualitative data. *BMJ: British Medical Journal*. 2000;320(7227):114. doi:10.1136/bmj.320.7227.114.

128.   Bailey J. First steps in qualitative data analysis: transcribing. *Family Practice*. 2008;25(2):127-31. doi:10.1093/fampra/cmn003.

129.   Bradley EH, Curry LA, Devers KJ. Qualitative Data Analysis for Health Services Research: Developing Taxonomy, Themes, and Theory. *Health Services Research*. 2007;42(4):1758-72. doi:10.1111/j.1475-6773.2006.00684.x.

130.   Bryman A. *Social Research Methods*. Oxford: Oxford University Press; 2012.

131.   Cooper HM, Camic PM. *APA Handbook of Research Methods in Psychology*. American Psychological Association; 2012.

132.   Birks M, Chapman Y, Francis K. Memoing in qualitative research: Probing data and processes. *Journal of Research in Nursing*. 2008;13(1):68-75. doi:10.1177/1744987107081254.

133.   World Bank Data. *Fertility rate, total (births per woman)*. Available from: https://data.worldbank.org/indicator/sp.dyn.tfrt.in. [Accessed 30th January 2020].

134.   Mahon E, Conlon C, Dillon LJTS. *Women and crisis pregnancy: a report presented to the Department of Health and Children*. Dublin: Stationary Office; 1998.

135.   Layte R, McGee H, Quail A, Rundle K, Cousins G, Donnelly C, et al. *The Irish Study of Sexual Health and Relationships Main Report*. Dublin: Crisis Pregnancy Agency; 2006.

136.   Zeng Y, Ni Z-m, Liu S-y, Gu X, Huang Q, Liu J-a, et al. Parity and All-cause Mortality in Women and Men: A Dose-Response Meta-Analysis of Cohort Studies. *Scientific Reports*. 2016;6:19351-. doi:10.1038/srep19351.

137.   Högnäs RS, Roelfs DJ, Shor E, Moore C, Reece T. J-Curve? A Meta-Analysis and Meta-Regression of Parity and Parental Mortality. *Population Research and Policy Review*. 2017;36(2):273-308. doi:10.1007/s11113-016-9421-1.

References

138.   Hurt LS, Ronsmans C, Thomas SL. The effect of number of births on women's mortality: Systematic review of the evidence for women who have completed their childbearing. *Population Studies*. 2006;60(1):55-71. doi:10.1080/00324720500436011.

139.   Adami HO, Lambe M, Persson I, Ekbom A, Adami HO, Hsieh CC, et al. Parity, age at first childbirth, and risk of ovarian cancer. *The Lancet*. 1994;344(8932):1250-4. doi:10.1016/S0140-6736(94)90749-8.

140.   Zhu J, Zhu X, Tu C, Li YY, Qian KQ, Jiang C, et al. Parity and thyroid cancer risk: a meta-analysis of epidemiological studies. *Cancer Medicine*. 2016;5(4):739-52. doi:10.1002/cam4.604.

141.   Brinton LA, Reeves WC, Brenes MM, Herrero R, de Britton RC, Gaitan E, et al. Parity as a risk factor for cervical cancer. *American Journal of Epidemiology*. 1989;130(3):486-96. doi:10.1093/oxfordjournals.aje.a115362.

142.   Jensen KE, Schmiedel S, Norrild B, Frederiksen K, Iftner T, Kjaer SK. Parity as a cofactor for high-grade cervical disease among women with persistent human papillomavirus infection: a 13-year follow-up. *British Journal of Cancer*. 2013;108(1):234-9. doi:10.1038/bjc.2012.513.

143.   Read S, Grundy E. Fertility history and quality of life in older women and men. *Ageing & Society*. 2010;31(1):125-45. doi:10.1017/S0144686X10000760.

144.   Koski-Rahikkala H, Pouta A, Pietiläinen K, Hartikainen AL. Does parity affect mortality among parous women? *Journal of Epidemiology and Community Health*. 2006;60(11):968-73. doi:10.1136/jech.2005.044735.

145.   Bastian LA, West NA, Corcoran C, Munger RGJPm. Number of children and the risk of obesity in older women. *Preventive Medicine*. 2005;40(1):99-104. doi:10.1016/j.ypmed.2004.05.007.

146.   Lawlor DA, Emberson JR, Ebrahim S, Whincup PH, Wannamethee SG, Walker M, et al. Is the Association Between Parity and Coronary Heart Disease Due to Biological Effects of Pregnancy or Adverse Lifestyle Risk Factors Associated With Child-Rearing? *Circulation*. 2003;107(9):1260-4. doi:10.1161/01.cir.0000053441.43495.1a.

147.   Dior UP, Hochner H, Friedlander Y, Calderon-Margalit R, Jaffe D, Burger A, et al. Association between number of children and mortality of mothers: results of a 37-year follow-up study. *Annals of Epidemiology*. 2013;23(1):13-8. doi:10.1016/j.annepidem.2012.10.005.

148.   van Noord PA, Dubas JS, Dorland M, Boersma H, te Velde E. Age at natural menopause in a population-based screening cohort: the role of menarche, fecundity, and lifestyle factors. *Fertility and Sterility*. 1997;68(1):95-102. doi:10.1016/s0015-0282(97)81482-3.

References

149. Harlow BL, Signorello LB. Factors associated with early menopause. *Maturitas*. 2000;35(1):3-9. doi:10.1016/s0378-5122(00)00092-x.

150. Kington R, Lillard L, Rogowski J. Reproductive history, socioeconomic status, and self-reported health status of women aged 50 years or older. *American Journal of Public Health*. 1997;87(1):33-7. doi:10.2105/ajph.87.1.33.

151. Grundy E, Foverskov E. Age at First Birth and Later Life Health in Western and Eastern Europe. *Population and Development Review*. 2016;42(2):245-69. doi:10.1111/j.1728-4457.2016.00128.x.

152. Eder FX, Hall LA, Hekma G (eds). *Sexual cultures in Europe: National histories*. Manchester: Manchester University Press; 1999.

153. Lee KJ, Carlin JB. Multiple imputation for missing data: fully conditional specification versus multivariate normal imputation. *American Journal of Epidemiology*. 2010;171(5):624-32. doi:10.1093/aje/kwp425.

154. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986;51(6):1173-82.

155. Lv H, Wu H, Yin J, Qian J, Ge J. Parity and Cardiovascular Disease Mortality: a Dose-Response Meta-Analysis of Cohort Studies. *Scientific Reports*. 2015;5:13411. doi:10.1038/srep13411.

156. Friedlander NJ. The relation of lifetime reproduction to survivorship in women and men: A prospective study. *American Journal of Human Biology*. 1996;8(6):771-83. doi:10.1002/(SICI)1520-6300(1996)8:6<771::AID-AJHB9>3.0.CO;2-W.

157. Gaudet MM, Carter BD, Hildebrand JS, Patel AV, Campbell PT, Wang Y, et al. Associations of parity and age at first pregnancy with overall and cause-specific mortality in the Cancer Prevention Study II. *Fertility and Sterility*. 2017;107(1):179-88.e6. doi:10.1016/j.fertnstert.2016.09.043.

158. Meyer TJ, Miller ML, Metzger RL, Borkovec TD. Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*. 1990;28(6):487-95. doi:10.1016/0005-7967(90)90135-6.

159. Cleves MA, Gould W, Marchenko YV. *An Introduction to Survival Analysis Using Stata*. College Station, TX: Stata Press; 2016.

160. StataCorp. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC; 2017.

References

161.   Discacciati A, Bellavia A, Lee JJ, Mazumdar M, Valeri L. Med4way: a Stata command to investigate mediating and interactive mechanisms using the four-way effect decomposition. *International Journal of Epidemiology*. 2019;48(1):15-20. doi: 10.1093/ije/dyy236.

162.   Grundy E. Women's fertility and mortality in late mid life: A comparison of three contemporary populations. *American Journal of Human Biology*. 2009;21(4):541-7. doi:10.1002/ajhb.20953.

163.   Le Bourg É. Does reproduction decrease longevity in human beings? *Ageing Research Reviews*. 2007;6(2):141-9. DOI: 10.1016/j.arr.2007.04.002.

164.   Beral V, Hermon C, Kay C, Hannaford P, Darby S, Reeves G. Mortality associated with oral contraceptive use: 25 year follow up of cohort of 46 000 women from Royal College of General Practitioners' oral contraception study. *BMJ*. 1999;318(7176):96-100. doi:10.1136/bmj.318.7176.96.

165.   Kahlenborn C, Modugno F, Potter DM, Severs WB. Oral contraceptive use as a risk factor for premenopausal breast cancer: a meta-analysis. *Mayo Clinic Proceedings*. 2006;81(10):1290-302. doi:10.4065/81.10.1290.

166.   Cibula D, Gompel A, Mueck AO, La Vecchia C, Hannaford PC, Skouby SO, et al. Hormonal contraception and risk of cancer. *Human Reproduction Update*. 2010;16(6):631-50. doi:10.1093/humupd/dmq022.

167.   Hannaford PC, Iversen L, Macfarlane TV, Elliott AM, Angus V, Lee AJ. Mortality among contraceptive pill users: cohort evidence from Royal College of General Practitioners' Oral Contraception Study. *BMJ*. 2010;340:c927. doi:10.1136/bmj.c927.

168.   Zhu H, Lei X, Feng J, Wang Y. Oral contraceptive use and risk of breast cancer: a meta-analysis of prospective cohort studies. *The European journal of contraception & reproductive health care : the official journal of the European Society of Contraception*. 2012;17(6):402-14. doi:10.3109/13625187.2012.715357.

169.   Charlton BM, Rich-Edwards JW, Colditz GA, Missmer SA, Rosner BA, Hankinson SE, et al. Oral contraceptive use and mortality after 36 years of follow-up in the Nurses' Health Study: prospective cohort study. *BMJ*. 2014;349:g6356. doi:10.1136/bmj.g6356.

170.   Zhong GC, Cheng JH, Xu XL, Wang K. Meta-analysis of oral contraceptive use and risks of all-cause and cause-specific death. *International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics*. 2015;131(3):228-33. doi:10.1016/j.ijgo.2015.05.026.

171.   Walsh BM. Trends in Age at Marriage in Postwar Ireland. *Demography*. 1972;9(2):187-202.

References

172. Barban N. Family Trajectories and Health: A Life Course Perspective. *European Journal of Population / Revue européenne de Démographie*. 2013;29(4):357-85. doi:10.1007/s10680-013-9296-3.

173. Hummer RA, Ellison CG, Rogers RG, Moulton BE, Romero RR. Religious involvement and adult mortality in the United States: review and perspective. *Southern Medical Journal*. 2004 2004/12//:1223+. doi:10.1097/01.SMJ.0000146547.03382.94.

174. Henretta J. Early childbearing, marital status, and women's health and mortality after age 50. *Journal of Health and Social Behaviour*. 2007;48(3):254-66. doi:10.1177/002214650704800304.

175. Fahey T Trends in Irish fertility rates in comparative perspective. *Economic & Social Review*. 2001;32(2):153-180.

176. World Bank Data. *Life expectance at birth, female.* Available from: https://data.worldbank.org/indicator/SP.DYN.LE00.FE.IN. [Accessed 30th January 2020].

177. Wright DM, Rosato M, Raab G, Dibben C, Boyle P, O'Reilly D. Does equality legislation reduce intergroup differences? Religious affiliation, socio-economic status and mortality in Scotland and Northern Ireland: A cohort study of 400,000 people. *Health & Place*. 2017;45:32-8. doi:10.1016/j.healthplace.2017.02.009.

178. Central Statistics Office. *Census 2016 Profile 8 - Irish Travellers, Ethnicity and Religion* Dublin, Ireland; 2017. Available from: https://www.cso.ie/en/releasesandpublications/ep/p-cp8iter/p8iter/ [Accessed 28th January 2020].

179. Idler EL, Kasl SV. Religion among disabled and nondisabled persons II: attendance at religious services as a predictor of the course of disability. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 1997;52(6):S306-16. doi:10.1093/geronb/52b.6.s306.

180. Hybels CF, Blazer DG, George LK, Koenig HG. The complex association between religious activities and functional limitations in older adults. *The Gerontologist*. 2012;52(5):676-85. doi:10.1093/geront/gnr156.

181. Fitchett G, Benjamins MR, Skarupski KA, Mendes de Leon CF. Worship attendance and the disability process in community-dwelling older adults. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 2013;68(2):235-45. doi:10.1093/geronb/gbs165.

182. Ahrenfeldt LJ, Moller S, Andersen-Ranberg K, Vitved AR, Lindahl-Jacobsen R, Hvidt NC. Religiousness and health in Europe. *European Journal of Epidemiology*. 2017;32(10):921-9. doi:10.1007/s10654-017-0296-1.

References

183.   Benjamins MR. Religion and Functional Health Among the Elderly:Is There a Relationship and Is It Constant? *Journal of Aging and Health.* 2004;16(3):355-74. doi:10.1177/0898264304264204.

184.   Benjamins MR, Musick MA, Gold DT, George LK. Age-Related Declines in Activity Level: The Relationship Between Chronic Illness and Religious Activities. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*. 2003;58(6):S377-S85. doi:10.1093/geronb/58.6.S377.

185.   Kelley-Moore JA, Ferraro KF. Functional Limitations and Religious Service Attendance in Later Life: Barrier and/or Benefit Mechanism? *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences.* 2001;56(6):S365-S73. doi:10.1093/geronb/56.6.S365.

186.   Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*. 1991;39(2):142-8. doi:10.1111/j.1532-5415.1991.tb01616.x.

187.   Savva GM, Donoghue OA, Horgan F, O'Regan C, Cronin H, Kenny RA. Using timed up-and-go to identify frail members of the older population. *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences*. 2013;68(4):441-6. doi:10.1093/gerona/gls190.

188.   Peterson MD, Duchowny K, Meng Q, Wang Y, Chen X, Zhao Y. Low Normalized Grip Strength is a Biomarker for Cardiometabolic Disease and Physical Disabilities Among U.S. and Chinese Adults. *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences*. 2017;72(11):1525-31. doi:10.1093/gerona/glx031.

189.   Cooper R, Kuh D, Hardy R, Mortality Review Group, FALCon and HALCyon Study Teams. Objectively measured physical capability levels and mortality: systematic review and meta-analysis. *BMJ*. 2010;341:c4467. doi:10.1136/bmj.c4467.

190.   Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: Evidence for a phenotype. *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences*. 2001;56(3):M146-M56. doi: 10.1093/gerona/56.3.m146.

191.   Kenny RA, Coen RF, Frewen J, Donoghue OA, Cronin H, Savva GM. Normative values of cognitive and physical function in older adults: findings from the Irish Longitudinal Study on Ageing. *Journal of the American Geriatrics Society*. 2013;61 Suppl 2:S279-90. doi:10.1111/jgs.12195.

192.   Bohannon RW. Comfortable and maximum walking speed of adults aged 20-79 years: reference values and determinants. *Age and Ageing*. 1997;26(1):15-9. doi:10.1093/ageing/26.1.15.

References

193.   Neufeld S, Machacova K, Mossey J, Luborsky M. Walking Ability and Its Relationship to Self-Rated Health in Later Life. *Clinical Gerontologist*. 2013;36(1):17-32. doi:10.1080/07317115.2012.731477.

194.   George C, Verghese J. Polypharmacy and Gait Performance in Community-dwelling Older Adults. *Journal of the American Geriatrics Society*. 2017;65(9):2082-7. doi:10.1111/jgs.14957.

195.   Ashfield TA, Syddall HE, Martin HJ, Dennison EM, Cooper C, Sayer AA. Grip strength and cardiovascular drug use in older people: findings from the Hertfordshire Cohort Study. *Age and Ageing*. 2009;39(2):185-91. doi:10.1093/ageing/afp203.

196.   Wood N, McMunn A, Webb E, Stafford M. Marriage and physical capability at mid to later life in England and the USA. *PLoS ONE*. 2019;14(1):e0209388. doi:10.1371/journal.pone.0209388.

197.   Welmer A-K, Kåreholt I, Rydwik E, Angleman S, Wang H-X. Education-related differences in physical performance after age 60: a cross-sectional study assessing variation by age, gender and occupation. *BMC Public Health*. 2013;13:641-. doi:10.1186/1471-2458-13-641.

198.   Henretta JC, McCrory C. Childhood Circumstances and Mid-Life Functional Mobility. *Journal of Aging and Health*. 2016;28(3):440-59. doi:10.1177/0898264315594135.

199.   Sternäng O, Reynolds CA, Finkel D, Ernsth-Bravell M, Pedersen NL, Dahl Aslan AK. Factors associated with grip strength decline in older adults. *Age and Ageing*. 2014;44(2):269-74. doi:10.1093/ageing/afu170.

200.   Vermeulen J, Neyens JCL, van Rossum E, Spreeuwenberg MD, de Witte LP. Predicting ADL disability in community-dwelling elderly people using physical frailty indicators: a systematic review. *BMC Geriatrics*. 2011;11(1):33. doi:10.1186/1471-2318-11-33.

201.   Radloff LS. The CES-D Scale:A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement*. 1977;1(3):385-401.

202.   Demakakos P, Cooper R, Hamer M, de Oliveira C, Hardy R, Breeze E. The bidirectional association between depressive symptoms and gait speed: evidence from the English Longitudinal Study of Ageing (ELSA). *PLoS ONE*. 2013;8(7):e68632-e. doi:10.1371/journal.pone.0068632.

203.   Fukumori N, Yamamoto Y, Takegami M, Yamazaki S, Onishi Y, Sekiguchi M, et al. Association between hand-grip strength and depressive symptoms: Locomotive Syndrome and Health Outcomes in Aizu Cohort Study (LOHAS). *Age and Ageing*. 2015;44(4):592-8. doi:10.1093/ageing/afv013.

References

204.   Nowakowski A, Sumerau JJS, Nonreligion. Health disparities in nonreligious and religious older adults in the United States: A descriptive epidemiology of 16 common chronic conditions. *Secularism & Nonreligion.* 2017;6:4. doi: 10.5334/snr.85.

205.   Ahrenfeldt LJ, Hvidt NC, Kjoller ST, Moller S, Lindahl-Jacobsen R. Religiousness and Diseases in Europe: Findings from SHARE. *Journal of Religion and Health.* 2019;58(6):1925-37. doi:10.1007/s10943-018-0664-5.

206.   Ahrenfeldt LJ, Möller S, Hvidt NC, Lindahl-Jacobsen R. Religiousness and lifestyle among Europeans in SHARE. *Public Health.* 2018;165:74-81. doi:10.1016/j.puhe.2018.09.009.

207.   Opsahl T, Ahrenfeldt LJ, Möller S, Hvidt NC. Religiousness and depressive symptoms in Europeans: findings from the Survey of Health, Ageing, and Retirement in Europe. *Public Health.* 2019;175:111-9. doi:10.1016/j.puhe.2019.07.011.

208.   Mattis JS, Fontenot DL, Hatcher-Kay CA, Grayman NA, Beale RL. Religiosity, Optimism, and Pessimism Among African Americans. *Journal of Black Psychology.* 2004;30(2):187-207. doi:10.1177/0095798403260730.

209.   Cheadle ACD, Dunkel Schetter C. Mastery, self-esteem, and optimism mediate the link between religiousness and spirituality and postpartum depression. *Journal of Behavioural Medicine.* 2018;41(5):711-21. doi:10.1007/s10865-018-9941-8.

210.   Donoghue OA, Horgan NF, Savva GM, Cronin H, O'Regan C, Kenny RA. Association between timed up-and-go and memory, executive function, and processing speed. *Journal of the American Geriatrics Society.* 2012;60(9):1681-6. doi:10.1111/j.1532-5415.2012.04120.x.

211.   Shankar A, McMunn A, Demakakos P, Hamer M, Steptoe A. Social isolation and loneliness: Prospective associations with functional status in older adults. *Health psychology.* 2017;36(2):179-87. doi:10.1037/hea0000437.

212.   Orr J, Tobin K, Carey D, Kenny RA, McGarrigle C. Religious Attendance, Religious Importance, and the Pathways to Depressive Symptoms in Men and Women Aged 50 and Over Living in Ireland. *Research on Aging.* 2019;41(9):891-911. doi:10.1177/0164027519860270.

213.   Sowa A, Golinowska S, Deeg D, Principi A, Casanova G, Schulmann K, et al. Predictors of religious participation of older Europeans in good and poor health. *European Journal of Ageing.* 2016;13(2):145-57. doi:10.1007/s10433-016-0367-2.

214.   Blazer DG. Depression in Late Life: Review and Commentary. *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences.* 2003;58(3):M249-M65. doi:10.1093/gerona/58.3.m249.

215.   Fiske A, Wetherell JL, Gatz M. Depression in older adults. *Annual review of clinical psychology.* 2009;5:363-89. doi:10.1146/annurev.clinpsy.032408.153621.

References

216.   O'Regan C, Kearney PM, Savva GM, Cronin H, Kenny RA. Age and sex differences in prevalence and clinical correlates of depression: first results from the Irish Longitudinal Study on Ageing. *International Journal of Geriatric Psychiatry.* 2013;28(12):1280-7. doi:10.1002/gps.3955.

217.   Astbury J. *Gender disparities in mental health.* 54th World Health Assembly; Geneva, Switzerland: World Health Organization 2001. Available from: http://www.who.int/mental_health/media/en/242.pdf [Accessed 30th January 2020].

218.   Smith TB, McCullough ME, Poll J. Religiousness and depression: evidence for a main effect and the moderating influence of stressful life events. *Psychological Bulletin.* 2003;129(4):614-36. doi:10.1037/0033-2909.129.4.614.

219.   Koenig H, King D, Carson VB. *Handbook of Religion and Health.* New York: Oxford University Press; 2012.

220.   Leurent B, Nazareth I, Bellon-Saameno J, Geerlings MI, Maaroos H, Saldivia S, et al. Spiritual and religious beliefs as risk factors for the onset of major depression: an international cohort study. *Psychological Medicine.* 2013;43(10):2109-20. doi:10.1017/S0033291712003066.

221.   Okulicz-Kozaryn A. Religiosity and life satisfaction across nations. *Mental Health, Religion & Culture.* 2010;13(2):155-69. doi: 10.1080/13674670903273801.

222.   Levin JS, Taylor RJ, Chatters LM. Race and gender differences in religiosity among older adults: findings from four national surveys. *Journal of Gerontology.* 1994;49(3):S137-45. doi: 10.1093/geronj/49.3.s137.

223.   Timonen V, Kamiya Y, Maty S. 'Social engagement of older people'. In: Barrett A, Savva GM, Timonen V, Kenny RA (eds). *Fifty Plus in Ireland: First Results from The Irish Longitudinal Study on Ageing (TILDA).* Dublin: The Irish Longitudinal Study on Ageing; 2011. p. 51-72.

224.   Central Statistics Office. *Census 2016 Summary Results - Part 1.* Dublin: CSO; 2017. Available from https://www.cso.ie/en/media/csoie/newsevents/documents/census2016summaryresultspart1/Census2016SummaryPart1.pdf [Accessed 20th February 2020].

225.   Levin J. Religion and mental health: theory and research. *International Journal of Applied Psychoanalytic Studies.* 2010;7(2):102-15. doi:10.1002/aps.240.

226.   Cheadle ACD, Dunkel Schetter C. Untangling the mechanisms underlying the links between religiousness, spirituality, and better health. *Social and Personality Psychology Compass.* 2017;11(2):e12299-n/a. doi:10.1111/spc3.12299.

References

227.   Park CL. Religiousness/spirituality and health: a meaning systems perspective. *Journal of Behavioral Medicine*. 2007;30(4):319-28. doi:10.1007/s10865-007-9111-x.

228.   Nilsson KW, Leppert J, Simonsson B, Starrin B. Sense of coherence and psychological well-being: improvement with age. *Journal of Epidemiology and Community Health*. 2010;64(4):347-52. doi:10.1136/jech.2008.081174.

229.   Pargament KI, Raiya HA. A decade of research on the psychology of religion and coping: Things we assumed and lessons we learned. *Psyke & Logos*. 2007;28(2):742-66.

230.   Hovey JD, Hurtado G, Morales LR, Seligman LD. Religion-based emotional social support mediates the relationship between intrinsic religiosity and mental health. *Archives of Suicide Research*. 2014;18(4):376-91. doi:10.1080/13811118.2013.833149.

231.   Fenelon A, Danielsen S. Leaving my religion: Understanding the relationship between religious disaffiliation, health, and well-being. *Social Science Research.* 2016;57:49-62. doi:10.1016/j.ssresearch.2016.01.007.

232.   Rasic D, Robinson JA, Bolton J, Bienvenu OJ, Sareen J. Longitudinal relationships of religious worship attendance and spirituality with major depression, anxiety disorders, and suicidal ideation and attempts: findings from the Baltimore epidemiologic catchment area study. *Journal of Psychiatric Research.* 2011;45(6):848-54. doi:10.1016/j.jpsychires.2010.11.014.

233.   Steffen PR, Masters KS, Baldwin S. What Mediates the Relationship Between Religious Service Attendance and Aspects of Well-Being? *Journal of Religion and Health*. 2017;56(1):158-70. doi: 10.1007/s10943-016-0203-1.

234.   Krause N. Church-based social support and health in old age: exploring variations by race. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences.* 2002;57(6):S332-47. doi:10.1093/geronb/57.6.S332.

235.   Maselko J, Hayward RD, Hanlon A, Buka S, Meador K. Religious service attendance and major depression: a case of reverse causality? *American Journal of Epidemiology*. 2012;175(6):576-83. doi:10.1093/aje/kwr349.

236.   O'Halloran AM, Kenny RA, King-Kallimanis BL. The latent factors of depression from the short forms of the CES-D are consistent, reliable and valid in community-living older adults. *European Geriatric Medicine*. 2014;5(2):97-102. doi:10.1016/j.eurger.2013.12.004.

237.   Muthén L, Muthén B. *Version 6 Mplus user's guide*. Los Angeles, CA: Muthén & Muthén. 2010.

238.   Wrzus C, Hänel M, Wagner J, Neyer FJ. Social network changes and life events across the life span: A meta-analysis. *Psychological Bulletin*. 2013;139(1):53-80. doi:10.1037/a0028601.

References

239.   Steiger JH. Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences*. 2007;42(5):893-8. doi: 10.1016/j.paid.2006.09.017.

240.   Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal.* 1999;6(1):1-55. doi:10.1080/10705519909540118.

241.   Muthén LK, Muthén BO. *Mplus 6.12*. Los Angeles, CA: Muthén & Muthén; 1998-2010.

242.   Briggs R, Carey D, O'Halloran A, Kenny R, Kennelly DS. Validation of the 8-item Centre for Epidemiological Studies Depression Scale in a cohort of community-dwelling older people: data from The Irish Longitudinal Study on Ageing (TILDA). *European Geriatric Medicine*. 2018;9:121-126. doi: 10.1007/s41999-017-0016-0.

243.   Hayward RD, Owen AD, Koenig HG, Steffens DC, Payne ME. Religion and the presence and severity of depression in older adults. *The American Journal of Geriatric Psychiatry*. 2012;20(2):188-92. doi: 10.1097/JGP.0b013e31822ccd51.

244.   Kidwai R, Mancha BE, Brown QL, Eaton WW. The effect of spirituality and religious pattendance on the relationship between psychological distress and negative life events. *Social Psychiatry and Psychiatric Epidemiology*. 2014;49(3):487-97. doi: 10.1007/s00127-013-0723-x.

245.   Dilmaghani M. Religiosity and Subjective Wellbeing in Canada. *Journal of Happiness Studies.* 2018;19:629-647. doi:10.1007/s10902-016-9837-7.

246.   Holt CL, Roth DL, Huang J, Clark EM. Role of religious social support in longitudinal relationships between religiosity and health-related outcomes in African Americans. *Journal of Behavioral Medicine*. 2018;41(1):62-73. doi: 10.1007/s10865-017-9877-4.

247.   Chatters LM, Taylor RJ, Woodward AT, Nicklett EJ. Social support from church and family members and depressive symptoms among older African Americans. *The American Journal of Geriatric Psychiatry.* 2015;23(6):559-67. doi: 10.1016/j.jagp.2014.04.008.

248.   Walsh BM. Labour Force Participation and the Growth of Women's Employment, Ireland 1971-1991. *Economic and Social Review*. 1993;24(4):369.

249.   McFarland M. Religion and Mental Health Among Older Adults: Do the Effects of Religious Involvement Vary by Gender? *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences.* 2009;65:621-30. doi: 10.1093/geronb/gbp112.

250.   Balbuena L, Baetz M, Bowen R. Religious Attendance, Spirituality, and Major Depression in Canada: A 14-Year Follow-up Study. *The Canadian Journal of Psychiatry*. 2013;58(4):225-32. doi:10.1177/070674371305800408.

References

251.   Li S, Okereke OI, Chang SC, Kawachi I, VanderWeele TJ. Religious Service Attendance and Lower Depression Among Women-a Prospective Cohort Study. *Annals of Behavioral Medicine*. 2016;50(6):876-84. doi:10.1007/s12160-016-9813-9.

252.   Manning LK, Miles A. Examining the Effects of Religious Attendance on Resilience for Older Adults. *Journal of Religion and Health.* 2018;57(1):191-208. doi: 10.1007/s10943-017-0438-5.

253.   Braam AW, Hein E, Deeg DJ, Twisk JW, Beekman AT, Van Tilburg W. Religious involvement and 6-year course of depressive symptoms in older Dutch citizens: results from the Longitudinal Aging Study Amsterdam. *Journal of Aging and Health.* 2004;16(4):467-89. doi:10.1177/0898264304265765.

254.   Inglis T. Church and Culture in Catholic Ireland. *Studies: An Irish Quarterly Review*. 2017;106(421):21-30.

255.   Schwarzbach M, Luppa M, Forstmeier S, Konig HH, Riedel-Heller SG. Social relations and depression in late life-a systematic review. *International Journal of Geriatric Psychiatry*. 2014;29(1):1-21. doi:10.1002/gps.3971.

256.   King M, Marston L, McManus S, Brugha T, Meltzer H, Bebbington P. Religion, spirituality and mental health: results from a national study of English households. *British Journal of Psychiatry.* 2013;202(1):68-73. doi:10.1192/bjp.bp.112.112003.

257.   Park RM, Schulte PA, Bowman JD, Walker JT, Bondy SC, Yost MG, et al. Potential occupational risks for neurodegenerative diseases. *American Journal of Industrial Medicine.* 2005;48(1):63-77. doi:10.1002/ajim.20178.

258.   Beeri MS, Davidson M, Silverman JM, Schmeidler J, Springer RR, Noy S, et al. Religious education and midlife observance are associated with dementia three decades later in Israeli men. *Journal of Clinical Epidemiology.* 2008;61(11):1161-8. doi:10.1016/j.jclinepi.2007.09.011.

259.   Yeager DM, Glei DA, Au M, Lin HS, Sloan RP, Weinstein M. Religious involvement and health outcomes among older persons in Taiwan. *Social Science & Medicine.* 2006;63(8):2228-41. doi:10.1016/j.socscimed.2006.05.007.

260.   Kaufman Y, Anaki D, Binns M, Freedman M. Cognitive decline in Alzheimer disease: Impact of spirituality, religiosity, and QOL. *Neurology.* 2007;68(18):1509-14. doi:10.1212/01.wnl.0000260697.66617.59.

261.   Hill TD, Burdette AM, Angel JL, Angel RJ. Religious Attendance and Cognitive Functioning Among Older Mexican Americans. *The Journals of Gerontology, Series B: Pscyhological Sciences and Social Sciences*. 2006;61(1):P3-P9. doi:10.1093/geronb/61.1.p3.

References

262.   Reyes-Ortiz CA, Berges IM, Raji MA, Koenig HG, Kuo YF, Markides KS. Church attendance mediates the association between depressive symptoms and cognitive functioning among older Mexican Americans. T*he Journals of Gerontology, Series A: Biological Sciences and Medical Sciences.* 2008;63(5):480-6. doi:10.1093/gerona/63.5.480.

263.   Kraal AZ, Sharifian N, Zaheed AB, Sol K, Zahodne LB. Dimensions of Religious Involvement Represent Positive Pathways in Cognitive Aging. *Research on Aging.* 2019;41(9):868-90. doi:10.1177/0164027519862745.

264.   Hosseini S, Chaurasia A, Oremus M. The Effect of Religion and Spirituality on Cognitive Function: A Systematic Review. *The Gerontologist.* 2017;59(2):e76-e85. doi: 10.1093/geront/gnx024.

265.   McDermott LM, Ebmeier KP. A meta-analysis of depression severity and cognitive function. *Journal of Affective Disorders.* 2009;119(1-3):1-8. doi:10.1016/j.jad.2009.04.022.

266.   Almeida OP, Hankey GJ, Yeap BB, Golledge J, Flicker L. Depression as a modifiable factor to decrease the risk of dementia. *Translational Psychiatry.* 2017;7(5):e1117-e. doi:10.1038/tp.2017.90.

267.   Baumgart M, Snyder HM, Carrillo MC, Fazio S, Kim H, Johns H. Summary of the evidence on modifiable risk factors for cognitive decline and dementia: A population-based perspective. *Alzheimer's & Dementia.* 2015;11(6):718-26. doi: 10.1016/j.jalz.2015.05.016.

268.   Corsentino EA, Collins N, Sachs-Ericsson N, Blazer DG. Religious attendance reduces cognitive decline among older women with high levels of depressive symptoms. *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences.* 2009;64(12):1283-9. doi:10.1093/gerona/glp116.

269.   Foong HF, Hamid TA, Ibrahim R, Haron SA. Moderating effect of intrinsic religiosity on the relationship between depression and cognitive function among community-dwelling older adults. *Aging & Mental Health.* 2018;22(4):483-8. doi: 10.1080/13607863.2016.1274376.

270.   Ellison CG, George LK. Religious Involvement, Social Ties, and Social Support in a Southeastern Community. *Journal for the Scientific Study of Religion.* 1994;33(1):46-61. doi:10.2307/1386636.

271.   Rote S, Hill TD, Ellison CG. Religious Attendance and Loneliness in Later Life. *The Gerontologist.* 2012;53(1):39-50. doi:10.1093/geront/gns063.

272.   Hussain M, Walker C, Moon G. Smoking and Religion: Untangling Associations Using English Survey Data. *Journal of Religion and Health.* 2019;58(6):2263-76. doi: 10.1007/s10943-017-0434-9.

273.   Garrusi B, Nakhaee N. Religion and Smoking: A Review of Recent Literature. 2012;43(3):279-92.

References

274.   Michalak L, Trocki K, Bond J. Religion and alcohol in the U.S. National Alcohol Survey: How important is religion for abstention and drinking? *Drug and Alcohol Dependence.* 2007;87(2):268-80. doi:10.1016/j.drugalcdep.2006.07.013.

275.   Homan KJ, Boyatzis CJ. Religiosity, Sense of Meaning, and Health Behavior in Older Adults. *The International Journal for the Psychology of Religion*. 2010;20(3):173-86. doi:10.1080/10508619.2010.481225.

276.   Bartke S, Schwarze. *Risk-averse by nation or by religion? Some insights on the determinants of individual risk attitudes*. SOEP paper on Multidisciplinary Panel Data Research No. 131, Deutsches Institut für Wirtschaftsforschung. 2008(131). doi:10.2139/ssrn.1285520.

277.   Poey JL, Burr JA, Roberts JS. Social Connectedness, Perceived Isolation, and Dementia: Does the Social Environment Moderate the Relationship Between Genetic Risk and Cognitive Well-Being? *The Gerontologist*. 2017;57(6):1031-40. doi: 10.1093/geront/gnw154.

278.   Sabia S, Nabi H, Kivimaki M, Shipley MJ, Marmot MG, Singh-Manoux A. Health behaviors from early to late midlife as predictors of cognitive function: The Whitehall II study. *American Journal of Epidemiology*. 2009;170(4):428-37. doi:10.1093/aje/kwp161.

279.   Deary IJ, Corley J, Gow AJ, Harris SE, Houlihan LM, Marioni RE, et al. Age-associated cognitive decline. *British Medical Bulletin*. 2009;92(1):135-52. doi:10.1093/bmb/ldp041.

280.   Folstein MF, Folstein SE, McHugh PR. Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975;12(3):189-98.

281.   Muthén L, Muthén B. *Mplus. The comprehensive modelling program for applied researchers: user's guide.* 2011;6.

282.   Jung T, Wickrama K. An introduction to latent class growth analysis and growth mixture modeling. *Social and Personality Psychology Compass*. 2008;2(1):302-17. doi: 10.1111/j.1751-9004.2007.00054.x.

283.   Nylund KL, Asparouhov T, Muthén BO. Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*. 2007;14(4):535-69. 10.1080/10705510701575396.

284.   Clark SL, Muthén B. *Relating latent class analysis results to variables not included in the analysis*. Statmodel: 2009. Available from https://www.statmodel.com/download/relatinglca.pdf. [Accessed 14th November 2019].

285.   Lo Y, Mendell NR, Rubin DB. Testing the number of components in a normal mixture. *Biometrika*. 2001;88(3):767-78. doi:10.1093/biomet/88.3.767.

References

286.   Ram N, Grimm KJ. Growth Mixture Modeling: A Method for Identifying Differences in Longitudinal Change Among Unobserved Groups. *International Journal for Behavioral Development*. 2009;33(6):565-76. doi:10.1177/0165025409343765.

287.   Kohler U, Karlson K. KHB: Stata module to decompose total effects into direct and indirect via KHB-method. *Statistical Software Components*: 2019.

288.   Kohler U, Karlson KB, Holm A. Comparing Coefficients of Nested Nonlinear Probability Models. *The Stata Journal*. 2011;11(3):420-38. doi:10.1177/1536867X1101100306.

289.   Zuckerman M, Silberman J, Hall JA. The Relation Between Intelligence and Religiosity:A Meta-Analysis and Some Proposed Explanations. *Personality and Social Psychology Review*. 2013;17(4):325-54. doi: 10.1177/1088868313497266.

290.   Zuckerman M, Li C, Lin S, Hall JA. The Negative Intelligence–Religiosity Relation: New and Confirming Evidence. *Personality and Social Psychology Bulletin*. 2019;0(0):0146167219879122. [Epub ahead of print]. doi: 10.1177/0146167219879122.

291.   Scarmeas N, Stern Y. Cognitive reserve and lifestyle. *Journal of Clinical and Experimental Neuropsychology*. 2003;25(5):625-33. doi:10.1076/jcen.25.5.625.14576.

292.   Mosca I, Wright RE. Effect of Retirement on Cognition: Evidence From the Irish Marriage Bar. *Demography*. 2018;55(4):1317-41. doi:10.1007/s13524-018-0682-7.

293.   Garrusi B, Nakhaee N. Religion and Smoking: A Review of Recent Literature. *The International Journal of Psychiatry in Medicine*. 2012;43(3):279-92. doi:10.2190/PM.43.3.g.

294.   Kim KH, Sobal J, Wethington E. Religion and body weight. *International Journal of Obesity and Related Metabolic Disorders*. 2003;27(4):469-77. doi:10.1038/sj.ijo.0802220.

295.   Cline KMC, Ferraro KF. Does Religion Increase the Prevalence and Incidence of Obesity in Adulthood? *Journal for the Scientific Study of Religion*. 2006;45(2):269-81. doi:10.1111/j.1468-5906.2006.00305.x.

296.   Pendlebury ST, Cuthbertson FC, Welch SJ, Mehta Z, Rothwell PM. Underestimation of cognitive impairment by Mini-Mental State Examination versus the Montreal Cognitive Assessment in patients with transient ischemic attack and stroke: a population-based study. *Stroke*. 2010;41(6):1290-3. doi:10.1161/STROKEAHA.110.579888.

297.   Hyde M, Wiggins RD, Higgs P, Blane DB. A measure of quality of life in early old age: the theory, development and properties of a needs satisfaction model (CASP-19). *Aging & Mental Health*. 2003;7(3):186-94. doi:10.1080/1360786031000101157.

298.   Sexton E, King-Kallimanis BL, Conroy RM, Hickey A. Psychometric evaluation of the CASP-19 quality of life scale in an older Irish cohort. *Quality of Life Research*. 2013;22(9):2549-59. doi:10.1007/s11136-013-0388-7.

References

299.   McKenna SP, Doward LC, Alonso J, Kohlmann T, Niero M, Prieto L, et al. The QoL-AGHDA: an instrument for the assessment of quality of life in adults with growth hormone deficiency. *Quality of Life Research*. 1999;8(4):373-83. doi:10.1023/a:1008987922774.

300.   Maslow AH. *Toward a psychology of being*. 2nd Edition. Van Nostrand; 1968.

301.   Ward M, McGarrigle CA, Kenny RA. More than health: quality of life trajectories among older adults-findings from The Irish Longitudinal Study of Ageing (TILDA). *Quality of Life Research.* 2019;28(2):429-39. doi:10.1007/s11136-018-1997-y.

302.   Sexton E, King-Kallimanis BL, Layte R, Hickey A. CASP-19 special section: how does chronic disease status affect CASP quality of life at older ages? Examining the WHO ICF disability domains as mediators of this relationship. *Aging & Mental Health.* 2015;19(7):622-33. doi:10.1080/13607863.2014.955457.

303.   Tay L, Li M, Myers D, Diener E. Religiosity and Subjective Well-Being: An International Perspective. In: Kim-Prieto C (ed). *Religion and Spirituality Across Cultures*. Dordrecht: Springer Netherlands; 2014. p. 163-75.

304.   Graham C, Crown. Religion and well-being around the world: Social purpose, social time, or social insurance? *International Journal of Wellbeing*. 2014;4(1). doi:10.5502/ijw.v4i1.1

305.   Deaton A, Stone AA. Two happiness puzzles. *American Economic Review*. 2013;103(3):591-7. doi:10.1257/aer.103.3.591.

306.   Myers DG, Diener E. The Scientific Pursuit of Happiness. *American Economic Review*. 2018;13(2):218-25. doi:10.1257/aer.103.3.591.

307.   Zuckerman M, Li C, Diener E. Religion as an Exchange System: The Interchangeability of God and Government in a Provider Role. *Personality and Social Psychology Bulletin.* 2018;44(8):1201-13. doi:10.1177/0146167218764656.

308.   Diener E, Tay L, Myers DG. The religion paradox: if religion makes people happy, why are so many dropping out? *Journal of Personality and Social Psychology*. 2011;101(6):1278-90. doi:10.1037/a0024402.

309.   Eger RJ, Maridal JH. A statistical meta-analysis of the wellbeing literature. *International Journal of Wellbeing.* 2015;5(2). doi:10.5502/ijw.v5i2.4.

310.   Diener E, Lucas RE, Oishi S. Advances and Open Questions in the Science of Subjective Well-Being. *Collabra Psychology*. 2018;4(1). doi:10.1525/collabra.115.

311.   Moons P, Luyckx K. Quality-of-life research in adult patients with congenital heart disease: current status and the way forward. *Acta Paedriatrica.* 2019;108(10):1765-72. doi:10.1111/apa.14876.

References

312.	Burlacu A, Artene B, Nistor I, Buju S, Jugrin D, Mavrichi I, et al. Religiosity, spirituality and quality of life of dialysis patients: a systematic review. *International Urology and Nephrology*. 2019;51(5):839-50. doi: 10.1007/s11255-019-02129-x.

313.	Abu HO, Ulbricht C, Ding E, Allison JJ, Salmoirago-Blotcher E, Goldberg RJ, et al. Association of religiosity and spirituality with quality of life in patients with cardiovascular disease: a systematic review. *Quality of Life Research*. 2018;27(11):2777-97. doi: 10.1007/s11136-018-1906-4.

314.	Wortmann JH, Park CL. Religion and Spirituality in Adjustment Following Bereavement: An Integrative Review. *Death Studies*. 2008;32(8):703-36. doi:10.1080/07481180802289507.

315.	Becker G, Xander CJ, Blum HE, Lutterbach J, Momm F, Gysels M, et al. Do religious or spiritual beliefs influence bereavement? A systematic review. *Palliative Medicine*. 2007;21(3):207-17. doi:10.1177/0269216307077327.

316.	Brown SL, Nesse RM, House JS, Utz RL. Religion and Emotional Compensation: Results from a Prospective Study of Widowhood. *Personality and Social Psychology Bulletin*. 2004;30(9):1165-74. doi:10.1177/0146167204263752.

317.	Pargament KI, Smith BW, Koenig HG, Perez L. Patterns of positive and negative religious coping with major life stressors. *Journal for the Scientific Study of Religion*. 1998;37(4):710-24. doi:10.2307/1388152.

318.	Bjorck JP, Thurman JW. Negative Life Events, Patterns of Positive and Negative Religious Coping, and Psychological Functioning. *Journal for the Scientific Study of Religion*. 2007;46(2):159-67. doi:10.1111/j.1468-5906.2007.00348.x.

319.	Whitford HS, Olver IN. The multidimensionality of spiritual wellbeing: peace, meaning, and faith and their association with quality of life and coping in oncology. *Psychooncology*. 2012;21(6):602-10. doi:10.1002/pon.1937.

320.	Zarzycka B, Sliwak J, Krok D, Ciszek P. Religious comfort and anxiety in women with cancer: The mediating role of hope and moderating role of religious struggle. *Psychooncology*. 2019;28(9):1829-35. doi:10.1002/pon.5155.

321.	Zamanian H, Eftekhar-Ardebili H, Eftekhar-Ardebili M, Shojaeizadeh D, Nedjat S, Taheri-Kharameh Z, et al. Religious Coping and Quality of Life in Women with Breast Cancer. *Asian Pacific Journal of Cancer Prevention*. 2015;16(17):7721-5. doi:10.7314/apjcp.2015.16.17.7721.

322.	Gaston-Johansson F, Haisfield-Wolfe ME, Reddick B, Goldstein N, Lawal TA. The relationships among coping strategies, religious coping, and spirituality in African American

References

women with breast cancer receiving chemotherapy. *Oncology Nursing Forum*. 2013;40(2):120-31. doi:10.1188/13.ONF.120-131.

323.   Andersson G, Health. Chronic Pain and Praying to a Higher Power: Useful or Useless? *Journal of Religion and Health*. 2008;47(2):176-87. doi:10.1007/s10943-007-9148-8.

324.   Marquez-Gonzalez M, Lopez J, Romero-Moreno R, Losada A. Anger, spiritual meaning and support from the religious community in dementia caregiving. *Journal of Religion and Health.* 2012;51(1):179-86. doi:10.1007/s10943-010-9362-7.

325.   Creswell JW, Clark VLP. *Designing and Conducting Mixed Methods Research.* Thousand Oaks, California: SAGE Publications; 2010.

326.   Harrington CB, Hansen JA, Moskowitz M, Todd BL, Feuerstein M. It's not over when it's over: long-term symptoms in cancer survivors--a systematic review. *International Journal of Psychiatry in Medicine*. 2010;40(2):163-81. doi:10.2190/PM.40.2.c.

327.   StataCorp. *Stata multilevel mixed-effects reference manual.* TX: StataCorp LP; 2013.

328.   Braam AW, Koenig HG. Religion, spirituality and depression in prospective studies: A systematic review. *Journal of Affective Disorders*. 2019;257:428-38.

329.   Kucharska J. Religiosity and the psychological outcomes of trauma: A systematic review of quantitative studies. *Journal of Clinical Psychology*. 2020;76(1):40-58. doi:10.1002/jclp.22867.

330.   Gebauer JE, Sedikides C, Schonbrodt FD, Bleidorn W, Rentfrow PJ, Potter J, et al. The religiosity as social value hypothesis: A multi-method replication and extension across 65 countries and three levels of spatial aggregation. *Journal of Personality and Social Psychology.* 2017;113(3):e18-e39. doi:10.1037/pspp0000104.

331.   Stavrova O, Fetchenhauer D, Schlosser T. Why are religious people happy? The effect of the social norm of religiosity across countries. *Social Science Research*. 2013;42(1):90-105. doi:10.1016/j.ssresearch.2012.07.002.

332.   Zeng Y, Ni Z-m, Liu S-y, Gu X, Huang Q, Liu J-a, et al. Parity and All-cause Mortality in Women and Men: A Dose-Response Meta-Analysis of Cohort Studies. *Scientific Reports*. 2016;6(1):19351. doi:10.1038/srep19351.

333.   Epel E. Keynote Address: Healthy Longevity and Telomeres: What Does Sex Have to Do With It? In: *North American Menopause Society Annual Meeting; 3-6 October 2018, San Diego, USA*. Available from: https://www.menopause.org/docs/default-source/press-release/telomeres-and-longevity-sex-impact-9-20-18.pdf [Accessed 29th January 2020].

334.   Kresovich JK, Parks CG, Sandler DP, Taylor JA. Reproductive history and blood cell telomere length. *Aging*. 2018;10(9):2383-93. doi:10.18632/aging.101558.

References

335.   Pollack AZ, Rivers K, Ahrens KA. Parity associated with telomere length among US reproductive age women. *Human Reproduction*. 2018;33(4):736-44. doi:10.1093/humrep/dey024.

336.   VanderWeele TJ. Religion and health in Europe: cultures, countries, context. *European Journal of Epidemiology*. 2017;32(10):857-61. doi:10.1007/s10654-017-0310-7.

Appendices

Central Aim:

To explore how women relate religious practice, belief and participation to their wellbeing in later life.

Topics	Questions
Intro	Maybe to start off you could tell me a little bit about your life at the moment? *If prompt needed:* Where do you live? Do you enjoy living in…? Are you involved with any religious congregation in…? *If no prompt needed:* Do you attend religious services anywhere else?
Life course trajectories of engagement with religion	*As we've discussed, this research wants to hear about your experiences with ageing and your engagement with religion. I would now like to ask you some questions about your religious engagement and beliefs throughout your life.* **Could you tell me a little about your life growing up?** *Prompt:* Where did you grow up? What was growing up in … like? Was your family religious? What was your relationship with your family like?

Appendices

	Have you always considered yourself to be a religious person?
Religious practices	**Could you tell me a little bit about your religious practices?** *Prompt:* For example, do you regularly go to church? Or do you practice religion more privately? Or in what other ways do you practice your religion? Would you say you engage with your religion every day, or? **And would you say it is necessary to practice religion in a certain way, or that there is room for interpretation in the conduct of one's religious practice?**
Personal beliefs	**Could you tell me what religion / your faith means to you personally?** *Prompt:* What does it mean to you to be religious? How would you describe your relationship with God / your faith? **Have you always felt this way about your faith? Where there any times in your life when you felt differently?** **What has shaped the way you think about your faith throughout your life?** *Prompt:* Are Church teachings important to you? Or do you find your own thinking and interpretation of your faith more important?

	And have you ever felt that your personal religious beliefs affect your views on social issues? *Prompt:* Have you relied on religious teachings or Church statements to decide on how you feel about certain issues?
Community and participation	**Can you tell me about the community involved in [your local religious organization]?** *Prompt:* What are the people in the congregation / community like? Is it a welcoming environment? Do you feel a part of the community? **And are there members of the congregation who you feel closer to?** *Prompt:* Do you ever spend time with members of the congregation outside of church? What kinds of things do you do? Would you feel comfortable getting in touch with anyone from church if you needed help or support with anything? Has anything like this ever happened?
Family and other social networks	*Now if you don't mind I'd like to find out a little bit more about other relationships in your life.* **Who do you currently live with?**

	Do you have any children?
	Do you have any other family who are close to you?
	Is religion an important part of family life for you? Has religion always been an important part of family life for you?
	Do you have any family or friends who are not religious? What is this relationship like?
Health and wellbeing	*Now I'd like to talk about how you feel in terms of your health and happiness.*
	Could you tell me about what being [age] has been like for you?
	Prompt: Do you feel your age? How is your health generally? How has getting older affected you?
	And do you think being religious has an effect on your wellbeing? Could you tell me about that?
	Prompt: What aspects of your faith or religious practice do you think could be good for your health/wellbeing?
	How would your life be different if you were not able to practice?
Closing	**Is there anything else you which we have not discussed and that you would like to add?**

Appendices

Joanna Orr
The Irish Longitudinal Study on Ageing (TILDA)
Trinity College Dublin
Dublin 2
t: 01 896 4820 / 086 4432 406
e: orrjo@tcd.ie

[Date]

[Contact Name]
[Job title]
[Church Name]
[Church address]

Dear [Contact],

RE: Trinity College Dublin research project on ageing, health and religious participation in older Irish women

I am writing to you regarding an upcoming research project from Trinity College Dublin and with funding support from the Irish Research Council. This is part of a PhD project aiming to gain a better understanding of the experiences of older Irish women of religion, health and ageing. We are seeking to recruit between 8 and 12 women aged 65 or over from a number of churches in the local community, to talk to a researcher about their lives and experiences.

We would like to seek your permission and/or assistance in recruiting participants for this study within your church community. This would involve permission to advertise on noticeboards or newsletters, and permission or assistance in reaching out to potential participants.

I have attached an advertisement, a letter for potential participants and an information leaflets for those considering taking part. Please feel free to look through these materials, and get in touch with me, the lead researcher, if you have any questions. I will be in touch with you in the coming days to see if you would be happy to permit recruitment in your church, and to ascertain what further steps we may need to take.

If you have any questions or would like to discuss this study further, please do not hesitate to be in contact. I look forward to speaking with you.

Sincerely,

Joanna Orr
(Lead Researcher)

Appendices

Joanna Orr
The Irish Longitudinal Study on Ageing (TILDA)
Trinity College Dublin
Dublin 2
t: 01 896 4820 / 086 4432 406
e: orrjo@tcd.ie

[Date]

Dear Participant,

RE: Trinity College Dublin research project on ageing, health and religious participation in older Irish women

I am writing to you regarding an upcoming research project from Trinity College Dublin and with funding support from the Irish Research Council. This is part of a PhD project aiming to gain a better understanding of the experiences of older Irish women of religion, health and ageing. We are seeking to recruit between 8 and 12 women aged 65 or over from a number of churches in the local community to talk to a researcher about their lives and experiences.

We would like to invite you to read through the information attached, and if you are eligible to participate, to consider being a part of the project. Please feel free to look through the attached information leaflet, and get in touch with the lead researcher if you have any questions.

If you have any questions or would like to discuss this study further, please do not hesitate to be in contact. I look forward to speaking with you.

Sincerely,

Joanna Orr
(Lead Researcher)

Appendices

Appendix 2.4: Study advertisement

Appendix 6 – Advertisement for participants

PARTICIPANTS WANTED!

Researchers from the Department of Medical Gerontology at Trinity College Dublin are inviting participants to take part in an upcoming study on women's experiences of ageing, religion and health.

We are looking for participants who are:

- Female
- Aged 65 and over
- Engaged in religious practice (Church attendance, private practice, etc.)

Participants will be asked to complete an interview with a trained researcher. Interviews will last anywhere between 45 and 120 minutes. We will discuss your life, your health, ageing and religion, and how you feel about them.

If you are interested in participating, or would like further information, please contact us below.

Lead researcher: Joanna Orr

Email: orrjo@tcd.ie

Phone: 086 4432 406 / 01 896 4820

Appendices

Information sheet:

'Women's experiences of ageing, health, wellbeing and religion in Ireland'

Introduction

The purpose of this study is to gain an understanding of the experiences of women living in Ireland and their health, wellbeing and religious participation in the context of getting older. We would like to hear about your life and experience, and how you understand the process of ageing as a religious person in Ireland.

Procedures

We are seeking to recruit female participants aged 65 or over. Participants should be involved in Catholic or other Christian religious practice to some extent (private practice, church attendance, other religious practices or beliefs, etc.) Participants should not be suffering from severe cognitive impairment and/or dementia. Participants will be invited to an interview with the lead researcher, who will ask you about past and present experiences, and for your opinions on a number of topics. These include:

How you feel your health and wellbeing is affected by ageing

How you practice your religion, and how important this is for you

Whether you feel your religious practice or faith has had any positive or negative influences on your wellbeing

What it is like being religious in Ireland

Each of these interviews will last around 45 to 120 minutes, and you will have an opportunity to introduce any issues you think are important. With your permission, the researcher will audio record the interview. The recording may be paused at any stage if you wish any part of the interview to not be recorded. These recordings will then be typed up by the researcher, and the original recording will be deleted. You may request that the researcher provides you with copies of recordings and/or transcripts of your own interview if you wish. All this information will be accessible to the lead researcher only, who will store it on a password protected computer.

The lead researcher will remove any identifiable information (such as names, place names, etc.) from these transcripts, and this anonymised information may then be shared with the research supervisor and other research collaborators. When reporting results, sections of the interview may be used in reports. However, no identifying information will be reported, and pseudonyms (made up names) will be used.

Appendices

Benefits

We hope that participating in this study will be a pleasant and fulfilling activity for you. We also believe that this research project will benefit the knowledge we have around health in older age, and particularly women's health. Women's health in later life has often been neglected in research, and we believe there is much to be gained from understanding older women's experiences in Ireland. This will hopefully provide evidence which will help create policy to enable older people to maintain practices and behaviours which are beneficial, and identify areas of social and private life which can confer risks to wellbeing.

Risks

Sometimes talking about our experiences can be upsetting. While this research project will not seek to explore any sensitive topics, it is always possible that during the course of the interview painful or uncomfortable memories and feelings may arise. If at any stage in the interview you feel uncomfortable or that you would rather not continue, it is completely within your rights to take a break or end the interview altogether. If any topics discussed in the interview leave you feeling upset, we encourage you to discuss this with the lead interviewer and/or the research supervisor. We have also included a list of mental health resources which you may find useful on the back of this form.

Exclusion from participation

We would like to make this study as inclusive as possible. However, for reasons of safety and to gain the most relevant information possible for this study, we cannot include participants for whom any of the following are true:

Is aged 64 or under

Is male

Is suffering from cognitive impairment and/or dementia

Does not consider themselves to be Catholic or other Christian

Confidentiality

Your identity will remain confidential throughout this study. Your name will not be published or shared with anyone, and all information collected from you will be kept anonymous. The lead researcher will ensure that any information shared does not contain any identifiable information, and you, the participant, retain the right to remove yourself and your information from the project at any time.

Appendices

However, if information is disclosed to the researcher which suggests you or others may be in danger (risk of self-harm, risk of harm to others, etc.), it is the researcher's duty to communicate this to a supervisor and relevant authorities if deemed necessary.

Insurance

This study is covered by insurance policies organized by Trinity College Dublin.

Voluntary participation

If you decide to take part in this study, your participation is entirely voluntary and you may withdraw from participation at any stage of the research. You may also choose not to answer any question during the interview without providing a reason.

Stopping the study

You can withdraw from participation in the study at any time and without penalty.

Permission

This research project has approval from the School of Medicine Research Ethics Committee at Trinity College Dublin.

Funding

This study is carried out as part of a PhD project which is funded by the Irish Research Council. No separate funding exists for this specific project.

Further information

If you would like to discuss the research, ask any questions or get more information about participation in the study and your rights, please contact the lead researcher by phone or email on the following:

Joanna Orr

Phone: 01 896 4820

Mobile: 086 4432 406

Email: orrjo@tcd.ie

Alternatively, you may also contact the research supervisor, Dr Christine McGarrigle:

Appendices

christine.mcgarrigle@tcd.ie

Thank you for taking the time to consider participating in this research.

Mental health resources

Samaritans – 116 123

Samaritans provide non-judgemental emotional support, 24 hours a day, for the price of a local call.

AWARE – 1800 80 48 48

AWARE is a national voluntary organization providing support through depression.

Senior Help Line – 1800 80 45 91

Senior Help Line is a confidential listening service for older people by older people for the price of a local call anywhere in Ireland. The lines are open from 10am to 10pm, seven days a week, 365 days a year.

Appendices

'Women's experiences of ageing, health, wellbeing and religion in Ireland'

- I have read, or had read to me, this consent form. I have also had an opportunity to read through the information leaflet and to ask any questions about participation in this research. I believe I understand what will happen if I agree to be part of this study.
- I understand that I may withdraw from this research at any time. I understand I may choose not to answer any questions I do not want to answer without having to give a reason.
- I understand that this research will be recorded, and I may request access to recordings and transcripts at any time.
- I understand that if I disclose information which may indicate that I or others may be in danger it is the duty of the researcher to disclose this information to a supervisor or relevant authorities. Other than in these circumstances, my identity will not be disclosed to anyone other than the lead researcher, and no identifiable information will be published or shared.

I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.

I have received a copy of this statement.

Participant's name:

Participant's signature:

Date:

Date on which participant was first furnished with this form:

Statement of investigator's responsibility: I have explained the nature, purpose, procedures, benefits and risks of this research study. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

Lead researcher signature:

Date:

Appendices

To account for the fact that the TILDA data does not have a direct measure of parity, we conducted an informal comparison of birth rate data from Eurostat with the TILDA dataset.

A difficulty in conducting a comparison of these two sources of data is that the types of data are different; TILDA has data on each woman's completed number of children at ages 50 through to 100; Eurostat collects the total births per woman, representing "the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year." (World Bank Databank https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?cid=GPD_11&end=2005&locations=IE&start=1960&view=chart (accessed 10th June 2019)).

Considering the above and considering the range of data available (1960 through to 2016), we decided to take the average Eurostat fertility rate data from 1960 to 1975. All women aged 15 to 45 in this time period would be aged 50 to 95 in 2010, and therefore are represented by the nationally representative TILDA data. We then compare this average to the TILDA average for women aged 50 to 95.

Table 3.1.1. TILDA / Eurostat comparison of birth rates

	Mean
TILDA age 50 to 95	3.21
Eurostat (average birth rate 1960-1975)	3.83

We see that the TIILDA average birth rate is somewhat lower than that of Eurostat. This is problematic, however, as part of the reason for checking against official fertility rates was the possibility of inflation of TILDA fertility rates due to the presence of adopted, fostered, or step children, a lower mean is perhaps not as worrying.

We conducted an alternative comparison to assess whether patterns of fertility rates were similar in TILDA as in the Eurostat. We took data on the average age of mothers for each year between 1960 and 1990, as well as the fertility rate for each of these years from the Eurostat. We then took the rounded average age of mothers for each year, and matched it to the corresponding age for TILDA respondents in 2010 (for example, the average age of mothers in Ireland in 1960 was 31.6; a 32 year old in 1960 would be 82 years old in 2010). We then compare the Eurostat fertility rate for each year with the matched-age average number of children in TILDA. Full data is given in Table 2A. Figure 1A shows that, while there is some variability, in particular in the oldest and youngest participants, the general trend appeared to be consistent. We include trend lines for fertility rate for the United Kingdom and Norway to further contextualise the data. These show that the TILDA data approximates the Irish fertility rate much more closely than other populations.

Appendices

Figure 3.1.1. TILDA and Eurostat Irish fertility trends for 1960 through to 1990. Trends for the UK and Norway given for context.
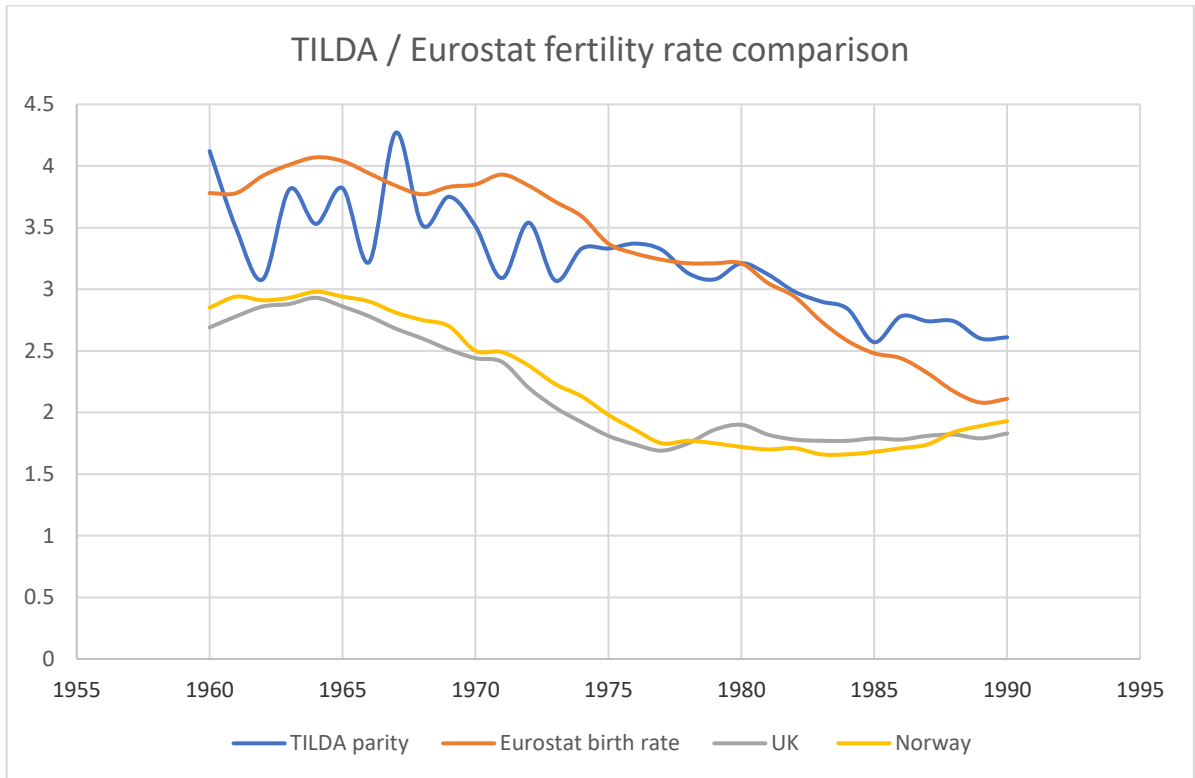
Data sources: Eurostat and TILDA. Eurostat data accessed on 10th June 2019, on World Bank Databank https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?cid=GPD_11&end=2005&locations=IE&start=1960&view=chart

Appendices

Table 3.1.2. Comparison of Eurostat and TILDA fertility rates by year (1960 to 1990) and matched-age in 2010.

Year	CSO average age of mothers	Rounded average age	Age at Wave 1 of TILDA	TILDA parity	Eurostat birth rate
1960	31.6	32	82	4.10	3.78
1961	31.5	32	81	3.41	3.78
1962	31.3	31	79	3.09	3.92
1963	30.9	31	78	3.80	4.01
1964	30.8	31	77	3.51	4.07
1965	30.6	31	76	3.80	4.04
1966	30.4	30	74	3.22	3.94
1967	30.1	30	73	4.27	3.84
1968	29.9	30	72	3.51	3.77
1969	29.6	30	71	3.77	3.83
1970	29.4	29	69	3.53	3.85
1971	29.1	29	68	3.09	3.93
1972	29	29	67	3.54	3.84
1973	28.9	29	66	3.07	3.71
1974	28.8	29	65	3.31	3.59
1975	28.8	29	64	3.32	3.37
1976	28.8	29	63	3.38	3.29
1977	28.8	29	62	3.32	3.24
1978	28.9	29	61	3.14	3.21
1979	28.8	29	60	3.08	3.21
1980	28.8	29	59	3.22	3.21
1981	28.9	29	58	3.11	3.05
1982	29	29	57	2.98	2.94
1983	29.1	29	56	2.90	2.74
1984	29.1	29	55	2.84	2.58
1985	29.3	29	54	2.56	2.48
1986	29.3	29	53	2.77	2.44
1987	29.4	29	52	2.74	2.32
1988	29.5	30	52	2.74	2.17
1989	29.6	30	51	2.61	2.08
1990	29.6	30	50	2.61	2.11

Appendices

Appendix 3.2: Non-imputed, non-weighted mediation analyses of three samples

Table 3.2.1. Health characteristics at Wave 1 by number of children

	Total n=4,166	Zero (n=513)	One (n=259)	Two (n=784)	Three (n=936)	Four (n=747)	Five or more (n=927)	*P value*
Excellent/Very good self-rated health	44.6	42.2	37.9	50.1	45.5	45.7	41.5	*0.001*
Number of medications Mean (SD)	2.7 (2.7)	2.8 (2.7)	2.8 (2.8)	2.5 (2.6)	2.6 (2.6)	2.5 (2.5)	3.1 (2.8)	
Any cardiovascular condition	45.3	46.2	46.3	41.7	42.5	41.0	54.1	*<0.001*
Diabetes	6.0	6.4	7.0	4.3	4.8	5.6	8.3	*0.008*
Number of physical limitations Mean (SD)	2.3 (2.4)	2.5 (2.5)	2.4 (2.4)	2.1 (2.3)	2.2 (2.3)	2.3 (2.3)	2.7 (2.5)	*<0.001*
Breast cancer	3.9	4.1	4.6	2.8	3.6	4.2	4.5	*0.518*
Ovarian cancer	0.3	0.6	1.2	0.1	0.2	0.1	0.2	*0.073*
Cervical cancer	0.2	0.0	0.0	0.3	0.3	0.4	0.2	*0.707*
Thyroid cancer	0.1	0.0	0.0	0.0	0.1	0.0	0.1	*0.780*
Menopause								
No menopause	9.8	10.1	10.0	13.5	10.8	10.6	4.9	*<0.001*
Menopause with HRT use	19.3	17.7	16.6	20.9	19.8	21.2	17.7	
Menopause with no HRT use	70.9	72.1	73.4	65.6	69.4	68.3	77.5	

Note: P values represent probability for Chi2 tests for categorical variables, and for Poisson regression for continuous variables with a Poisson distribution (number of medications, number of physical limitations).

Appendices

Table 3.2.2. Social characteristics at Wave 1 by number of children

	Total n=4,214	Zero (n=518)	One (n=261)	Two (n=794)	Three (n=940)	Four (n=758)	Five + (n=943)	*P value*
Close relatives and friends (mean (SD))	10.4 (5.7)	8.8 (6.1)	8.1 (4.9)	9.5 (5.3)	10.0 (5.2)	10.8 (5.6)	12.6 (6.0)	*0.001*
Social participation %	46.0	47.3	39.1	45.7	45.7	48.6	45.5	*0.185*
Transfers								
Neither gives nor receives	36.0	100.0	54.8	33.1	24.0	22.2	21.3	*<0.001*
Receives only	9.6	0.0	5.4	7.4	8.1	10.6	18.5	
Gives only	27.4	0.0	23.8	33.5	37.5	32.6	24.1	
Gives and receives	27.0	0.0	16.1	25.9	30.4	34.7	36.2	
Religious attendance								
Frequent	61.5	62.6	55.6	50.9	58.1	65.8	71.4	*<0.001*
Rarely	25.3	23.9	23.4	31.5	28.4	24.1	19.2	
Never	9.4	8.3	13.8	11.0	10.4	7.7	7.7	
Not religious	3.8	5.2	7.3	6.7	3.1	2.4	1.7	

Note: P values represent probability for Chi2 tests for categorical variables, and for Poisson regression for continuous variables with a Poisson distribution (number of medications, number of physical limitations).

Table 3.2.3. Mental health characteristics at Wave 1 by number of children

	Total n=3,208	Zero (n=410)	One (n=194)	Two (n=615)	Three (n=732)	Four (n=578)	Five or more (n=927)	*P value*
Penn State Worry scale (mean (SD))	16.9 (8.1)	16.2 (8.0)	17.7 (8.5)	17.2 (8.2)	17.4 (8.1)	16.5 (8.0)	16.6 (8.0)	*0.030*
Loneliness								
Rarely/Never	78.6	79.0	75.3	80.2	79.0	78.4	77.5	*0.254*
Some of the time	13.2	14.6	14.4	12.7	12.4	12.1	14.0	
Most of the time	5.8	4.6	6.7	4.9	7.2	6.6	5.0	
Always	2.5	1.7	3.6	2.3	1.4	2.9	3.5	

Note: P values represent probability for Chi2 tests for categorical variables, and for Poisson regression for continuous variables with a Poisson distribution (number of medications, number of physical limitations).

Table 3.2.4. Cox proportional multivariable model results and physical health factor mediation analysis by total parity, using med4way (HR) (n=4,166)

	Unadjusted*	Model 2 Socio-demographic**	Model 3 Self-rated healthy	Model 4 Medications	Model 5 CVD	Model 6 Diabetes	Model 7 Ovarian cancer	Model 8 Physical impairments	Model 9 HRT	Model 10 No HRT	Model 10 Full model
Total Parity	**0.93 [0.89; 0.96]**	**0.91 [0.88; 0.96]**	**0.93 [0.88; 0.97]**	**0.91 [0.84; 0.98]**	**0.85 [0.79; 0.92]**	**0.91 [0.87; 0.96]**	**0.91 [0.88; 0.96]**	**0.90 [0.84; 0.97]**	**0.92 [0.88; 0.97]**	**0.87 [0.77; 0.98]**	**0.91 [0.87; 0.96]**
Self-rated healthy (Excellent, Very good self-rated health)			**0.57 [0.39; 0.82]**								**0.60 [0.47; 0.77]**
Medications	*	*	*	**1.07 [1.02; 1.13]**	*	*	*	*	*		1.03 [0.99; 1.07]
CVD	*	*	*	*	0.82 [0.58; 1.14]	*	*	*	*		0.94 [0.76; 1.16]
Diabetes	*	*	*	*	*	**1.92 [1.17; 3.15]**	*	*	*		**1.50 [1.11; 2.02]**
Ovarian cancer	*	*	*	*	*	*	**4.26 [1.06; 17.0]**	*	*		**3.70 [1.33; 10.3]**
Physical impairments	*	*	*	*	*	*	*	**1.09 [1.03; 1.15]**	*		**1.05 [1.01; 1.09]**
Menopause (ref: no menopause)											
Menopause + HRT	*	*	*	*	*	*	*	*	1.28 [0.60; 2.70]		1.04 [0.55; 1.95]
Menopause - HRT	*	*	*	*	*	*	*	*		0.95 [0.48; 1.89]	1.24 [0.70; 2.18]

Note. Models include survey weights and imputed values. Estimates presented are hazard ratios (HR) and their corresponding 95% confidence intervals (CI). Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). **Model 2 early life circumstances: education, childhood health and wealth, father's social class, religion, any marriage, smoking. *** Models 3 to 10 are adjusted for early life circumstances and corresponding mediator. Model 10 is adjusted for early life circumstances and all mediators.
Mediation models were conducted using Med4way (159).

Table 3.2.5. Cox proportional multivariable model results for total parity, using med4way (HR) (n=4,214)

	Unadjusted*	Model 2 Early life**	Model 3 Family and friends	Model 4 Social participation	Model 5 Transfers: Receives	Model 6 Transfers: Gives	Model 7 Transfers: Gives and receives	Model 8 Religious attendance: Rarely	Model 9 Religious attendance: Never	Model 10 Religious attendance: Never	Model 11 Full model
Total Parity	**0.93 [0.90; 0.97]**	**0.92 [0.88; 0.96]**	**0.89 [0.82; 0.97]**	**0.92 [0.88; 0.97]**	**0.92 [0.87; 0.97]**	**0.92 [0.88; 0.96]**	**0.92 [0.87; 0.97]**	**0.93 [0.89; 0.97]**	**0.91 [0.87; 0.95]**	**0.92 [0.89; 0.97]**	**0.93 [0.88; 0.97]**
Number of family and friends	*	*	0.98 [0.96; 1.01]	*	*	*	*	*	*	*	1.00 [0.98; 1.02]
Social participation	*	*	*	0.85 [0.62; 1.17]	*	*	*	*	*	*	0.92 [0.75; 1.12]
Social transfers (ref: Neither gives nor receives)	*	*	*	*	*	*	*	*	*	*	*
Receives only	*	*	*	*	1.04 [0.64; 1.70]	*	*	*	*	*	0.98 [0.75; 1.28]
Gives only	*	*	*	*	*	0.71 [0.38; 1.31]	*	*	*	*	**0.73 [0.53; 1.00]**
Gives and receives	*	*	*	*	*	*	0.89 [0.55; 1.45]	*	*	*	0.93 [0.71 to 1.21]
Religious attendance (ref: frequently)	*	*	*	*	*	*	*	*	*	*	*
Rarely	*	*	*	*	*	*	*	**1.58 [1.05; 2.38]**	*	*	**1.31 [1.03; 1.68]**
Never	*	*	*	*	*	*	*	*	1.46 [0.93; 2.29]	*	**1.57 [1.18; 2.09]**
Not religious	*	*	*	*	*	*	*	*	*	2.00 [0.70; 5.67]	1.24 [0.65 to 2.38]

Models include survey weights and imputed values. Estimates presented are hazard ratios (HR) and their corresponding 95% confidence intervals (CI). Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). **Model 2 is adjusted for early life circumstances and socioeconomic characteristics: education, childhood health and wealth, father's social class, religion, any marriage, smoking. *** Models 3 to 10 are adjusted for early life circumstances and corresponding mediator. Model 10 is adjusted for early life circumstances and all mediators.
Mediation models were conducted using Med4way (159).

Appendices

Table 3.2.6. Cox proportional multivariable model results for total parity, using med4way (HR) (n=3,208)

	Unadjusted*	Model 2 Early life**	Model 3 Penn Worry scale	Model 4 Loneliness some of the time	Model 5 Loneliness Moderate	Model 6 Loneliness most of the time	Model 7 Full model
Total Parity	**0.91 [0.86 to 0.95]**	**0.88 [0.83 to 0.93]**	**0.83 [0.74; 0.93]**	**0.87 [0.82; 0.93]**	**0.88 [0.83; 0.93]**	**0.88 [0.83; 0.94]**	**0.88 [0.83; 0.93]**
Penn State Worry scale			1.00 [0.98; 1.03]				1.01 [1.00; 1.03]
Loneliness (ref: Never)	*	*		*	*	*	
Some of the time	*	*		0.81 [0.47; 1.40]	*	*	0.97 [0.70; 1.35]
Most of the time	*	*		*	0.76 [0.34; 1.71]	*	1.06 [0.69; 1.63]
Always	*	*		*	*	1.01 [0.37; 2.80]	1.29 [0.73; 2.26]

Models include survey weights and imputed values. Estimates presented are hazard ratios (HR) and their corresponding 95% confidence intervals (CI). Statistically significant results are p <0.05 and are presented in bold. *adjusted for age (timescale variable). **Model 2 is adjusted for early life circumstances and socioeconomic characteristics: education, childhood health and wealth, father's social class, religion, any marriage, smoking. *** Models 3 to 7 are adjusted for early life circumstances and corresponding mediator. Model 7 is adjusted for early life circumstances and all mediators.
Mediation models were conducted using Med4way (159).

Appendices

Variable	Missing	Total	Percent missing
TUG W1	2,345	8,174	28.7%
TUG W2	227	7,084	3.2%
TUG W3	1,221	6,293	19.4%
TUG W4	271	5,597	4.8%
TUG W5	242	4,873	5.0%
Total TUG sample	1,813	8,174	22.2%
Grip strength W1	2,316	8,174	28.3%
Grip strength W2	350	7,084	4.9%
Grip strength W3	1,681	6,293	26.7%
Grip strength W4	404	5,597	7.2%
Total grip strength sample	1,788	8,174	21.9%
Religious affiliation	7	8,174	0.1%
Religious attendance	9	8,174	0.1%
Height	642	8,174	7.9%
CES-D	131	8,174	1.6%
Number of medications	82	8,174	1.0%
Education	4	8,174	0.1%
Father's education	1	8,174	0.0%
Current self-rated health	1	8,174	0.0%
Age	1	8,174	0.0%
Smoking status	1	8,174	0.0%
Sex	0	8,174	0.0%
Marital status	0	8,174	0.0%
Total missing	**2,052**	**8,174**	**25.1%**

Note: TUG and grip strength missingness varies in this sample; these were collected either in the home by trained interviewers in non-health assessment waves (Waves 2, 4 and 5) or during a health assessment by a research nurse in health waves (Waves 1 and 3) as described in the methods section of the main manuscript. In Wave 1, 72% completed a health assessment and 83% completed it in Wave 3. Therefore, missingness is higher for those waves as the sample is restricted to those who completed a health assessment. To be eligible for inclusion in the sample, a respondent needed at least two separate observations for the TUG and grip strength measures, to enable growth curves to be fitted. The total eligible sample participating in TILDA at Wave 1 was of 8,174 respondents aged 50 and over. Missingness is given for TUG and grip strength for each wave as a percentage of the total wave sample. The total sample for TUG and grip strength includes all respondents with observations for two or more time points for both TUG and grip strength, and missingness for this total is given as a percentage of the Wave 1 total sample. Wave totals are for the sample who completed a self-interview, therefore do not include respondents whose data was collected by proxy (proxy interviews do not complete physical health measures).

Appendices

Sample health and physical function characteristics by deceased status (n=1,062) and inclusion and exclusion in analytical sample. Missing indicates numbers missing observations of the respective variable in the deceased excluded sample.

Measures % / Mean (SD)	Total in sample (n=6,122)	Deceased in sample (n=458)	Deceased excluded (n=604)	Missing measure
Female (%)	53.8	43.7	48.8	0
Age, years (mean (SD))	62.7 (9.0)	73.0 (9.5)	74.9 (10.6)	0
Marital status (%)				0
Married	72.5	54.4	41.6	
Never married	8.9	13.3	16.6	
Separated/Divorced	6.8	3.9	4.6	
Widowed	11.8	28.4	37.3	
Education (%)				1
Primary/None	25.7	43.7	53.7	
Secondary	41.2	32.5	32.0	
Third level	33.1	23.8	14.3	
Father's education (%)				0
Less than primary	10.4	15.7	18.1	
Primary	56.0	55.5	55.3	
More than primary	22.7	19.7	14.6	
Unknown	8.9	9.2	12.1	
TUG, seconds (mean (SD))	9.0 (2.6)	11.6 (4.2)	14.2 (6.5)	239
Grip strength, kg (mean (SD))	27.8 (9.9)	24.7 (9.2)	23.1 (8.4)	220
Height, cm (mean (SD))	166.0 (9.3)	164.6 (9.4)	165.4 (10.7)	203
CESD (mean (SD)) (scale range: 0-48)	5.6 (7.0)	6.5 (7.9)	7.4 (7.7)	26
ADLs (mean (SD)) (scale range 0-6)	.10 (.44)	.25 (.74)	.50 (1.15)	0
Number of medications (mean (SD))	2.5 (2.6)	4.1 (3.1)	4.3 (3.2)	24
Vigorous physical activity (days/week) (mean (SD))	1.0 (2.0)	0.6 (1.7)	0.3 (1.3)	0
Self-rated health (%)				0
Excellent	17.4	8.7	5.3	
Very good	30.2	21.6	18.5	
Good	32.3	31.9	30.5	
Fair	16.2	28.6	30.8	
Poor	3.9	9.2	14.9	
Smoking status (%)				0
Never	44.9	32.5	34.9	
Past	38.8	45.9	40.9	
Current	16.3	21.6	24.2	

Appendices

Summary of the Centre for Epidemiologic Studies-Depression Scale Short Form Items (CES-D 8) (O'Halloran, 2014) (236).

Item	Scoring (range 0-24)
I felt depressed	0-3
I felt that everything I did was an effort	0-3
My sleep was restless	0-3
I was happy	3-0
I felt lonely	0-3
I enjoyed life	3-0
I felt sad	0-3
I could not get "going"	0-3

Appendices

Appendix 5.2: Sample with data at all waves (n=4,946) (weighted[2])

Table 5.2.1: Descriptive statistics of the sample with data available at all waves

Measure	Female (n=2,722)				Male (n=2,224)			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
Age (mean (SD))	62.38 (8.80)	-	-	-	62.63 (8.74)	-	-	-
Secondary or higher education	77.6%	-	-	-	71.4%			
Self-reported								
Excellent	18.7%	16.2%	14.0%	13.9%	16.8%	15.1%	14.4%	12.2%
Very good	30.2%	34.5%	35.3%	35.1%	31.3%	34.4%	33.9%	34.8%
Good	31.8%	33.5%	34.0%	34.8%	32.4%	35.7%	34.4%	36.9%
Fair	15.6%	13.3%	13.9%	13.3%	15.7%	12.8%	14.5%	14.1%
Poor	3.6%	2.5%	2.9%	2.8%	3.8%	2.0%	2.8%	2.0%
Marital status								
Married/Cohabiting	67.8%	66.1%	63.8%	62.5%	78.0%	76.8%	75.8%	74.6%
Single	7.8%	7.5%	7.6%	7.6%	10.2%	9.9%	9.9%	9.9%
Separated/Divorced	8.2%	8.5%	8.4%	8.0%	4.9%	5.1%	5.2%	5.4%
Widowed	16.2%	17.9%	20.2%	21.9%	7.0%	8.2%	9.1%	10.1%
Rel affiliation								
Catholic	92.7%	91.9%	91.6%	91.5%	92.2%	91.3%	90.6%	90.7%
Rel attendance								
Never/Almost	8.2%	8.5%	9.7%	10.4%	11.1%	12.0%	11.1%	12.2%
Once or twice a	9.4%	10.3%	11.2%	11.3%	12.6%	11.8%	13.8%	13.5%
Every few months	8.8%	9.1%	8.4%	9.9%	8.5%	9.3%	9.6%	9.5%
Once or twice a	8.9%	10.3%	9.8%	9.2%	9.1%	9.8%	9.1%	9.5%
Once a week	48.1%	45.8%	45.0%	43.7%	49.8%	47.8%	46.9%	45.0%
More than once a	16.6%	15.9%	15.9%	15.5%	9.0%	9.2%	9.5%	10.3%
Rel importance								
Not important	14.4%	15.3%	15.4%	14.4%	25.0%	25.4%	25.3%	24.7%
Somewhat	31.5%	27.8%	30.7%	30.7%	34.2%	33.8%	32.6%	33.3%
Very important	54.1%	56.9%	52.9%	54.9%	40.8%	40.8%	42.1%	42.1%
Social connectivity (mean (SD))	10.56 (5.72)	10.10 (5.50)	9.23 (4.82)	8.44 (4.24)	11.77 (7.40)	10.28 (6.86)	9.69 (6.24)	8.62 (5.25)
CES-D 8 (mean (SD)	3.28 (3.99)	2.99 (3.71)	3.56 (3.99)	3.54 (3.82)	2.21 (3.25)	2.18 (3.26)	2.67 (3.42)	2.70 (3.34)

[2] Longitudinal weights using age, education and urban versus rural location were derived to account for attrition

Appendices

Table 5.2.2: Growth curve models using a sample with data available at all waves

		Estimates					Model fit		
		Intercept [90%CI]	StdYX	Slope [90%CI]	StdYX	I/S covariance [90%CI]	RMSEA [90%CI]	CFI	TLI
Depressive symptoms	Female	3.410 [3.252; 3.567]	1.104	0.122 [0.068; 0.175]	0.161	-0.858 [-1.264; -0.452]	0.047 [0.037; 0.058]	0.980	0.976
	Male	2.287 [2.155; 2.420]	0.863	0.176 [0.131; 0.221]	0.228	-0.705 [-0.998; -0.413]			
Religious attendance	Female	0.288 [0.223; 0.354][1]	0.279	-0.053 [-0.065; -0.041]	-0.338	-0.020 [-0.035; -0.006]	0.018 [0.010; 0.025]	1.000	1.000
	Male	0.000[1]	-	-0.015 [-0.025; -0.004]	-0.115	-0.009 [-0.021; 0.003]			
Religious importance	Female	0.420 [0.351; 0.489][1]	0.472	-0.001 [-0.017; 0.015]	-0.008	-0.006 [-0.029; 0.017]	0.031 [0.020; 0.043]	0.999	0.999
	Male	0.000[1]	-	0.014 [0.000; 0.027]	0.105	-0.007 [-0.028; 0.015]			
Social connectedness	Female	10.091 [9.921; 10.262]	2.906	-0.631 [-0.691; -0.572]	-0.794	-1.336 [-1.728; -0.944]	0.037 [0.026; 0.049]	0.988	0.986
	Male	10.714 [10.493; 10.936]	2.838	-0.785 [-0.865; -0.705]	-0.901	-1.243 [-1.791; -0.694]			

[1]No intercept value is calculated for the reference group (male) in growth models for ordered categorical variables.

Appendices

Table 5.2.3: Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness, using a sample with data available at all waves

	Female				Male			
	Unmediated	**StdYX**	**Mediated**	**StdYX**	**Unmediated**	**StdYX**	**Mediated**	**StdYX**
Depressive symptoms intercept								
Attendance intercept	-0.692 (0.143)***	-0.224	-0.649 (0.141)***	-0.211	-0.839 (0.142)***	-0.291	-0.753 (0.145)***	-0.261
Importance intercept	0.279 (0.204)	0.070	0.376 (0.200)†	0.096	0.729 (0.154)***	0.242	0.737 (0.154)***	0.245
Social intercept	-	-	-0.191 (0.028)***	-0.217	-		-0.130 (0.022)***	-0.185
Depressive symptoms Slope								
Attendance intercept	0.033 (0.081)	0.043	0.028 (0.077)	0.036	-0.013 (0.073)	-0.015	-0.030 (0.081)	-0.035
Attendance slope	-0.585 (1.368)	-0.118	-0.422 (1.387)	-0.086	0.468 (1.136)	0.086	0.862 (1.304)	0.160
Importance intercept	0.077 (0.311)	0.077	0.094 (0.309)	0.096	-0.039 (0.141)	-0.043	-0.012 (0.173)	-0.013
Importance slope	-0.345 (1.433)	-0.085	-0.426 (1.353)	-0.111	-0.237 (1.160)	-0.046	-0.461 (1.224)	-0.098
Social intercept	-	-	0.003 (0.013)	0.013	-	-	-0.004 (0.010)	-0.019
Social slope	-	-	-0.054 (0.075)	-0.061	-	-	-0.137 (0.080)†	-0.156
Social connectedness intercept								
Attendance intercept	-	-	0.200 (0.182)	0.057	-	-	0.660 (0.245)**	0.161
Importance intercept	-	-	0.534 (0.251)	0.121	-	-	0.072 (0.256)	0.017
Social connectedness Slope								
Attendance intercept	-	-	-0.027 (0.094)	-0.031	-	-	-0.124 (0.115)	-0.126
Attendance slope	-	-	1.868 (1.385)	0.337	-	-	2.554 (1.622)	0.415
Importance intercept	-	-	0.122 (0.322)	0.111	-	-	0.125 (0.252)	0.122
Importance slope	-	-	-0.899 (1.378)	-0.209	-	-	-1.395 (1.720)	-0.259

Model fit	Unmediated	Mediated
RMSEA [90% CI]	0.061 [0.058, 0.063]	0.053 [0.051, 0.055]
CFI	0.984	0.981
TLI	0.982	0.978

Note. *p < .05. **p < .01. ***p < .001. †p < .10

Appendices

Appendix 5.3: Catholic sample (n=6,356 (female =3,505; male =2,851))

Table 5.3.1: Latent growth curve models in a Catholic only sample

		Estimates					Model fit		
		Intercept [90%CI]	StdYX	Slope [90%CI]	StdYX	I/S covariance [90%CI]	RMSEA [90%CI]	CFI	TLI
Depressive symptoms	Female	3.296 [3.190; 3.403]	1.085	0.117 [0.075; 0.158]	0.157	-0.864 [-1.096; -0.631]	0.047 [0.038; 0.057]	0.988	0.986
	Male	2.322 [2.223; 2.422]	0.881	0.181 [0.141; 0.222]	0.235	-0.656 [-0.841; -0.470]			
Religious attendance	Female	0.231 [0.185; 0.277][1]	0.230	-0.038 [-0.048; -0.028]	-0.270	-0.014 [-0.025; -0.002]	0.030 [0.024; 0.036]	1.000	1.000
	Male	0.000[1]	-	-0.023 [-0.034; -0.012]	-0.184	-0.004 [-0.015; 0.007]			
Religious importance	Female	0.370 [0.315; 0.426][1]	0.417	-0.017 [-0.031; -0.003]	-0.141	-0.018 [-0.037; 0.000]	0.024 [0.014; 0.035]	1.000	1.000
	Male	0.000[1]	-	-0.007 [-0.019; 0.006]	-0.053	-0.009 [-0.029; 0.012]			
Social connectedness	Female	10.224 [10.102; 10.345]	2.996	-0.607 [-0.651; -0.563]	-0.854	-1.046 [-1.336; -0.756]	0.041 [0.032; 0.051]	0.990	0.988
	Male	10.698 [10.543; 10.853]	2.875	-0.770 [-0.828; -0.711]	-0.903	-1.103 [-1.547; -0.660]			

[1]No intercept value is calculated for the reference group (male) in growth models for ordered categorical variables.

Appendices

Table 5.3.2: Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness, using a Catholic-only sample

	Female				Male			
	Unmediated	StdYX	Mediated	StdYX	Unmediated	StdYX	Mediated	StdYX
Depressive symptoms intercept								
Attendance intercept	-0.611 (0.114)***	-0.201	-0.558 (0.113)***	-0.185	-0.785 (0.124)***	-0.272	-0.715 (0.125)***	-0.248
Importance intercept	0.280 (0.150)†	0.078	0.331 (0.152)*	0.091	0.700 (0.139)***	0.231	0.726 (0.138)***	0.239
Social intercept	-	-	-0.169 (0.021)***	-0.191	-		-0.149 (0.019)***	-0.212
Depressive symptoms Slope								
Attendance intercept	0.065 (0.050)	0.083	0.064 (0.049)	0.082	0.021 (0.091)	0.025	0.012 (0.094)	0.014
Attendance slope	-0.644 (0.510)	-0.128	-0.638 (0.517)	-0.127	-0.392 (1.057)	-0.076	-0.331 (1.068)	-0.065
Importance intercept	-0.016 (0.079)	-0.017	-0.015 (0.080)	-0.016	-0.104 (0.143)	-0.116	-0.104 (0.141)	-0.116
Importance slope	-0.464 (0.709)	-0.086	-0.480 (0.733)	-0.088	0.552 (1.258)	0.101	0.535 (1.245)	0.099
Social intercept	-	-	-0.002 (0.009)	-0.008	-	-	0.005 (0.009)	0.026
Social slope	-	-	-0.009 (0.065)	-0.009	-	-	-0.062 (0.061)	-0.072
Social connectedness intercept								
Attendance intercept	-	-	0.292 (0.147)*	0.086	-	-	0.463 (0.212)*	0.112
Importance intercept	-	-	0.293 (0.195)	0.072	-	-	0.183 (0.233)	0.042
Social connectedness Slope								
Attendance intercept	-	-	-0.024 (0.056)	-0.031	-	-	-0.177 (0.142)	-0.176
Attendance slope	-	-	0.857 (0.544)	0.170	-	-	1.792 (1.552)	0.300
Importance intercept	-	-	-0.055 (0.086)	-0.058	-	-	0.118 (0.224)	0.112
Importance slope	-	-	0.235 (0.763)	0.043	-	-	-1.225 (1.925)	-0.197

Model fit	Unmediated	Mediated
RMSEA [90% CI]	0.069 [0.067, 0.071]	0.061 [0.059, 0.062]
CFI	0.983	0.981
TLI	0.981	0.977

Note. *p < .05. **p < .01. ***p < .001. †p < .10.

Appendices

Table 5.4.1: Latent growth curve models for depression using a binary cut off of the CES-D 8

		Estimates					Model fit		
		Intercept [90%CI]	StdYX	Slope [90%CI]	StdYX	I/S covariance [90%CI]	RMSEA [90%CI]	CFI	TLI
Depressive symptoms	Female	0.256 [0.218; 0.295]	0.468	0.050 [0.038; 0.062]	0.329	-0.028 [-0.044; -0.012]	0.026 [0.022; 0.030]	0.970	0.993
	Male	0.000	-	0.077 [0.063; 0.091]	0.470	-0.037 [-0.056; -0.017]			

Models used a cut off of CES-D 8 >= 9 to derive a binary marker for depression. As these are included in models as binary variables, no intercept value is given for the reference group (Male).

Appendices

Table 5.4.2: Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness, using a binary cut off of the CES-D 8 as a marker for depressive symptoms

	Female				Male			
	Unmediated	StdYX	Mediated	StdYX	Unmediated	StdYX	Mediated	StdYX
Depressive symptoms intercept								
Attendance intercept	-0.068 (0.031)*	-0.116	-0.057 (0.031)†	-0.096	-0.124 (0.041)**	-0.173	-0.104 (0.041)*	-0.146
Importance intercept	0.018 (0.039)	0.026	0.030 (0.039)	0.043	0.086 (0.045)†	0.116	0.091 (0.044)*	0.122
Social intercept	-	-	-0.036 (0.006)***	-0.212	-		-0.032 (0.006)***	-0.185
Depressive symptoms Slope								
Attendance intercept	0.028 (0.015)†	0.169	0.026 (0.015)†	0.159	0.016 (0.024)	0.085	0.014 (0.024)	0.077
Attendance slope	-0.127 (0.154)	-0.114	-0.129 (0.157)	-0.116	-0.025 (0.266)	-0.021	-0.006 (0.273)	-0.005
Importance intercept	-0.024 (0.023)	-0.122	-0.025 (0.024)	-0.128	-0.022 (0.036)	-0.114	-0.022 (0.038)	-0.115
Importance slope	-0.127 (0.197)	-0.113	-0.124 (0.198)	-0.113	-0.015 (0.299)	-0.013	-0.021 (0.289)	-0.019
Social intercept	-	-	0.005 (0.003)*	0.110	-	-	0.001 (0.003)	0.012
Social slope	-	-	0.001 (0.016)	0.002	-	-	-0.013 (0.016)	-0.071
Social connectedness intercept								
Attendance intercept	-	-	0.327 (0.145)*	0.094	-	-	0.607 (0.206)**	0.148
Importance intercept	-	-	0.311 (0.189)	0.076	-	-	0.140 (0.225)	0.033
Social connectedness Slope								
Attendance intercept	-	-	-0.013 (0.057)	-0.017	-	-	-0.116 (0.105)	-0.116
Attendance slope	-	-	0.944 (0.657)	0.176	-	-	1.758 (1.297)	0.275
Importance intercept	-	-	-0.069 (0.098)	-0.073	-	-	0.054 (0.181)	0.052
Importance slope	-	-	0.272 (0.854)	0.051	-	-	-0.859 (1.441)	-0.142

Model fit	Unmediated			Mediated			
RMSEA [90% CI]	0.059 [0.057, 0.061]			0.053 [0.051, 0.054]			
CFI	0.986			0.985			
TLI	0.987			0.984			

Note. *p < .05. **p < .01. ***p < .001. †p < .10.

Appendices

Total 50 and over sample: 8,174

Excluded due to Alzheimer's disease, Parkinson's disease, dementia or severe cognitive decline: 94

Total eligible sample: 8,079

Table A1. Missingness on all measures

Variable	Missing	Total	Percent missing
MMSE class	743	8,079	9.2%
CES-D	128	8,079	1.6%
Number relatives and friends	18	8,079	0.2%
Religious affiliation	9	8,079	0.1%
Education	4	8,079	0.1%
Self-rated health	1	8,079	0.0%
Age	1	8,079	0.0%
Smoking status	1	8,079	0.0%
Sex	0	8,079	0.0%
Marital status	0	8,079	0.0%
High cholesterol	0	8,079	0.0%
High blood pressure	0	8,079	0.0%
Diabetes	0	8,079	0.0%
High cholesterol	0	8,079	0.0%
Total missing	**743**	**8,079**	**9.2%**

Appendices

Total eligible sample (female, aged 57 and over at Wave 1, Christian religion): 3,003

Total eligible sample with at least two returned SCQs: 2,651 (88.3% of eligible sample).

Table A. Missingness on all measures

Variable	Missing	Total	% missing
SCQ two or more returned	352	3,003	11.7
CASP-12 two or more observations	571	2,651	21.5
Home ownership	51	2,651	1.9
Incontinence	14	2,651	0.5
Number relatives and friends	7	2,651	0.3
Religious attendance	3	2,651	0.1
Chronic pain	2	2,651	0.1
Education	1	2,651	0.0
Fear of falling	1	2,651	0.0
Self-rated mental health	1	2,651	0.0
Self-rated health	0	2,651	0.0
Age	0	2,651	0.0
Marital status	0	2,651	0.0
ADLs	0	2,651	0.0
IADLs	0	2,651	0.0
Social participation	0	2,651	0.0
Total missing	**634**	**2,651**	**23.9**