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FACTORS ASSOCIATED WITH USING A CARE  
HOME FOR OLDER PEOPLE LIVING IN  
SCOTLAND:  
ANALYSES USING LINKED ADMINISTRATIVE  
DATA

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*“...long story short, I survived.” – Taylor Swift (2020).*

## THESIS 2.0

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*“Right now*

*It's like you're carrying all the weight of your past*

*I could tell all your bruises, yellow, dark blue, and black*

*But baby a bruise is, only your body*

*Tryna keep you intact.*

*So right now*

*I think we should go get drunk on cheap wine*

*I think we should hop on the purple line*

*'Cause maybe our purpose*

*Is to never give up when we're on the right track” – MUNA (2017).*

## Quote References

MUNA (2017) I Know A Place [Song]. On *About U* [LP]. RCA Records: Studio B, Nashville, TN.

Swift, T. A. (2020) Long Story Short [Song]. On *Evermore* [LP]. Republic: Long Pond Studios, NY.

# DECLARATION

**Degree:** PhD

**College:** Medicine and Veterinary Medicine

**School:** Centre for Clinical Brain Sciences

**Matriculation number:** s1683369

**Supervisors:**

Dr Tom Russ (primary)

Dr Matthew Iveson

Professor Chris Dibben

No longer acting supervisors:

Professor John Starr (deceased)

Professor Ian Deary (retired)

**Declaration:**

I, Dorothy Helen Corby, hereby declare:

- that the thesis has been composed by myself (Dorothy Helen Corby), and
- that the work is my own, or, where I have been a member of a research group, that I have made a substantial contribution to the work, such contribution being clearly indicated, and
- that this work has not been submitted for any other degree or professional qualification except as specified, and
- that any included publications are my own work, except where indicated throughout the thesis.

**Signed:**

**Date:** 13/12/2022

## THESIS ABSTRACT

**BACKGROUND** - Scotland has an ageing population, so an increasing responsibility for old age social care. Research elsewhere has demonstrated that several socio-demographic, geographical and health factors predict entry to a care home. Scotland has some key originalities, even compared to other UK countries. Thus, it was important to investigate the factors associated with using social care here.

**OBJECTIVES** – This thesis used routinely collected administrative data to identify socio-demographic, self-rated health, geographical and household factors which were associated with institutional social care use in later life in Scotland. It aimed to investigate whether factors known to be associated with care use for older people through research elsewhere, were generalisable to Scotland. Additionally, it aimed to explore some factors which may not have been investigated elsewhere.

**METHODS** - Linked administrative data from the Scottish Longitudinal Study (SLS), a 5.3% representative sample of the Scottish population (<https://sls.lscs.ac.uk/>) - provided a longitudinal dataset including people aged 65 years and older, who were still living at home. Information about socio-demographics, household members, informal care, geography and health were gathered from their census responses. Then care status – living in a nursing/care home or not – was determined from the next census. Logistic regression was used to model the associations of these factors with care outcome at follow-up.

**KEY FINDINGS** - The analyses considered two time periods: 1991-2001 and 2001-2011. In the 1991-2001 sample, three lesser researched factors were found to be associated with care use – 1) living in a flat (1.21 (1.04, 1.41))\* , 2) recent employment (0.66 (0.53, 0.80)), and 3) population density (Low density 9.71 (7.85, 12.03)); plus an interaction between population density and urban rural classification – with highest attributable risk in low-density city areas (12.83 (9.64, 17.07)). Additionally, patterns for living with different

relatives originally found in a Northern Irish study were replicated, with living alone or with siblings associated with increased odds of being in care at follow-up. In the 2001-2011 sample, most associations were consistent, however, this was not the case for the area-based measures such as deprivation and measures of geography, which were no longer associated with care outcome. It was also possible to look at the association of receiving and providing informal care in this later sample, both of which were associated with care outcome (1.81(1.42, 2.29) and 0.70 (0.53, 0.91) respectively). Sex/gender differences were also evidenced for several factors.

**CONCLUSIONS** – Administrative data were used to identify both lesser researched and known factors associated with institutional care use in Scotland, over two different time periods. The factors associated with being in a care home at follow-up in Scotland were broadly similar those evidenced by previous literature in other global-northern populations. The possible explanations for the differences between the samples, which evidence reduced spatial inequality in the later cohort, are discussed, such as the introduction of a new social care policy in 2002 and broader changes to the health and social care landscape in Scotland. Recommendations for future policy and practice are also considered.

\*(Odds Ratio (95% Confidence Interval)) Note: for the odds ratio the null value is 1. Source: SLS.

The help provided by the staff of the Longitudinal Studies Centre – Scotland (LSCS) is acknowledged. The LSCS is supported by the ESRC/JISC, the Scottish Funding Council, the Chief Scientist's Office, and the Scottish Government. The authors alone are responsible for the interpretation of the data. Census output is Crown copyright and is reproduced with the permission of the Controller of HMSO and the King's Printer for Scotland.

## LAY ABSTRACT

**BACKGROUND** – Scotland has an ageing population – this means the number of older people is increasing. With more older people, there will be a greater need for care homes and nursing homes. Understanding what older people who use care homes have in common could inform policies to help older people maintain their independence longer, or identify groups with greater care needs. While research has been conducted elsewhere, the best way to inform social care policies in Scotland is research in our own population.

**AIMS** – This thesis aimed to increase our understanding of the things that might make older people in Scotland more or less likely to need care in a care/nursing home in old age. This had two parts, first, checking whether research done in other places could also be applied to Scotland and second, finding other possible factors which might be important to care outcomes here.

**METHODS** – Administrative data (data collected originally for another purpose) from the Scottish Longitudinal Study (<https://sls.lscs.ac.uk/>) were used to carry out this research. Census records for a small anonymous sample of Scottish people (5.3%), can tell us information like age, sex, self-reported health, who they live with and if they live in rural, urban or city areas. At the next census, whether they are in a care/nursing home can be determined. Statistical analysis of these data tells us which of these characteristics are more common among those who are living in a care/nursing home at the following census, and therefore might be risk factors for losing independence in old age.

**KEY FINDINGS** – Three less-studied factors were found – they evidenced that people living in flats and in lower population density areas (areas with fewer people living there) had greater chances of being in a care home at the following census, while people who were recently employed had lower chances. Geography turned out to be more complex than previously thought,

with low density urban areas having the highest chances of people moving into care/nursing homes. Which relatives older people lived with were found to be important in a Northern Irish study, and the same patterns were found in Scotland. These analyses were repeated in a more recent group of older people living in Scotland and some key differences were found. Differences were also found for which factors predicted being in a care home for men and women.

**CONCLUSIONS** – This thesis identified newer and known factors which might affect older people's risk of needing to move to a care/nursing home in Scotland. It goes on to discuss how these factors might work to increase or reduce this risk, and reasons why some of these factors might not be important anymore in the more recent group of older people studied. Some recommendations for policy and future care services are suggested, based on these findings.



# CHAPTER 1 – INTRODUCTION

## INTRODUCTION

This thesis looks at formal social care for older people in Scotland. Social care is an umbrella term for different types of support provided to diverse groups of people. However, this thesis will focus on the social care provided for older people in care/nursing homes. In line with the United Nations definition of old age, the population group that this thesis will study is people aged 65 years old and over, living in Scotland (United Nations, 2019).

This introductory chapter will briefly introduce the background and context of social care in Scotland in four key areas:

- First, the people – the demographics of the Scottish population.
- Second, the politics - the political landscape in the UK and Scotland, and key policy changes linked the health and social care.
- Third, the place – aspects of geography which make Scotland unique.
- Then fourth, the period – the context of historical events, culture, structures of society and human rights movements which happened during the life course of the people who will be studied in the research of this thesis.

These aspects of Scotland are all relevant to interpreting the analyses in this thesis, because they all have the potential to influence the lives of Scottish people, and subsequently how they use care in old age.

## SCOTLAND – THE PEOPLE (OLDER PEOPLE IN SCOTLAND)

At the time of writing, the population of Scotland is estimated at ~5.46 million, and about 19% of this population is aged 65 and older – an ageing population (National Records of Scotland, 2020a). Ageing populations are common across the global-north and are caused by three main factors – mortality, migration and fertility (Uhlenberg, 2005). Lower mortality rates (number of people dying) in combination with lower fertility rates (the number of children people have) can result in a top-heavy population pyramid

(Uhlenberg, 2005). For Scotland this looks roughly even all the way up, with some variations due to key demographic events (see Figure 1). Demographic events like baby booms (where fertility rates increase rapidly) cause bulges in the population pyramid, and events like wars (where mortality rates rapidly increase for people of a certain age) cause indents (Saroha, 2018). Figure 1, shows the population pyramid for Scotland in 2019 with baby booms highlighted.

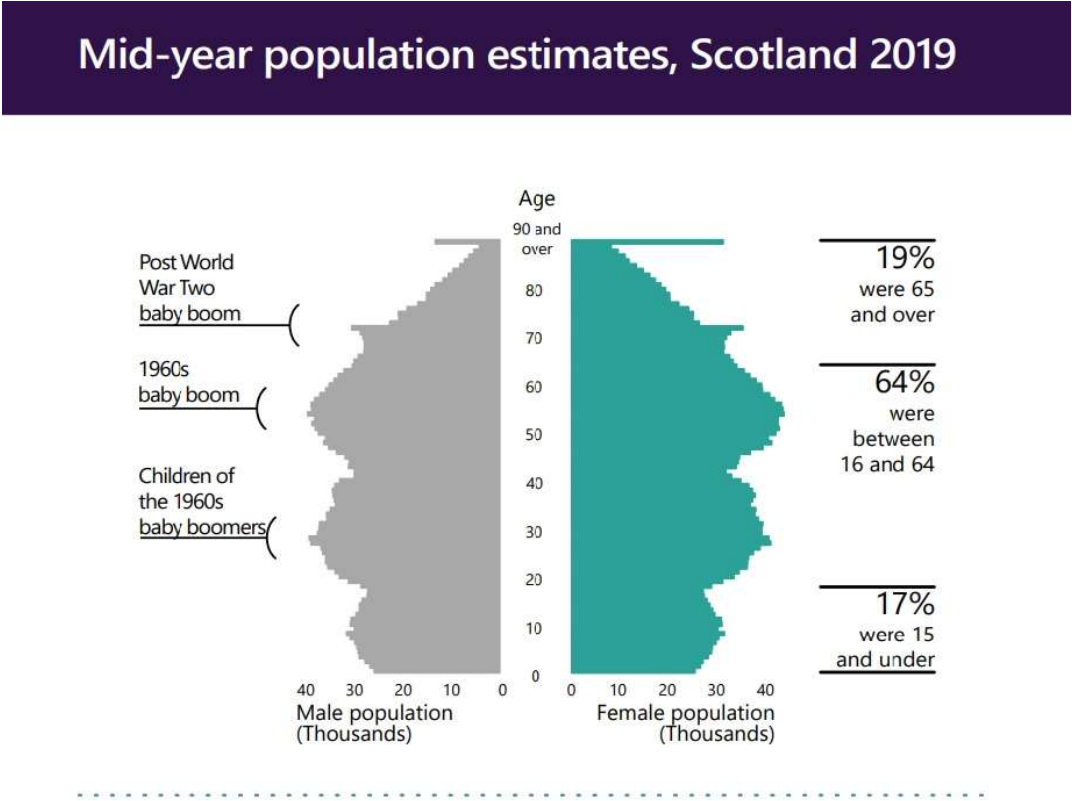


Figure 1. Population Pyramid Based on Mid-Year Population Estimates for Scotland 2019 from National Records of Scotland  
 Population pyramid for Scotland in 2019, based on National Records of Scotland 2019 mid-year population estimates. Note: Reprinted from “Mid-year population estimates, Scotland Mid-2019”, by . National Records of Scotland (2020a). Copyright 2020 by National Records of Scotland; Open Government Licence.

An ageing population is a sign of increasing health and life-expectancy. While it is often presented as a problem – this is because societies with ageing populations will have to make adaptations to meet the needs of an older population (Dilnot, 2011). For example, ageing populations may need greater provision of old age social care services or to reconsider urban planning to

reduce ableist infrastructure (infrastructure designed primarily around the needs of the able bodied, cisgender, heterosexual white man (Stafford et al., 2022)), which can disadvantage those with poorer mobility.

Scotland's ageing population is relevant to this thesis because the increasing number of older people means that there will be greater need for care homes and social care provision in the future. By 2039, population projections for Scotland predict that the number of people aged 65-75 will increase by 22% and the number of people aged 75+ will increase by 85% (National Records of Scotland, 2017). So with around three in four older people currently requiring admission to a care home at some point in their old age (Dilnot, 2011), the need for formal social care in Scotland is likely to increase greatly in the near future.

There are many different approaches governments can take to provide social care to meet the changing needs of their older citizens, and this is a source of continued political debate. While the specifics of these debates are outside the remit of this thesis, politics and social care policy have an important influence on how care is provided and used within Scotland. Politics also indirectly affect care use in later life, via determinants of health in old age like socio-economic factors, pollution and wellbeing (Mackenbach, 2014; Muntaner et al., 2011). So next, the political and policy landscape surrounding social care in the UK and Scotland will be briefly outlined.

**SCOTLAND – THE POLITICS (SOCIAL CARE IN THE UK AND SCOTLAND)**  
In the UK, the National Health Service (NHS) was formed in 1948, providing free health care at the point of need for all UK citizens (The National Archives, 2008). However, no equivalent national service or branch of the NHS was created for social care needs, despite the overlap between what is classed as health care and social care. Social care services were not free at the point of need – instead families were expected to provide or pay for social care (Glasby & Littlechild, 2004). Over time some conditions which were initially covered under healthcare were de-medicalised – incontinence, for

example – and now fall under social care (Glasby & Littlechild, 2004). What is classed as healthcare and what is classed as social care today is shaped by this steady de-medicalisation, but ultimately, there is no clear distinction between the two. For example, some health conditions like diabetes can eventually result in disability and need for social care, particularly in old age. Thus, precisely where the boundary between health and social care should be drawn is a contentious issue.

This arbitrary distinction has led to a complicated history of disputes between health and social care services in the UK. In the 1950s there were problems with some people falling between the two services - being too sick for social care, but too well for hospital treatment; so by the 1960s and 70s, there were moves toward joining up the services (Glasby & Littlechild, 2004). This theme has continued to the present day, with still more calls for better integration of health and social care services (Nicholson & Shuttleworth, 2021).

In 1998, following a vote for a devolution of the UK government in 1997, the UK split into four different legislatures and executives for each constituent nation (Civil Service, 2019). For Scotland, this was the Scottish Parliament (legislature) and Scottish Government (executive - originally called 'Scottish Executive' until 2007). The UK Government still has 'reserved powers' over all nations, but each devolved nation has certain 'devolved powers' which include making laws and delivering public services (including social care) (Civil Service, 2019). This also means that the NHS and social care systems became devolved. Thus, while the NHS is still called the NHS across the UK, it is technically a different system in each of the devolved nations (Nicholson & Shuttleworth, 2021). In Scotland these were already separate systems of sorts, with 'health and social care' services falling under the responsibilities of local authorities. However, devolution paved the way for larger-scale policy change and reform within both services enacted by the devolved Scottish powers.

This is an important foundation for this thesis, because health and social care policies changed in Scotland following devolution. Policy could influence care use – for example McCann, Grundy, et al. (2012) demonstrated that older people in Northern Ireland who owned their homes were less likely to be admitted to a care home. They suggested this was in part due to care home admission being disincentivised by the care policy at the time, where if older people owned their homes, this capital could be used to pay their social care costs (McCann, Grundy, et al., 2012). Therefore, policy changes, particularly those related to health and social care policies, may impact care use in Scotland. However, enacted health and social care policies have varied between devolved nations and research from the other devolved nations may not be generalisable to Scotland, thus justifying the need to conduct research on social care in Scotland. So next, a brief overview of some of the relevant changes to health and social care policies in Scotland following devolution will be presented.

#### *POLICY CHANGES IN SCOTLAND*

Following devolution there were some key changes in policy and law that applied only to Scotland. The most relevant to this thesis - because it directly impacts social care - was The Community Care and Health (Scotland) Act 2002 which made 'personal care' and 'nursing care' free at the point of need for people in Scotland aged 65 and older (Scottish Executive, 2002). This will be discussed in greater detail below, including definition of these two forms of care. Other changes that may have affected care use in Scotland include:

- Free prescriptions and minor ailments scheme – The National Health Service (Charges for Drugs and Appliances) Regulations 2000 and subsequent amendment acts have made prescribed medications, appliances, medical travel and medical equipment free at the point of need for people in Scotland (Nicholson & Shuttleworth, 2021). Elsewhere in the UK, prescriptions etc. carry extra costs for which a contribution must be paid by the service user, unless they have a

medical condition which gives them exemption, or are under 18 years old or over 60 years old.

- Free ophthalmic services – The National Health Service (General Ophthalmic Services) (Scotland) Regulations 2006 meant that eye sight and eye health testing are provided without cost either in an opticians or via home visit (Scottish Government, 2019b). Eye tests also detect early signs of other conditions such as diabetes, problems in the vascular system, some cancers and high blood pressure.
- Systematic and structural changes in how health and care services are run – in Scotland the purchaser/provider split model was abolished, meaning the services are run directly rather than by tenure contracts (i.e. contracting service management out to private companies) (Nicholson & Shuttleworth, 2021). More recently, the Public Bodies (Joint Working) (Scotland) Act 2014 made 31 integrated authorities across Scotland to integrate health and social care services (Nicholson & Shuttleworth, 2021); while this is outwith the timeframe of the thesis, joint working has been managed differently between health and care services in Scotland relative to other UK countries due to devolved powers.
- Greater spending on public services – since devolution Scottish Government spending on public services has been higher than the UK average (UK Government, 2017a); this includes social services where, compared to other parts of the UK, spending is 25% higher per capita (Bonney, 2014), however social services includes other services than older people's social care alone. Figures for older adult (65 years +) social care still show higher spending in Scotland compared with England consistently between 2011 and 2019 (Institute for Government, 2022).

This is by no means a comprehensive list of all the policy changes in Scotland following devolution. However, the changes outlined above might have consequences for care use in Scotland. For example, having free

prescriptions and medical supplies might help people maintain their independence in old age for longer, especially those for whom the cost of a prescription might have prevented their seeking medical treatment for preventable/treatable conditions. It is important to be aware of these changes because this thesis will investigate care use spanning the period before and after devolution, when these changes were implemented. Thus, understanding this context will be important for interpreting the results of the analyses presented within this thesis.

### *THE COMMUNITY CARE AND HEALTH (SCOTLAND) ACT 2002*

As mentioned above, this is the most relevant policy for this thesis because it directly concerns social care and its provision in Scotland. Before 2002, social care provision for older people varied substantially between local authorities, with some local authorities providing care services free, some providing them free on a means-tested basis and others with schemes of full or partial charging for different social care services (Audit Scotland, 2008; Bell et al., 2007). Social care services were managed by local authorities, however the enactment of The Community Care and Health (Scotland) Act 2002 (and the amendment Community Care (Personal and Nursing Care) (Scotland) Act 2002) pushed local authorities to provide what was, in theory, a more standardised level of social care, where personal care and nursing care were provided free of charge without means testing. The aim of this was to make social care provision more consistent and accessible across all local authorities in Scotland. Note that for this policy, personal care was defined as care of a personal nature such as washing, toileting, assistance with eating, dressing, mobility and simple treatments that do not require a qualified nurse; while nursing care was defined as care by a qualified nurse such as administration of injections or wound/bed sore management (Care Information Scotland, 2022).

The policy stipulated that personal care and nursing care would be provided free of charge to those aged 65 and older and living in Scotland; based only on a needs assessment rather than taking into account monetary

savings/resources (Scottish Executive, 2002). The policy covered nursing and personal care in all settings – home, care home, assisted living etc. However, under this policy some things were still not covered, such as the 'hotel costs' of staying in a care home. Hotel costs include changing bed linen (unless due to incontinence), housework/cleaning and shopping etc. (Scottish Government, 2019a).

However, the policy has been criticised for still failing to provide a consistent level of social care across all of Scotland; with provision of free social/nursing care under the policy depending on a needs assessment by the Local Authority which has subjective elements (Jepson, 2019). The outcome of these assessments are criticised for lacking objectivity – the resources available to the Local Authority at the time of the assessment will be balanced alongside the need of the person, plus charging for care services which did not fall under the policy were at the discretion of each individual council (Audit Scotland, 2008; Jepson, 2019). Therefore, two people with the same needs might receive different outcomes from their assessments if one was living in a Local Authority with a greater remaining budget and more bed availability, and the other in a Local Authority that had fewer available resources or a greater number of older people seeking care at the time of the assessment (Jepson, 2019).

This policy is a key factor in social care in Scotland, as free provision of personal and nursing care, should in theory, have removed cost as a barrier to accessing these types of social care. Post enactment, access to these types of care should be based on need rather than need balanced with ability to pay for care. However, since Local Authorities varied in how they provided social care prior to the enactment of this policy, the effect of this policy will differ by Local Authority. Whether the policy provides care in direct response to care need alone is criticised (Jepson, 2019), and how much difference providing only these types of social care free, makes in practice to older people is still debated – for further discussion and evaluation of this policy see: Gatherum (2018); McLeod and Mair (2015); Sutherland (2008a, 2008b).



This policy is relevant to this thesis because it concerns social care provision in Scotland, but also it is important to note that the policy was enacted in the middle of the time period studied by this thesis. Therefore, half of the analyses were carried out on a cohort of older people experiencing old age and social care in Scotland prior to its enactment (1991-2001); while the other half of the analyses were carried out on older people following its enactment (2001-2011). Further information on these cohorts will be given in the Methods in Chapter 3, however, this change is important context for interpreting the findings, especially when comparing the cohorts.

### SCOTLAND – THE PLACE

In addition to demographics and health/social care policies, there are other factors about Scotland which might affect care use here. Understanding the context of Scotland as a country, such as the geography and history of the area, will be important for interpreting what the results of the analyses in this thesis tell us about care use here. So these unique aspects of Scotland will be discussed in this section.

First, the geography of Scotland. It is a country made up of a mainland with islands off its northern and western coastlines. Most of Scotland's population is concentrated in an area known as the central belt – which contains its two largest cities, Edinburgh and Glasgow. North of this central belt are large areas of highland, hilly and mountainous terrain, popular for their beauty and rainfall. However, there are still cities, towns, villages and rural communities in these areas and on the islands to the north and west. This mixed geography has implications for social care, as provision of care services is more challenging in rural and remote parts (Pugh et al., 2007; Schoenberg & Coward, 2008). Additionally, the cities in Scotland, most notably Glasgow, have very densely populated areas where providing enough services to meet demand is also challenging, for example services may have waiting lists due to the number of older people seeking the service (Schoenberg & Coward, 2008).

Second, Scotland's latitude is between 54°38' degrees north (at its most southern point in the Mull of Galloway) and 60°49' degrees north (at its most northern point on Out Stack, in the Shetland Islands). At these latitudes, the average levels of vitamin D in the population tend to be low and as a result, between the months of October and April, the Scottish Government recommend taking vitamin D supplements to prevent deficiency (Scottish Government, 2022b). Vitamin D deficiency has been linked to multiple health conditions – chronic illnesses, infectious disease, psychological disorders, inflammation and all-cause mortality (Autier et al., 2014). Since all of these conditions can affect life-expectancy, physical functioning, independence and need for health care, Scotland's physical position in the world, could have implications for care use here.

Additionally, research on dementia in Scotland has shown geographical patterns in the risk of developing dementia, with risk generally higher in the north than the south (Russ et al., 2015). There is also some evidence that this pattern might be caused by an environmental factor(s) that vary with geography - Russ et al. (2015) suggest vitamin D as a candidate, as this varies with latitude and would fit the north-south effect they observed in dementia risk. This is backed up by Wang et al. (2020) who demonstrated that genetically higher vitamin D levels were associated with lower risk of Alzheimer's disease in their Mendelian Randomisation study. Therefore, environmental factors like this mean that areas and countries have their own specific mixture of characteristics which might affect health, disease, care need/use and ultimately mortality. This section has covered some of the geographical context of Scotland and the next section will address the context of the time period covered by this thesis research in Scotland.

## SCOTLAND – THE PERIOD

Aspects of the period in which this research is orientated may also affect both care use, and how the findings of this research should be interpreted. This thesis focuses on older people in Scotland between 1991 and 2011, who will have been born around 1891-1936 in order to be 65+ in the study periods

(see Methods in Chapter 3 for further information). As such, they will have experienced the politics, culture and key events that have occurred in Scotland over their life courses. How they have lived their lives – as well as their health, beliefs and priorities - will all have been shaped by this period in time. This takes a similar stance to the 'life course' approach in epidemiology, which was made prominent by Elder (1998) and Kuh et al. (2003); where they posited that people's health was a product of their place, period and physical/social life experiences etc.

In this section, a selective timeline of events will be presented, to contextualise the period in question, followed by some discussion of key aspects of the period which might affect demographics, health and ultimately care use in Scotland.

#### *TIMELINE*

Some key events which happened in the lives of these older people living in Scotland include:

- World War 1 (1914-1918), World War 2 (1939-1945) and Falklands War (1982)
- Women obtained the right to vote in 1928 (UK Government, 1928)
- Emergency services founded ~1937
- National Health Service (NHS) founded in 1948
- Oral contraceptives first available through the NHS in 1961 (only for married women) (Igliskowski-Broad, 2021)
- Death penalty abolished in 1965 (UK Government, 1965)
- Abortion first legalised in 1967 (UK Government, 1967a)
- Contraceptives made available to all women regardless of marital status in 1967 (UK Government, 1967b)
- Divorce reform allowing divorce to both men and women on the grounds of separation in 1969 (UK Government, 1969)

- Sex between two men legalised in Scotland in 1981 (previously this had been punishable by imprisonment, and before 1861 punishable by death) (Scottish Parliament, 1980)
- AIDS epidemic began in 1981
- Miners strikes and beginning of deindustrialisation under Margaret Thatcher's Conservative Government in the early 1980s
- Marital rape against women criminalised in 1992 (UK Government, 1992)
- End of the British Empire in 1997
- Devolution of UK Governments in 1998 (following referendum vote in 1997)
- Age of consent equalised for same-sex sexual activities in 2001 (UK Government, 2000)
- Gender/sex transition no longer classed as a mental illness in 2002 (Department for Constitutional Affairs, 2002)
- Same-sex civil partnerships legalised from 2005 (UK Government, 2004a)
- Trans individuals allowed to change their legal gender from 2005 (UK Government, 2004b)
- Same-sex couples allowed to adopt children from 2007 (Scottish Parliament, 2007)
- Same-sex marriages legalised from 2014 (Scottish Parliament, 2014)
- Last anti-gay law repealed in 2017 – homosexuality is now no longer grounds for dismissal from merchant shipping vessels (UK Government, 2017b)
- Ban on conversion therapy for lesbian, gay, bisexual, queer and trans individuals is still pending legislature at the time of writing, although the government have pledged a ban but this will not extend to trans people, only gay and bisexual people (Equality Network, 2022; UK Parliament, 2022). Currently, there exists a Memorandum of Understanding (MOU) between 20 key organisation across the UK,

including NHS Scotland, which has been in place from 2017 (British Psychological Society et al., 2017).

### *HUMAN RIGHTS*

Recognition of different human rights has also changed over time, and these changes are relevant when trying to understand the lives of older people living in Scotland. How people live their lives is inevitably constrained by the society in which we live, particularly those who face oppression and mistreatment. So it is important to understand the human rights context in which the Scottish people included in this thesis were living. This is by no means a comprehensive account, and it should be noted that many of these issues are intersectional, meaning people's experiences are far more nuanced the more minority groups to which they belong.

Firstly, women in Scotland have had fewer rights, legal protections and opportunities during their life course than men, and this is especially the case for older women. Feminists have lobbied for social, political, economic and legal equality for women, but this is an ongoing pursuit – equality has still not been achieved. So the Scottish women represented in this thesis will have different lives to women born more recently in Scotland. For example, the timeline above shows women did not have access to contraceptives without a husband until 1967 and marital rape was criminalised as late as 1992 (The Fawcett Society, 2016). Summerfield (2002) suggests during this period, marriage was a necessity, or “institution” – something required to successfully integrate within society. This also made divorce less likely, and divorce was legally harder to achieve than today. Ultimately, marriage served a different purpose throughout history than it does today, where people are more likely to marry for companionship (Summerfield, 2002).

Additionally, gender roles have been shifting significantly throughout the twentieth and twenty-first centuries, with rates women's employment in the paid workforce increasing and more women attending higher education and working in male-dominated roles (Criado Perez, 2019; Office for National

Statistics, 2013). However, women still undertake the majority of housework, childcare, unpaid carer roles and organisational labour – their paid work is usually undertaken, on top of their unpaid work (Criado Perez, 2019).

Therefore, the women represented in this thesis will have been less likely than the men, to work in a paid role, instead partaking in unpaid labour within the home. They would also have been less likely than the men, to have attained any additional qualifications outside the mandatory schooling, especially due to the era in which they lived. This historical context, means that marital status, employment, educational attainment and fertility rate for the women studied in this thesis, will be a product of the time period they lived in, and different to women living in Scotland today.

Secondly, LGBTQ+ (referring to people who identify as Lesbian, Gay, Bisexual, Trans, Queer and other sexual and/or gender identities) rights in Scotland have changed dramatically over the life courses of the older people studied in this thesis. In both 2015 and 2016, Scotland was awarded best country in Europe for LGBTQ+ and human rights by The Rainbow Europe Index (IGLA Europe, 2022; Rainbow Europe, 2022). However this has not always been the case. Sex between two men was not decriminalised in Scotland until 1981 (Scottish Parliament, 1980) – for the people included in this thesis research, the youngest would have been 45 years old at this point in time. Meanwhile for trans individuals, the youngest of the older people studied in this thesis would have been 69 years old by the time it was legal for them to change their gender. Thus, the timeline shows just how recently the rights of LGBTQ+ identifying people have been recognised in Scotland.

For this thesis, this means LGBTQ+ individuals may never have been able to identify as such, consequently they will be hidden within other demographics. For example, instead of same-sex marriages, LGBTQ+ individuals may have entered hetero-normative marriages or have remained single. Additionally, due to the AIDS epidemic which began in the early 80s and disproportionately affected homosexual men, a considerable proportion will have died from AIDS so will be missing from the sample (Catalan et al.,

2020). This will disproportionately affect areas of Scotland like Edinburgh, where the infection rate was almost seven times the UK National Average (Lothian Health Services Archive, 2022). Consequently, the cohorts studied by this thesis will not be representative of the LGBTQ+ community, and where they are represented, how they are represented will be influenced by the laws and stigma of the period they lived through.

Finally, there are other issues of human rights like racism and classism which have yet to receive the attention that feminist and LGBTQ+ issues have. Scotland has a large majority of white people (96% at the 2011 census (Scotland's Census, 2021a)) and is only presently starting to deal with the systemic racism inherent in society (Eddo-Lodge, 2018; Racism Unmasked, 2020). Similarly with classism which is also a systematic issue in the UK where people of lower socio-economic status suffer discrimination and prejudice (Jones, 2012). While steps are being taken to address inequality in Scotland (Scottish Government, 2020), further disadvantage from prejudice and discrimination on account of being part of the population experiencing higher level of deprivation persists throughout the UK (Jones, 2012).

Therefore, while Scotland is regarded as a progressive country generally (Dennehy, 2022; King, 2015), it has in recent history seen systematic discrimination, oppression, criminalisation and punishment of various groups in society (e.g. laws against same-sex intercourse until 1981); some of which continues today (Criado Perez, 2019; Eddo-Lodge, 2018; Jones, 2012; Scottish Parliament, 1980; TUC, 2022; UK Government, 2000). The extent to which race continues to be a source of inequality in the UK economy and society was emphasised by the COVID-19 pandemic, where types of work and work modalities explained why people of colour, particularly black people, were both more likely to get the COVID-19 virus, and also more likely to die from it (TUC, 2022).

Ultimately, these experiences will have shaped people's lives, meaning many people could have lived differently than they would have, had they been part

of a later generation or afforded the same rights and privilege as cis-gendered heterosexual (cis-het) white men. It is important to be aware of this and how it affects the demographics of Scotland – it will mean that these groups are misrepresented or underrepresented in the data. Thus, the findings should be interpreted with reference to the lived experience of these people, and caution should be taken when generalising to such groups. So in terms of social care, this research may not fully describe the old age and social care experiences of people in these groups in Scotland.

### *THE SCOTTISH EFFECT/THE GLASGOW EFFECT*

The Scottish Effect refers to an excess mortality for Scottish people compared with English and Welsh citizens – this means that, on average, Scottish people die earlier than their English/Welsh counterparts. For example, Popham and Boyle (2011) used census data to examine mortality differences between those from Scotland with those from England and Wales, while accounting for deprivation (known itself to be associated with earlier death). Popham and Boyle (2011) found that the higher risk of early death for people born in Scotland persisted, even if they moved away from Scotland during their lives. The effect seemed to be driven by Glasgow, which faced extreme deprivation following the deindustrialisation that began in the 1950s and peaked in the 1980s (Walsh et al., 2008). Greater Glasgow accounts for around 40% of the population of Scotland (National Records of Scotland 2022b), and can skew analyses for all of Scotland – so evidence of this mortality effect being concentrated in the greater Glasgow area of Scotland, led to it being referred to as ‘The Glasgow Effect’ (Walsh et al., 2010a). When comparing Glasgow with other deindustrialised UK cities, Liverpool and Manchester, premature mortality was >30% higher in Glasgow and all-cause mortality around 15% higher (Walsh et al., 2010b). Interestingly, Walsh et al. (2010b) reported that this mortality gap appears to be widening from 1970 onwards.

The Scottish/Glasgow Effect remains an intense area of research and numerous possible explanations have been offered to explain it, some more



conceivable than others. However, one of the original authors has more recently said that calling the observation of excess mortality in Scotland, a Scottish/Glasgow Effect, has not been helpful for people understanding the seriousness of this observation; instead it has resulted in the effect being used as an explanation in and of itself, rather than a concerning issue to be investigated further (Walsh, 2016). To investigate the underlying drivers of the excess mortality, Walsh et al. (2017) investigated forty possible theories for drivers behind the effect, concluding that the combination of extremes of deprivation which had not been measured well, and damaging economic and social policies, explained why people in Glasgow experienced excess mortality. The Scottish/Glasgow Effect is important to this thesis because it affects the Scottish population that this thesis will study. While this affects mortality, it also affects care which is often required in the final months of life (Dilnot, 2011); so this excess mortality might have implications for care use in Scotland too.

While this thesis will not compare Scottish care use to that in England and Wales to investigate any “Scottish Effect” in care too, other comparative studies have noted differences in Scottish samples. Lievesley et al. (2011) compared stays by older people in BUPA care homes across the UK, and found that stay lengths in Scotland were longer for all types of care homes. This shows there might be important differences between care use/needs in Scotland, compared with the other UK countries. Scottish care use has not been examined as much as the rest of the UK, and given the different geographical, demographic and political landscape we cannot generalise to Scotland - so we need bespoke research. This section has highlighted differences between the rest of the UK and Scotland, providing further rationale for this thesis to research social care here.

### *CARE PHILOSOPHIES*

The culture of countries like Scotland are also an important part of the context of this research. “Care philosophies” are how a nation views care and care responsibilities; whether in a particular culture it is seen as the role of

the family to take on caregiving for their older relatives, or the responsibility of the state to provide this (Gaugler et al., 2007; Gawande, 2014). Fernández-Carro and Evandrou (2014) reports that, in southern European countries, care is generally seen as a family responsibility, with older people being cared for by relatives. In northern European countries, by contrast, care is generally seen as a responsibility of the state, so there is greater use of formal carers and care facilities (Fernández-Carro & Evandrou, 2014).

Gawande (2014) also comments on how globally, most cultures are becoming more individualistic and that this is affecting care philosophies, with views shifting towards care being provided by professionals rather than family. Perhaps this shift also links to the changing culture with regards to feminism and women joining the workforce. As care responsibilities primarily fall to women and more women have been joining the workforce (Criado Perez, 2019; Ford, 2019), women are perhaps less able to take on unpaid care roles at home, so there is a greater reliance on professional care services to fill this gap.

For Scotland, a northern European country, this means an existing trend towards outsourcing care to professionals (Fernández-Carro & Evandrou, 2014); plus the trends towards more individualistic cultures as highlighted by Gawande (2014), this likely means that in Scotland there will be further outsourcing to professional care services in the future. Thus, further understanding formal (professional/institutional) social care use patterns specific to Scotland, will be a valuable research contribution.

## CONCLUSION

In summary, this chapter has outlined the focus of this thesis – formal social care for older adults – and discussed relevant background context to the Scottish population in which this will be studied. This was split into four key dynamics, and how each was relevant to either interpreting the thesis, or provided rationale for investigating formal social care in Scotland.

First, the ageing population of Scotland and its implications for care use. With projected increases in the number of older people in the Scottish population, there will also be an increased need for social care provision in the future. This provides a rationale for this thesis to investigate care use in Scotland, to gain a better understanding of factors that influence care use here.

Second, changes to the political landscape of the UK and Scotland were also discussed, with devolution resulting in significant changes to social care for Scotland. This section also discussed how health and social care are viewed as distinct services, and this originated when the UK Government developed the NHS. This arguably arbitrary distinction has persisted because health care was provided free under the NHS, while social care remained chargeable depending on means testing. Shortly after devolution, specific aspects of personal and nursing care became free, based on a needs assessment (rather than means) in Scotland (but not the rest of the UK). It is important to note that since this thesis research will cover the period before and after devolution, these and other policy changes following devolution may have some effect on the findings and interpretation.

Third, the geography of Scotland - with largely sparsely populated highlands and islands, and densely populated cities in the central belt - was discussed. There are also aspects of latitude and research on specific chronic conditions, like dementia, which have geographical patterns in Scotland – all of which make Scotland's geography something that should be considered when investigating care use, as this thesis aims to do.

Then fourth, the period of time in history in which the thesis study subjects lived; some of the key events occurring across their lifetimes were highlighted and discussed. The changes in recognition of human rights, particularly those of women and LGBTQ+ identifying individuals, are important considerations for undertaking this project, as they will affect the sample and representativeness of the findings. For example, study subjects (older adults) who might identify as LGBTQ+ if living in today's society, might instead be

concealed in other demographics because they may remain single, or marry hetero-normatively – meaning the results will not reflect LGBTQ+ groups in society. Moreover, it is important for readers and particularly the researcher (who grew up in the 1990s) to appreciate these historical aspects of policy, and give due consideration to how the period and sociology at this time might influence how the data should be interpreted.

In conclusion, while formal social care is the focus of this thesis, there are many issues surrounding social care which are also important to consider. These issues are complex, and while not unique to Scotland, the way in which they interact is unique to Scotland. How social care use is affected by these things may be different for Scotland, compared to other countries. Therefore being aware of these dynamics is an important starting point for the research which will make up this thesis. In the next chapter, a review of the literature on the factors associated with formal social care use will be presented.

## CHAPTER 2 – LITERATURE REVIEW

### CHAPTER SUMMARY

This chapter presents the literature review which informed the research presented by this thesis. It is made up of four parts, each presenting research around a theme relating to social care for older people. Broadly, the themes include:

- socio-demographics, self-rated health and geography
- sex/gender differences – an extension from the socio-demographics
- household structure – who older people live with
- informal care – both providing and receiving unpaid care from friends/relatives/cohabitants

For each part, a review of the relevant literature is presented followed by how this built the rationale for this piece of research on social care in Scotland. The broad remaining questions relevant to social care in a Scottish context are presented at the end of each section, and these informed the research within this thesis. This chapter then concludes with a summary of the general aims and objectives for the research in this thesis, based on the findings of the literature reviewed across the four parts/themes.

### INTRODUCTION

As mentioned in the previous chapter, this thesis presents research on social care for older adults in Scotland. Existing literature from other populations around the world is relevant, however Scotland, like all countries, has its own individualities. Several of these features of Scotland were discussed in the previous introductory chapter. But this means that it is important to assess how relevant the findings from research carried out in other places are in Scotland. This is fundamental to the research carried out and presented in this thesis.

This chapter is split into four parts, each with a theme related to social care, and these themes correspond to the four pieces of research that make up this thesis, each presented in the subsequent analysis chapters.

- Part 1 (socio-demographics, self-rated health and geography) to Chapters 4 and 5
- Part 2 (sex/gender differences) to Chapter 6
- Part 3 (household structure) to Chapter 7
- Part 4 (informal care) to Chapter 8

For each of these themes and corresponding analysis chapters, this chapter provides: a review of the previous literature, a rationale based on this review and the remaining questions about social care in Scotland. Thus, this chapter forms the background and context for the research within this thesis. First though, the methods of how the review was undertaken are presented.

### *REVIEW METHODS*

The type of literature review undertaken for this thesis research was a narrative/integrative review - a type of review which sits in the traditional review family (Grant & Booth, 2009; Sutton et al., 2019). The narrative aspect was deemed most appropriate for this thesis, firstly because there were already systematic reviews and meta-analyses of the research on the predictors of using or entering social care facilities in old age, and they contained studies from various global-northern populations – for example: (Harrison, Walesby, et al., 2017); Luppa, Luck, Weyerer, et al. (2010). Then second, because this thesis was primarily concerned with social care in Scotland, and the question remained whether these studies were generalisable to Scotland, so understanding patterns elsewhere was important. The integrative aspect was deemed appropriate here because the topic of this thesis is applied, concerning social policy and practice. Therefore, there will be relevant research on this topic outside of traditional academic journals, for example in Government policy reviews, charity research reports and private provider reports.

An alternative option would have been to undertake a systematic review of predictors of using social care in Scotland. However, at the beginning of this PhD research, very little research on the predictors of using social care in Scotland had been carried out. However, over the course of this PhD research project, several other projects completed relevant research in Scotland – for example: Burton and Guthrie (2018); Burton et al. (2019); Harrison, MacArthur, et al. (2017); Henderson et al. (2021); Henery (2018); Schneider and Atherton (2018). Since at the outset, these studies did not yet exist, a traditional literature review (narrative/integrative review) was undertaken, as this type of review would identify what work has been done previously, and identify gaps and further questions (Grant & Booth, 2009).

### **Literature Search Strategy**

#### *Identification*

Relevant literature was identified by searching Web of Science, PsycINFO, DiscoverEd and Pubmed databases. Databases were chosen as the primary source of relevant literature as this is typical for traditional literature reviews such as narrative reviews (Sutton et al., 2019). The original literature searches were carried out during the 2016-2017 academic year and this was expanded in 2017 and 2018 as part of the PhD groundwork. Then these searches were updated in 2021 during the write-up phase of the PhD thesis. All literature searches were carried out by a single researcher (DHC). The search terms used are presented below in Table 1.

Table 1.

Table of Search Terms for Literature Search

Table displaying the search terms which were used to search Web of Science, PsycINFO, DiscoverEd and Pubmed databases for relevant literature by the researcher (DHC) in order to conduct the literature review for this thesis. The key criteria of the research are presented alongside the range of search terms which were used to identify papers including these criteria in their research.

<b>Research Aspect</b>	<b>Search Terms</b>
Social Care	social care
	care home*
	nursing home*
	institutional care
	retirement home*
Older Adults	older adults
	old* people
	elderly
	old age
	pensioners
Factors	factors associated with...
	predictors of...
	determinants of...

Some relevant grey literature (e.g. government/charity/private provider reports) and books were also identified through discussions with colleagues and through reference list checking in papers identified by database searching. These supplementary methods of identifying papers were used because they contributed to the integrative aspect of the review – including social care research from policy and practice contexts, which might not appear in academic journals (Cooper et al., 2018; Sutton et al., 2019).

*Screening*

Articles and sources were screened (via title then abstract) by one researcher (DHC), this sifted the numerous search results, so only relevant articles were read in full. Then articles deemed relevant were read in full, also by one researcher (DHC). Relevant articles included research which: a) investigated people receiving social care in care homes, nursing homes, residential homes and institutions providing social care (termed formal social care by this thesis); b) looked at this in samples of older people (roughly those aged around 60 years old and older); c) investigated factors associated



with using formal social care, predictors of entry to formal social care settings, or hospital discharge to formal social care settings.

### *Inclusion*

There were several themes of research on social care for older people that emerged from the review; through consultation with the supervisory team, four of these topic areas were chosen as themes that the thesis would research further (as outlined in the chapter summary and introduction above). So, whether articles and sources were included in the literature review for this thesis generally depended upon whether they considered factors which fit within one of these four topics. Articles were excluded if they were from outside the review date span, which was 1980-2001 (1990 was originally going to be the earliest date to keep research contemporary, but some seminal papers were published in the 1980s, so this was expanded to include these). Additionally, I made exclusions where findings were ambiguous, if a study was old and more recent studies were available, or if the population studied was a niche or limited group (e.g. only older people with dementia) and similar studies on more representative samples were available. Inclusion/exclusion was decided by a single reviewer (DHC).

### *CROSS-OVER WITH PREVIOUS ASSESSED WORK*

I have previously reviewed some of the relevant literature for this thesis, for an earlier degree (Master of Public Health (MPH), University of Edinburgh, awarded 2017) (University of Edinburgh, 2021). As part of this previous degree, both the literature on the socio-demographics, self-rated health and geography (Part 1), and the literature on sex/gender differences (Part 2) was reviewed and presented for that degree dissertation. Since this previous degree led onto this current PhD thesis, the literature reviewed there is relevant, but that literature review cannot be presented as part of this degree. Instead, I have summarised it and clearly attributed it as part of the previous degree. It is also followed up with an expansion and update of the review, undertaken at the time of writing; this includes a wider range of studies

and/or more recent pieces of research. Also, the findings from the analysis in the previous degree are reported.

## PART 1 – SOCIO-DEMOGRAPHICS, HEALTH AND GEOGRAPHY

### *LITERATURE REVIEW*

#### **Findings from literature review for previous degree**

The MPH degree (University of Edinburgh, 2021) formed the start of the 1+3 ESRC Studentship, which culminates with this PhD thesis. For the dissertation component of the MPH, a scoping piece of research on the factors associated with care use in Scotland was undertaken (Corby, 2017); and this involved a review of the literature. The findings of this literature review are presented below.

I, found evidence – where multiple studies corroborated the findings, or robust methodologies reported the findings (eg. meta-analyses and larger scale studies) – for the following factors increasing the risk of care home use (Corby, 2017):

- Increased age (Branch & Jette, 1982; Gaugler et al., 2007; Greene & Ondrich, 1990; Grundy & Jitlal, 2007; Hancock et al., 2002; Harrison, Walesby, et al., 2017; Luppa, Luck, Matschinger, et al., 2010; Luppa, Luck, Weyerer, et al., 2010; Luppa et al., 2012; McCallum et al., 2005; Miller & Weissert, 2000; Shapiro & Tate, 1985).
- Women compared to men (Grundy & Jitlal, 2007; Harrison, Walesby, et al., 2017; Luppa, Luck, Matschinger, et al., 2010; Luppa, Luck, Weyerer, et al., 2010; Luppa et al., 2012; Martikainen et al., 2009; McCann et al., 2011; McCann, Donnelly, et al., 2012; Tomiak et al., 2000; Woo et al., 2000).
- Marital status – being married was associated with lower risk of using care/nursing home (Gaugler et al., 2007; McCann et al., 2011; McCann, Donnelly, et al., 2012; Steverink, 2001); being single was associated with increased risk (Branch & Jette, 1982; Gaugler et al., 2007; Grundy & Jitlal, 2007; Luppa, Luck, Matschinger, et al., 2010;

Luppa, Luck, Weyerer, et al., 2010; Luppa et al., 2012; McCann et al., 2011; McCann, Donnelly, et al., 2012; Steverink, 2001; Woo et al., 2000); and being widowed or divorced was also associated with a greater risk (McCann et al., 2011).

- Poor health (this was consistent regardless of which measure of health were used, including: medical records, self-reported health, prescriptions, specific health conditions etc.) (Gaugler et al., 2007; Greene & Ondrich, 1990; Grundy & Jitlal, 2007; Hancock et al., 2002; Harrison, Walesby, et al., 2017a; Hébert et al., 2001; Jette et al., 1992; Luppa, Luck, Weyerer, et al., 2010; McCallum et al., 2005; Miller & Weissert, 2000; Tomiak et al., 2000).
- Housing tenure – with homeowners at less risk compared to people renting their homes (Gaugler et al., 2007; Greene & Ondrich, 1990; Grundy & Jitlal, 2007; Hancock et al., 2002; McCann, Grundy, et al., 2012).

I found evidence – where findings were reported by fewer studies, or from less robust methodologies – for associations of the following factors with risk of care home use (Corby, 2017):

- An interaction between marital status and sex – with men generally at lower risk when married compared to being single, than women, even when health and age are controlled for (McCann, Donnelly, et al., 2012; Tomiak et al., 2000).
- Education, specifically higher levels of education were associated with reduced risk (Luppa, Luck, Weyerer, et al., 2010; Woo et al., 2000).
- Measures of wealth, deprivation or socio-economic status – with those experiencing lower income and higher deprivation at greater risk (Connolly & O'Reilly, 2009; Grundy & Jitlal, 2007; Hancock et al., 2002; Headen Jr, 1993; Luppa, Luck, Weyerer, et al., 2010; Shapiro & Tate, 1985).

Then I found mixed evidence – where the associations reported were not corroborated across different studies – for the following factor (Corby, 2017):

- Urban-Rural Classification – with some evidence suggesting that living in rural areas posed increased risk of using care homes, relative to living in urban areas (Coward et al., 1996; Tomiak et al., 2000); while others found evidence that living in rural areas was associated with lower risk of using care homes (McCann et al., 2014; Penrod, 2001). The research conducted in a UK sample (so possibly most relevant to Scotland), reported that living in rural areas of Northern Ireland was associated with reduced risk of using care/nursing homes (McCann et al., 2014).

The research on care use has primarily been conducted in global-northern countries, and Scotland is also a global-northern county. Therefore, given the findings in the literature, it is likely that the factors – age, sex, marital status, health, housing tenure, deprivation, education, urban rural classification and an interaction term between marital status and sex - will also be important in explaining care use in Scotland. However, none of these studies were conducted in Scotland, so this literature review was used to inform which factors were investigated in both the MPH research, and the research in this thesis, in a Scottish sample.

### **Update and expansion of the Literature Review**

This previous literature review was undertaken before the beginning of this PhD project in 2017. Thus, some relevant literature could have been published in the interim period. So an update of the review is presented below, including some studies which were either not included originally, or have been published since. This update covers literature about the predictors of care use generally, followed by studies about social care in Scotland.

#### *Research on Institutional Care Use Predictors*

Grundy (1992) investigated moving address in old age (65 years and older) using English and Welsh longitudinal study data, finding support for the idea

that migration in old age was associated with care/support need – with many of the over 75s either moving into institutions or to cohabit with relatives. Grundy (1992) had census data from 1971 and 1981, then institutionalisation status in 1981 - in the full sample, being in an institution in 1981 was more common in the older age groups and for women; it was more common for those who were single in 1981 and those who were tenants (rented their homes) in 1971; those without amenities (an in-house bath/toilet) in 1971 were also more commonly in an institution in 1981. The paper concluded that marital status and living arrangements were associated with institutionalisation and suggested this indicated the importance of family support (Grundy, 1992).

In a study of just elderly divorced and widowed women, also using English and Welsh longitudinal data, Glaser et al. (2003) investigated transitions to care homes and supported private households over two decades, 1971-1981 and 1981-1991. They report that the older the women, the more likely they either made a transition to a care home than a supported private household, or made a transition to a care home than remained independent (Glaser et al., 2003). Glaser et al. (2003) also found an effect of housing tenure and limiting long-term illness, with homeowners less likely to move to a care home than women who were renting their homes, and women with a long-term limiting illness more likely to move to a care home than women without.

Kauppi et al. (2018) investigated predictors of entry to long-term care facilities using a Finnish sample of people age 90 and older. They reported that women, people with two or more chronic conditions, people living alone and people receiving help (i.e. informal care), were all at increased risk of using long-term care facilities (Kauppi et al., 2018). This newer research corroborates with the findings of the literature review above.

Additionally, Hanratty et al. (2018) used the English Longitudinal Study of Ageing (ELSA) to investigate loneliness, they found loneliness was associated with increased risk of using a care home after controlling for age,

sex, social isolation, depression, memory loss/Alzheimer's diagnoses, disability, long-term conditions and wealth. For these socio-demographics and health factors that they controlled for in their study, they report the same directions of association as those found generally across the literature. This means that this study corroborates with the literature review above.

### *Research in Scotland*

Since the initial review, more research has been carried out on social care in Scotland. First, Burton et al. (2019) provided the first description of the older adult population of Scotland who were living in Scotland's care homes. Using data from the Scottish Care Home Census (SCHS) from 2012-2016, they reported that there were between ~34,000 and ~39,000 residents in long stay care facilities across Scotland (Burton et al., 2019). Of these residents, ~70% were part or wholly local authority funded; mean admission age was 79 years old, while mean age at census was 81 years; 68% were women and 48-50% formally diagnosed dementia (Burton et al., 2019). However, not all care homes fill in the SCHS, Burton et al. (2019) reported a 79-90% completeness over the years their data spanned, so some older people may be systematically excluded from this data source.

Then Henderson et al. (2021) linked Scottish prescribing records to the Scottish Social Care Survey. They reported that multi-morbidity (having multiple health conditions) was associated with a greater likelihood of social care use, as was increased age and deprivation (Henderson et al., 2021). However, social care in this study was primarily non-residential care, however sub-analyses included care home residents, and they reported similar results to the main analyses (Henderson et al., 2021). Nevertheless, their findings corroborate with the findings of the literature review, and demonstrates the importance of these three factors in a Scottish sample.

Furthermore, Schneider and Atherton (2018) measured care use for people who had died in Scotland. They found that in Scotland, the number of people needing institutional care at the end of life decreased from 2001 to 2012,

while over a similar period in England it had increased. They also reported that 4 in 5 Scottish people still lived at home in the year prior to death. They concluded that this revealed changing care needs and changes in the type of care needed by people in Scotland (Schneider & Atherton, 2018). This study also demonstrated key differences in Scotland compared to other UK countries, thus, providing further rationale for investigating care use in Scotland.

### *Conclusion*

In conclusion, the more recent literature has looked at predictors in different old age groups, and measured predictors using alternative methods. Additionally, other studies have started to explore the predictors of social care use in Scotland. Broadly, the findings are in agreement with the previous findings from the literature review. However, several unanswered questions about the predictors of care use in Scotland remain, and these remaining questions informed the research questions that this thesis aimed to address.

### **Research Findings from MPH Dissertation**

The main research in my MPH dissertation (Corby, 2017), was a scoping analysis into the factors associated with care/nursing home use in Scotland. It found evidence that the factors associated with receiving care in Scotland are largely similar to those identified in the other populations, discussed in the literature review. Increased age, being a woman, being either single, divorced or widowed, reporting suffering from a limiting long-term illness and experiencing deprivation were all associated with greater odds of being in care at follow-up. Then living in rural areas and being a homeowner were associated with reduced odds.

However, there was no evidence of any association between education and care use; but in the Scottish sample used, very few people had been educated past school level, which is likely a feature of the cohort studied including people born in or before 1926. The findings also supported the

interaction between sex and marital status, which suggests being unmarried is associated with greater chances of using care for men than women.

The study also investigated three factors, which to the best of the researcher's knowledge, had not received much attention in research elsewhere. These included living in a flat (compared to other house types), reporting recent employment (within the last 10 years) and population density. Living in a flat was associated with increased odds of receiving care whilst recent employment was associated with reduced odds. However, contrary to the research predictions, living in low population density areas was associated with greatly increased odds of receiving care – this finding was seemingly paradoxical. Rural areas were associated with reduced odds of using care while low density areas with greatly increased odds of using care. Ultimately, this paradoxical finding needed further investigation.

#### *RATIONALE FOR RESEARCH IN THIS THESIS – CHAPTER 4 AND CHAPTER 5*

The literature review above includes research conducted in England and Wales, and in Northern Ireland, all using equivalent longitudinal datasets. These datasets have been used to investigate the factors associated with using care/nursing homes in old age (Grundy & Jitlal, 2007; McCann et al., 2011; McCann, Donnelly, et al., 2012; McCann, Grundy, et al., 2012; McCann et al., 2014). These broadly equivalent linked administrative datasets exist throughout the UK, and they come from longitudinal studies using samples of census data (Dibben et al., 2018): one for England and Wales called the Office for National Statistics Longitudinal Study (ONS LS) for example, this was used by Grundy and Jitlal (2007); one for Northern Ireland called Northern Irish Longitudinal Study (NILS) for example, this was used by McCann et al. (2011); and one for Scotland called the Scottish Longitudinal Study (SLS) (Dibben et al., 2018; Scottish Longitudinal Study Development & Support Unit, 2017).

While similar research on social care was carried out using ONS LS and NILS, no equivalent study used the SLS. Therefore, it remained unknown if



the effects observed by previous research using the English and Welsh, and Northern Irish samples would replicate in a Scottish sample. Thus providing a rationale to perform an equivalent piece of research using the corresponding longitudinal study data for Scotland, to see if the findings in the rest of the UK also apply here. Additionally, the literature review provided above identified several factors associated with using care homes in other populations, and these too could be important in Scotland. So this first analysis aimed to investigate the factors that are associated with entry to formal care for older people in Scotland, using the available data in the SLS.

The first piece of research carried out for this thesis was not aiming to be a direct replication of any previous work. Previous analyses in England, Wales and Northern Ireland had aimed to answer different research questions themselves – so while the analyses were very similar, they were not the same. The English and Welsh studies have explored how socio-demographics, living arrangements, health and housing tenure are associated with care use using a longitudinal study cohorts of older people, the date ranges covered have generally been between 1971 and 2001 (Glaser et al., 2003; Grundy, 1992, 2011; Grundy & Jitlal, 2007). The Northern Irish studies built on this, investigating some associations in more detail including urban-rural classification, gender, household structure and housing tenure (McCann et al., 2011; McCann, Donnelly, et al., 2012; McCann, Grundy, et al., 2012; McCann et al., 2014). So, this study in Scotland aimed to first explore whether the more general factors could be corroborated in Scottish longitudinal data, then second, to build on this previous work, by expanding the factors investigated.

However, this expansion of the factors explored in this first analysis was determined by the research undertaken in my Master's thesis mentioned earlier; including the additional lesser researched factors: recent work, living in a flat and population density (Corby, 2017). The rationale and theoretical basis around exploring these factors was part of this Master's thesis. As such it cannot be reproduced in this doctoral thesis, however, these factors were

originally hypothesised to be predictive of social care for the following reasons:

- Recent work – it was hypothesised that recently working would be protectively associated with social care use, as those still working may be fitter, younger and healthier, so less likely to enter social care by the follow up (Corby, 2017).
- Living in a flat – particularly in Scotland there are a lot of tenement flats (Morgan & Daunton, 1983) which have dark uneven stairs to enter; for older people who may have mobility limitations or sight problems these could be dangerous and thus a risk factor for moving into a care home (Corby, 2017). Previous work by Nihtilä and Martikainen (2008) demonstrated that house type was not an important predictor of older people in Finland moving into residential care, but they considered several different house types such as detached, semi-detached, terraced, flats, etc. Besides the socio-economic aspect of this, which was controlled for in their models, there would little practical difference between these housing types except for flats - as flats might pose accessibility issues if there were stairs. Thus, the question remained whether flats independently predicted using formal social care in old age.
- Population density – previous literature had considered urban rural classification, although the findings were mixed. While some evidence suggesting that compared to urban areas, living in rural areas posed increased risk of using care homes (Coward et al., 1996; Tomiak et al., 2000); others studies found evidence of lower risk for those living in rural areas (McCann et al., 2014; Penrod, 2001). Since the research conducted by McCann et al. (2014), on a Northern Irish (other UK) sample, reported that living in rural areas was associated with reduced risk of using care/nursing homes; it was hypothesised that low population density areas of Scotland would similarly to the rural areas in Northern Ireland, be associated with reduced odds of being in a

care home at follow-up. The justification for looking at this measure of geography, in addition to urban rural classification, was based on urban rural classification being a measure made up of several different aspects of geography (Corby, 2017). For example, urban rural classification combines accessibility by road as well as how many people live in an area. Population density on the other hand, looks only at the number of people living in an area. So looking at both may have separated which aspect of urban rural classification could be driving the association with care home use in old age – accessibility of areas by road, or the density of the population in that area.

However, it should be noted that these hypothesised associations were the work of this Masters project. All three factors were associated with care use as outlined in the summary of this Masters research above, but the association observed for population density was unexpected, it was in the opposite direction to the association observed for urban rural classification (Corby, 2017). This current thesis research will expand on this by exploring this unexpected effect and the justification for this is provided next.

### **Urban Rural Classification and Population Density**

As mentioned above, I undertook a rudimentary analysis for my Masters thesis (Corby, 2017). The findings of this analysis were surprising with regard to population density, so further analyses were planned to unpack this, plus some improvements to the analysis strategy were made. These changes and the justification for them, will be outlined to clarify how this analysis differs considerably from my Masters thesis.

Firstly, established factors such as deprivation and education were not found to be good predictors in the initial analysis. However, a stepwise modelling building strategy was used for this initial analysis. Stepwise regression is not a recommended strategy for very large datasets, especially ones with multiple independent variables; when using stepwise for analyses like this, important explanatory variables can end up excluded from the model (Smith,

2018). When this happens, the resulting model might fit the sample data well, but will not perform as well in the population the sample was taken from (Smith, 2018). Therefore, for this analysis, a different model building strategy was used – this is described in the paper.

Secondly, an additional interaction term was added to explore how measures of geography were associated with care use. As reported above, the initial exploratory analysis revealed a surprising association between population density and care use. Unlike urban-rural classification, where rural areas were associated with reduced odds of care use compared to cities (Odds Ratio 0.35 and 95% Confidence Interval 0.29, 0.43); low population density areas were associated with greatly increased odds (Odds Ratio 9.05 and 95% Confidence Interval 7.34, 11.19) (Corby, 2017). So the present analysis aimed to investigate if there was an interaction between these two measures of geography, which might help explain this seemingly paradoxical result. Also, the measures of geography themselves and how they were calculated would be scrutinised further.

So this analysis has considerable differences to the initial analysis undertaken for the Masters dissertation. It would develop this research further by exploring the unexpected results; both the lack of support for established factors evidenced in other populations, and the seemingly paradoxical association of urban-rural classification and population density.

#### *AIMS AND OBJECTIVES OF CHAPTER 4 AND CHAPTER 5*

In summary, the initial piece of research in this thesis aimed to investigate whether the conclusions drawn from studies using English, Welsh and Northern Irish longitudinal datasets, about patterns in care home usage, could also be applied to Scotland, by utilising an approximately-equivalent Scottish longitudinal dataset. While a meta-analysis of the other UK studies might provide a general estimate for the UK, this would not include Scotland, and its generalisability to Scotland would be unknown. Chapter 1 presented several reasons why we might not assume care use patterns in Scotland to

be the same as the rest of the UK. Therefore, this study aimed to provide Scotland-specific estimates for the associations between socio-demographics, geography and health factors and entry to care for older people.

The analysis in Chapters 4 and 5 expanded upon the scoping analysis, from my Masters thesis, by aiming to address problems inherent in the analysis technique used originally. Additionally, it aimed to further investigate the geographical patterns in care use observed, exploring the seemingly paradoxical findings for urban rural classification and population density.

## PART 2 – SEX/GENDER DIFFERENCES

### *LITERATURE REVIEW*

From the literature review in my MPH, evidence for an interaction between marital status and sex was found. The studies evidencing this observed that men generally seemed to experience a reduced likelihood of entering care homes, compared to women (even when health and age were controlled for) (McCann, Donnelly, et al., 2012; Tomiak et al., 2000). So this demonstrated that the association of marital status may also differ for older people in Scotland, depending on their sex/gender. However, in the literature there was a gap concerning the sex/gender differences in the socio-demographic, self-rated health and geographical factors associated with care outcomes.

Sex/gender differences were mainly considered in terms of: first, sex as a predictor or control variable itself – for example: Grundy and Jitlal (2007); Harrison, Walesby, et al. (2017); Luppa, Luck, Matschinger, et al. (2010); Luppa, Luck, Weyerer, et al. (2010); Luppa et al. (2012); Martikainen et al. (2009); McCann et al. (2011); McCann, Donnelly, et al. (2012); Tomiak et al. (2000); Woo et al. (2000). Then second, the interaction between marital status and sex (McCann, Donnelly, et al., 2012; Tomiak et al., 2000). So generally, separate estimates for men and women have not been produced and interactions between sex and other socio-demographics, self-rated

health and/or geography, have not received the same amount of research attention.

#### *RATIONALE FOR RESEARCH IN THIS THESIS – CHAPTER 6*

An area warranting further expansion was sex/gender differences in the factors associated with older people using care homes in old age. Women have been consistently shown to have a greater risk of entering a care home (Glaser et al., 2003; Grundy, 1992, 2011; Grundy & Jitlal, 2007; Harrison, Walesby, et al., 2017; Luppá, Luck, Weyerer, et al., 2010; Luppá et al., 2012; McCann et al., 2011; McCann, Donnelly, et al., 2012; Woo et al., 2000). As touched upon in the summary of my MPH literature review above, previous research has found evidence of a more complex association between care use, sex/gender and marital status (Tomiak et al., 2000); suggesting being married was more beneficial to men than women. This was corroborated by my MPH research, where evidence for the interaction between marital status and sex was found in Scottish data (Corby, 2017).

However, if there are differences in how marital status is associated with care outcomes for men and women, there could be other factors for which the effects vary depending on sex/gender. For example, in the case of marital status, McCann, Donnelly, et al. (2012) suggested that men are more likely to receive informal care from a partner or spouse when they become ill, and this is why marriage is more protective against entering a care home for men than women. This explanation highlights how both sex and gender differences are important. Sex differences in life expectancy mean that men die at an earlier age (National Records of Scotland 2021) and men also have a lower age of healthy life expectancy (National Records of Scotland 2022a), so men generally will need care or support earlier. Gender differences mean that women (in heterosexual partnerships) generally marry older partners, so their partner will generally suffer chronic illness/physical limitations due to old age first; thus women would be physically able to provide care when their partner needs it, while men are more likely to already be sick or deceased by the time the woman in the partnership has support needs (McCann,

Donnelly, et al., 2012). Moreover, work by Grundy (1992) looking at socio-demographics, tenure and household amenities (e.g. in-home baths/toilets) found differences for men and women in how often, when their old age living arrangements changed, this was a move to a care facility (called institutions in the original work). So, it is feasible that sex and/or gender differences could also affect how other factors are associated with social care outcomes. Below, some examples are given of other factors where the effects could be different for men and women.

First for women - women generally spend longer at the end of their lives living with disability from multiple chronic conditions (Carmel, 2019). So long-term conditions might be more influential for women, as they are more likely to have multiple conditions which might lead to care needs. Then, in old age women more commonly have problems associated with daily living tasks such as climbing stairs, caused by their greater burden of chronic illnesses (Carmel, 2019). Thus, living in a flat where stairs might be difficult, could be a push factor for moving into a care home in old age, which could be more important for women. Additionally in Scotland, like other global-northern populations, a greater number of women than men live alone in old age (Forward et al., 2022; National Records of Scotland, 2020). So remaining independent could be difficult for women who live alone – but this could be even worse for women who then also have reduced mobility from chronic illness and/or live in a flat.

Additionally, homeownership has been evidenced to be protectively associated with care home use, meaning homeowners are less likely to use care homes (McCann, Grundy, et al., 2012). McCann, Grundy, et al. (2012) proposed that an explanation for this could be that in their sample of Northern Irish older people, their homes (their children's/next of kin's inheritance) could be sold to cover the cost of living in a care home - something older people would likely be reluctant to do. Since women are more commonly the last surviving member of a couple - out-living a partner/widowhood is something more common for women than men in Scotland (One Scotland - Scottish

Government, 2019) – thus, homeownership may be more influential on women’s care home use than men’s. Generally, as the last surviving member of the couple, this decision is more likely to be made by women. Moreover, homeownership might be less influential for men, because an alternative source of old age care (informal care from their partner), is available. Additionally, within couples, women are often younger than their husbands, and thus remain healthy longer than their partner, so generally men would likely benefit from their partner being healthy enough to still run their home, more able to provide informal care and also want to remain living there. (Note: this logic is based on the assumption that the majority of older couples in Scotland are heteronormative, so consist of a man and a woman – while it is currently difficult to enumerate same versus mixed sex couples in the UK, evidence to underpin his assumption can be taken from marriages, where even in 2019, of the 26,007 marriages in Scotland, only 912 were between same-sex couples (National Records of Scotland, 2020)). Consequently, homeownership might be more important in explaining variance in care use in old age for women, than for men.

Then for men, socio-economic status might be more important - as traditionally men have been more likely to be part of the workforce due to gender norms in society, and socio-economic status is an indicator of the physical characteristics of the jobs men were likely to have (Warren et al., 2004). Particularly for men with lower socio-economic status, where jobs have a more manual nature and less autonomy, this could have led to a greater chance of industrial injury and stress. For example, Warren et al. (2004) found that the physicality of jobs was associated with poorer health outcomes such as musculoskeletal problems. So a manual job could have consequences for dependency in old age, and as this could be indicated by socio-economic status. Thus, socio-economic status might be an important predictor of care outcomes on old age for men rather than women, as due to gender norms, they have traditionally have been more likely to be members of the workforce than women.



Also, previous research suggests being married is more beneficial for men, possibly because their partners are more likely provide informal care, which buffers them from needing formal care (Tomiak et al., 2000). So given this evidence of an interaction between sex and marital status (Corby, 2017; McCann, Donnelly, et al., 2012; Tomiak et al., 2000); marriage is likely a more important predictor of care outcomes for men than for women.

Ultimately, these are just some suggestions of how the factors associated with care outcomes in old age, might be different in nature or effect size for men and women. There could be other effects that vary by sex/gender. Therefore, to better understand how socio-demographic, self-rated health and geographical factors are associated with care use in later life, it was important to also look at this separately for men and women.

#### *AIMS AND OBJECTIVES OF CHAPTER 6*

So the aim of this part of the thesis research, was to look at the differences between men and women. Firstly, exploring by the interaction between sex and marital status further. Then by examining if there were differences in which other factors predicted care use for men and women. It is difficult to tease apart whether these differences are due to sex or gender (see the Methods in Chapter 3 for a discussion of the differentiation used by this thesis), and this analysis will not be able to separate this. However, the patterns will be discussed, and the possible explanations for any differences proposed.

For women, who are more likely to live alone, disability from illness and struggling with stairs to a flat are likely to push them towards moving into a care home, while owning a home is likely to be a barrier to making such a move. So it was hypothesised that for women, factors like long-term conditions, living in a flat and homeownership will be more important, as these are practical reasons for losing or maintaining independence in old age.

Previous research suggests being married is more beneficial for men, as their partners provide informal care, which buffers them from needing formal care (Tomiak et al., 2000). Plus, men are more likely to be part of the workforce and if their job was manual, more likely to suffer industrial injury or impacts from manual labour on their bodies. This could have consequences for care outcomes in old age. Since socio-economic status is a proxy for the manual nature of people's jobs, this could be a more important factor for men. Therefore, it was hypothesised that marriage and socio-economic status are likely to be more important in explaining the variance in care home use for men.

### PART 3 – HOUSEHOLD STRUCTURE

#### *LITERATURE REVIEW*

Note: this topic was not previously reviewed for another degree.

Household Structure (HHS) refers to who is living in the household with an older person – across the literature this is referred to by different terms such as living arrangements, household composition etc. The most commonly investigated aspect of HHS studied in the literature is living alone. Living alone is consistently associated with increased risk of using care/nursing homes in different global-north populations at different time periods (Aarsland et al., 2000; Branch & Jette, 1982; Gannon & Davin, 2010; Giebel et al., 2021; Glaser et al., 2003; Greene & Ondrich, 1990; Grundy, 2011; Kasper et al., 2010; Martikainen et al., 2009; McCann et al., 2011; Nihtilä & Martikainen, 2008). Grundy (2011) noted that while compared to living alone, living in a couple or with relatives at the start of a decade was associated with reduced likelihood of using institutional care at the end of a decade, there were downward trends in living with relatives between 1971 and 2001 in England and Wales. More specifically, Nihtilä and Martikainen (2008) reported that in a Finnish sample, while older people living alone were generally at increased risk of entering a care/nursing home, men had 70% increased risk while women had a 29% increased risk, suggesting there are

sex/gender differences in HHS risks. Other studies have looked at HHS in terms of the number of people co-habiting with older people. Connolly and O'Reilly (2009) found that compared to living alone, the risk of care home admission is reduced with each additional co-habitant up to three, after which extra co-habitants did not add any extra benefit.

Nihtilä and Martikainen (2008) also reported that living with a spouse was protectively associated with care use; they suggested this was for three reasons: 1) the informal care provided by a spouse and support in arranging external care services when needed, 2) emotional support provided by a spouse and 3) marriage has financial benefits, so married older people benefit from increased wealth. Martikainen et al. (2009) also looked at HHS, reporting again that living with a spouse had the lowest risk of care use, followed by living with other family members; the riskiest HHS in their analysis was living alone. Additionally, they reported that living with a spouse was more beneficial for men than women, in terms of reduced likelihood of entering a nursing/care home (Martikainen et al., 2009); this again suggests there are sex/gender differences in HHS risk.

McCann et al. (2011) investigated HHS in more detail in a Northern Irish sample of older people. For people living alone, they split this up by marital status (single, married, widowed and divorced); for people living with others, they split this up into living with: a partner, a partner and child, a partner and others, a child, siblings and others. They found that overall, living alone was associated with increased risk for both women and men, compared to living with a partner. However, when living alone and single, men had greater risk of using care than women; when separated/divorced, this was associated with increased risk for men, but not women; then when married but living alone, this was associated with greater risk for women, but not men (McCann et al., 2011). For those not living alone, they found that compared to living with a partner, living with a partner and children was associated with a reduced hazard of using care; but when the sample was split by sex this was limited to men (McCann et al., 2011). However, research by Grundy and Jitlal

(2007) suggests whether the children are married and have their own families matters - with older people living with unmarried children at lower risk of care home admission. Other studies suggest the sex/gender of the child is important, with women offering greater protection to their elderly parents against care home admission (Charles & Sevak, 2005; Freedman, 1996).

McCann et al. (2011) also reported that for both men and women, living with a sibling was associated with an increased hazard of using care compared to living with a partner; however this was a greater increased hazard for men than women. McCann et al. (2011) conclude that this demonstrates that living with others is not equally beneficial, instead the relationship(s) with the other people living in the household mattered. It also demonstrates that HHS is not only more complex than simply living alone or not, but the sex/gender of older people matters too.

In conclusion, there is strong evidence that living alone poses an increased risk of using institutional care while living with a spouse/partner appears to be protective. Authors seem to agree this is likely to be driven by the informal care provided by household members, particularly spouses/partners. There is also considerable support for the role of sex/gender in these patterns, with women benefiting less from living with a spouse/partner in terms of reduced chances of using social care. Also, there is evidence that women experienced lower excess risk in the HHSs generally associated with greater risk of using social care, than men did. This is hypothetically due to women providing a disproportionate amount of informal care for partners compared to men (Martikainen et al., 2009; McCann et al., 2011). Men are generally the older member of the couple in heterosexual partnerships, and also men have a lower age of healthy life expectancy than women (McCann, Donnelly, et al., 2012) - men's healthy life expectancy was 61.1 in Scotland in 2009-2011, while women's was 63 in the same period (National Records of Scotland, 2021a) (however in more recent estimates this difference is lower with men's and women's healthy life expectancy at 60.1 and 61, respectively (National Records of Scotland, 2022)). Despite women having a lower percentage of

their life expectancy spent in healthy life expectancy (76% for women versus 79% for men (National Records of Scotland, 2022)), within couples, men are still on average the member of the couple who will exit their period of healthy life expectancy first. McCann, Donnelly, et al. (2012) propose this is why they provide less informal care than women - because they are less physically able to, due to their own ill-health. Ultimately, the evidence in the literature suggests HHS might be more complex – with the relationships within the household playing a role in how beneficial living with cohabitants is. Thus, this should be investigated in a Scottish sample; and given HHS was important in a Northern Irish sample, it is likely that it will also be important in Scotland too.

#### *RATIONALE FOR RESEARCH IN THIS THESIS – CHAPTER 7*

##### **Why is HHS relevant to care use?**

In short, HHS is thought to be an important determinant of care use because it is a proxy for the informal care that an older person may receive from within their household. Informal care is unpaid care provided without a contract, usually by friends, neighbours or family. Informal care has been evidenced to delay or prevent older people from needing care in a care/nursing home (Bonsang, 2009; Gannon & Davin, 2010; Gaugler et al., 2007; Jette et al., 1995; Lo Sasso & Johnson, 2002; Van Houtven & Norton, 2004). Therefore, informal care will be crucial to explaining why some people need formal care in old age and some people do not. Thus, looking at HHS is like looking at older people's potential sources of informal care.

Measuring informal care directly is difficult, as recording informal caring roles in the UK is not standard practice, so research looking at this generally has to rely on contemporary surveys/questionnaires/censuses containing questions about caring responsibilities. However, there are often discrepancies between informal care reporting between the carer and the care recipient; plus the language around "care" is ambiguous, with question wording affecting responses (Rutherford & Bu, 2018). Therefore, for all this part of the

thesis looks at HHS, this is with acknowledgement that effects observed for this factor, may be partly explained by the informal care potential of the HHS.

### **Customs of Care**

Within any society there are customs relating to care or care philosophies – these customs are ideas, beliefs and traditions around care and caring roles (Gaugler et al., 2007; Gawande, 2014). It is important to be aware of these customs when interpreting analyses of care use in Scotland, because these customs could affect care use. Moreover, since customs of care, like culture, are not stable over time (Gawande, 2014), being aware of these customs and how they change in Scotland will provide context for interpreting the analyses in chapter 7. In this section, several suggestions will be put forward, for how customs surrounding care could influence both informal care, HHS and ultimately formal care use.

Firstly, when analysing HHS, it is common to consider one member of an elderly couple. Yet by definition couples have two members, so if one is receiving informal care/support, the other is probably providing it. Sometimes this can be transactional, with each member of the couple taking on particular roles and responsibilities (Riekkola et al., 2019). However, when one member of the couple becomes too ill or frail, responsibility for the independence of the couple may fall to the healthier person. While this can be beneficial for the care recipient member of the couple, who avoids or delays using institutional care, providing informal care comes at a large cost in terms of time, energy, health and often the wellbeing of the individual providing the care (Gibbons et al., 2014; Ornstein et al., 2019; Reiss-Sherwood et al., 2002).

This is where societal views and gender roles become important – because informal care is mainly provided by women, especially within a couple. Criado Perez (2019) reports that women are responsible for providing 75% of unpaid care. Informal care falls under the plethora of unpaid labour that is classed as “women’s work” – and is accordingly under-valued and underpaid due to

gender biases in the foundations of our society (Criado Perez, 2019; Neno, 2004). This societal view of unpaid care could be why informal care provision was not measured in administrative records like the census, until 2001. However, this convention of informal care being provided predominantly by women will be important in understanding the trends in care use that chapter 7 of this thesis will explore. So given Criado Perez (2019)'s statistic, older women are more likely to be providing care, and older men receiving it. This gender bias means we might expect effects of gender in how HHS is associated with care outcomes.

Secondly, at a country level, different countries have different "care philosophies". This is a term used by Gaugler et al. (2007) to describe the societal ideas, practices and traditions about who should provide social care for older people. Fernández-Carro and Evandrou (2014) reported that in Europe, the responsibility for social care generally fell to the family in southern countries, while in more northern countries, this was more commonly seen as a responsibility of the state. This influenced HHS, because in the southern countries, different generations of families were more likely to live in the same household to facilitate this informal care provision. Therefore, the care philosophies of a country will determine who is seen as responsible for social care, influencing both informal care provision and HHS, and ultimately formal care use.

Scotland would fall into the northern European category. Accordingly, state-funded social care provision was one of the flag-ship policies during the devolution of UK governments (Birrel, 2009; Bowes & Bell, 2007). This aligns with Scotland being generally more socialist, progressive and politically left-wing leaning than England and the UK Government (Hepburn & Rosie, 2014; Revest, 2016). This means the customs for care in Scotland likely lean toward state responsibility for care provision, and suggests that even within the UK, Scotland may differ in care philosophy. Consequently, patterns of informal care and how HHS is linked to care use, could be nuanced within each constituent country. Therefore, this provides a rationale to investigate

HHS and care use in a Scottish population, as this will be an appropriate basis to inform future Scottish policy and practice.

This said, the care philosophies of countries are not static - they can change over time. Gawande (2014) discusses a cultural shift in western countries, with people becoming more individualistic; this has resulted in smaller households and the responsibility for caring for older relatives shifting from a whole family responsibility, to the responsibility of the older individual themselves. Both of these changes mean that in Scotland, we might expect firstly, to see changes in HHS, with more single person or couple households. Accordingly, Grundy (2011) evidenced a downwards trend in older adults moving to cohabit with relatives over three decades between 1971 and 2001 in England and Wales. Then secondly, changes in how different HHSs are associated with care use in later life - if family members are providing less informal care, some HHSs might become less protective against formal care use.

Furthermore, returning to the point about women's roles in care and HHS; with progress towards gender equality and more women in the workplace, it is possible women will provide less informal care in the future. Since women are responsible for most informal care provision currently, this could impact the association between HHS and care use in the future. If women are less pressured or willing to provide informal care, HHSs with cohabitants could be less protective against formal care use. Therefore, the generalisability and representativeness of past and current trends in HHS and care use, should be considered.

Ultimately, the effect of HHS is likely complicated. Within countries, several cultural/societal beliefs can affect informal care, demography of HHS and ultimately care use itself. Moreover, customs can change overtime as movements like feminism are questioning these belief systems. It is possible that the association between HHS and care outcomes might remain constant, with only demographic changes occurring over time, for example, an



increasing number of single person households. Alternatively, these associations might not be time-constant - for example living with a partner might become less beneficial in future as informal care provision is expected/provided to a lesser extent. Therefore, since beliefs in different countries can be so nuanced, investigating this within a Scottish population will be necessary to draw conclusions about HHS for older people in Scotland.

### **Previous Research on HHS**

As highlighted in the literature review section above, different HHS types are associated with social care outcomes for older people. The previous literature shows that both living with others and the relationship to those others are both important predictors of social care outcomes. One study outlined in the literature review will now be discussed in greater detail. As carrying out a similar piece of research in Scotland, such as a replication study, would explore how HHS is associated with using formal social care in a Scottish context. Also replicating an existing method of measuring household structure would reveal more about the differences and similarities between the populations, than would deriving another new method of measuring HHS.

#### *McCann's study*

McCann et al. (2011) used the Northern Irish Longitudinal Study (NILS) (the Northern Irish equivalent of the longitudinal study in Scotland called the SLS which will be discussed further in the Methods in Chapter 3). They investigated how the living arrangements of older people might affect care home admission. They used the NILS 2001 census records as their baseline to measure independent variables, and then retrieved care home admissions data for six years following the 2001 census, from the regional care home inspectorate data which were linked to the NILS members' data (McCann et al., 2011). This meant they could undertake Cox regression analysis for this six year follow-up period.

They found that those living alone had the highest risk of being in care at follow-up, compared to those who lived with a partner (McCann et al., 2011).

They also reported that risk of admission to a care home was similar for people living with children and living with a partner, but reduced for those who lived a partner and children (McCann et al., 2011). Table 2 shows the hazard ratios and 95% confidence intervals reported by McCann et al. (2011), the association with increased risk is highlighted in red and the protective association is highlighted in green.

*Table 2.*

*Table Showing the Household Structure Full Sample Results from McCann et al. (2011)*

*Table presenting the results from McCann et al. (2011) for modelling done on the full sample older Northern Irish people. This was a Cox model regressing whether older people had entered a care home during a six year follow-up period, by their household structure at the initial time point (who they lived with/living arrangements). The model controlled for age, general health and presence of a limiting long-term condition. Model results for the different household structures are presented in terms of hazard ratios and 95% confidence intervals. Reproduced with permission (License Number: 5450770264619). For full license see Appendix D.*

<b>Household Structure</b>	<b>Hazard Ratio</b>	<b>95% Confidence Interval</b>
Lives with partner	1.00	(reference)
Lives alone	1.66	1.48, 1.87
Lives with children	0.97	0.81, 1.16
Lives with partner and children	0.67	0.54, 0.83

They repeated their analysis splitting their sample by sex, the models were adjusted for age, general health and long-term illness. They found that there were some differences in which factors were protective or riskier for men and women. In

Table 3, the factors associated with increased hazard of entering a care home are highlighted in red and the factors associated with reduced hazard are highlighted in green – for example living with a partner and children is beneficial for men, but there is not enough evidence of a similar effect for women (McCann et al., 2011). Similarly, living alone and being separated/divorced was associated with a 2.4 times increased hazard for men but no difference in risk compared to living with a partner for women; additionally, living alone and being married was associated with increased hazard for women, but this is not the case for men (McCann et al., 2011).

Table 3.

*Table Showing the Household Structure Results from McCann et al. (2011) Split by Sex*  
 Table presenting the model results from McCann et al. (2011) when models were split by sex. These were Cox models regressing whether older people had entered a care home during a six year follow-up period, by their household structure at the initial time point (who they lived with/living arrangements). The models controlled for age, general health and presence of a limiting long-term condition. Model results for the different household structures are presented in terms of hazard ratios and 95% confidence intervals. Reproduced with permission (License number: 5450770264619). For full license see Appendix D.

		<b>Males</b>	<b>Females</b>
Lives alone	Never married	2.57 (1.99, 3.32)	1.86 (1.52, 2.27)
	Widowed	1.44 (1.14, 1.82)	1.47 (1.26, 1.72)
	Separated/divorced	2.39 (1.55, 3.68)	1.18 (0.73, 1.90)
	Married	1.94 (0.96, 3.93)	1.74 (1.12, 2.70)
Lives with	Partner	1.00 (reference)	1.00 (reference)
	Partner and children	0.61 (0.43, 0.85)	0.82 (0.59, 1.14)
	Partner and others	1.38 (0.77, 2.47)	0.47 (0.18, 1.27)
	Siblings	2.39 (1.66, 3.45)	1.52 (1.17, 1.98)
	Children	1.05 (0.69, 1.58)	0.90 (0.73, 1.11)
	Others/complex	1.19 (0.78, 1.84)	1.11 (0.87, 1.42)

McCann et al. (2011) conclude that living alone seemed to increase risk for men and women in most marital statuses, but this risk increased more for men. Since living with a partner was the reference category they used, this could also be interpreted as living with a partner being less beneficial for women, but this is not how the authors interpret this. McCann et al. (2011) also report that of the potential co-habitants, only some were beneficial in terms of risk of care home admission. As mentioned earlier, they note the excess risk for living with a sibling compared to a partner, yet demographically these two types of cohabitant would have similar demographics. Therefore, they conclude this shows that relationships of cohabitants are important (McCann et al., 2011).

Based on these findings, we might expect also to see an effect of living arrangements/household structure, in Scotland. Additionally, given the sex differences reported by McCann et al. (2011), sex/gender differences are something which should also be explored in Scotland when investigating HHS.

### *AIMS AND OBJECTIVES OF CHAPTER 7*

Based on the previous research and rationale presented above, the aim of the analyses in Chapter 7 was to perform a replication using Scottish data, of the original study by McCann et al. (2011). This would establish whether HHS/living arrangements were also important in explaining variation in care home use by older people in Scotland. Further aims of this research were first, to explore the sex/gender differences in how HHS is associated with older people using care homes in Scotland. Then second, to explore HHS in more than one time period in Scotland, to see if the patterns were the same at both time points.

It was predicted, based on previous research, that living alone would be associated with increased odds of using care at follow-up compared to living with a partner. Based on McCann et al. (2011)'s findings, it was predicted that living with a partner and children would be associated with reduced odds, while living with siblings would be associated with increased odds of being in a care home at follow-up (both also compared to living with a partner). It was also hypothesised that there would be sex/gender differences in which levels of the household structure variable would be important to men and women; with probable differences for living alone and being divorced/separated and married, and for living with a partner and children.

## **PART 4 – INFORMAL CARE**

### *LITERATURE REVIEW*

Note: this topic was not previously reviewed for another degree.

#### **Receiving Informal Care**

Lemmon (2020) reports that around 34% of older people living in Scotland have an informal carer. Since informal care is a proposed driver behind the association of HHS (McCann et al., 2011), it follows that informal care too should be explored in the literature and eventually this thesis research. Generally, there is evidence that informal care reduces formal care home use, or delays it (Bonsang, 2009; Gannon & Davin, 2010; Gaugler et al.,

2007; Jette et al., 1995; Lo Sasso & Johnson, 2002; Van Houtven & Norton, 2004). This suggests that informal care is protective against needing to enter a care/nursing home, so this is likely also true in Scotland.

Lo Sasso and Johnson (2002) found that informal care reduced the risk of nursing home admissions in their US sample; at two-year follow-up, those receiving informal care were 60% less likely to have entered a nursing home. Additionally, Jette et al. (1995) found a lower risk of nursing home admission for the older people in a US sample who received informal care. However, they also report that the risk was more than doubled for older people whose carer was a man, compared with those whose carer was a woman (Jette et al., 1995).

In European research, Gannon and Davin (2010) reported that in their French and Irish samples, informal care reduced the use of formal care services. The findings of Bonsang (2009), who used data from Survey on Health, Ageing and Retirement in Europe (SHARE), corroborate this; however, with the caveat that the protective effect of informal care diminishes when the disability of the care recipient increases. Alternatively, Kjær and Siren (2020) looked at the different care trajectories for the modes of care used by older people living in Denmark; they noted trajectories involving formal care homes were more common among older people living far away from children (a source of informal care), and/or with higher levels of disability, which fits with the findings of Bonsang (2009).

Therefore, there is good evidence to support the protective association of informal care and its role in reducing or delaying care/nursing home use. The sex/gender differences reported by Jette et al. (1995), where risk of using care was higher for older people with men as carers, fits with the pattern of married women experiencing higher risk of care use than married men - the marital status and sex interaction reported in the literature (McCann, Donnelly, et al., 2012; Tomiak et al., 2000). This relies on the assumptions that first, married women are cared for by their partner, and second, a

majority of heterosexual partnerships, meaning that women are generally partnered with men. However, this does not explain why men providing care places people at greater risk of using care homes; it could be that there is a difference in the quality or type of care provided by men and women. Alternatively, due to gender roles in society, and care being classed as “women’s work” (Neno, 2004), social services/care needs assessors could be more likely to determine an older person needs care in a care/nursing home when their informal carer is a man. Ultimately, this question remains unanswered, but demonstrates that sex/gender is an important factor for many aspects of care use.

### **Providing Informal Care**

Much of the research on informal care considers the role of children, as informal carers, however, for many older people it is their spouse who provides them with informal care. Therefore older people themselves may be carers, and this could be for spouses, partners, siblings, friends or other relatives – thus being a carer may have implications for older peoples own care risk. Del Bono et al. (2009) report that the economic contribution of informal carers is large, as this reduces the need for formal service provision; with Bell et al. (2006) reporting each spouse caregiver saves the government £28,840 annually. However, Neno (2004) conducted a literature review on spouse caregivers and concluded that older carers do not get the same level of support, yet older people may struggle providing care because they are old themselves and caregiving is physically and mentally demanding. Therefore, caregiving may have implications for older people’s own health and social care outcomes in later-life.

Del Bono et al. (2009) report that women provide more hours of informal care and to a wider range of people; while men predominantly only provide informal care to spouses. Accordingly, Neno (2004) also reports women providing the most care, particularly women in their sixties. They go on to equate this to the caregiver role being seen as “women’s work”, additionally, many women do not report providing informal care for spouses as they see

this as part of their role in marriage (Neno, 2004). Therefore, caregiving and any impact it has on later-life care needs may disproportionately affect women.

There is very little research on caregiving and the care outcomes for older carers. Predominantly, health outcomes are the focus of much of the literature on caregivers, with caregivers experiencing greater negative health outcomes than non-caregivers (Gibbons et al., 2014; Ornstein et al., 2019; Reiss-Sherwood et al., 2002). Ornstein et al. (2019) report that spouses who provide care in later-life are more likely to end up isolated, experience symptoms of depression and suffer negative health outcomes. These outcomes of caregiving are all factors which may make caregivers more vulnerable to care home admission themselves. Moreover, Gibbons et al. (2014) found that women who were caregivers experienced more burden, poorer mental and physical health, more depressive symptoms, and took part in fewer leisure activities than men. Notably, women also received less services and support with their caregiver role than men; which Gibbons et al. (2014) proposed was due to the societal view of caregiving as a women's role. Again, this evidence suggests caregiving could impact caregivers own care outcomes, and this may be exaggerated particularly for women.

Ultimately, the care outcomes for older caregivers themselves are under-researched. The evidence on other caregiving outcomes seem to suggest the caregiver role could have negative implications on independence in old age. Informal care has economic benefits for society, but not enough is known about the effect on the caregiver's own care outcomes, therefore, the effect of providing informal care on care use should be investigated further.

#### *RATIONALE FOR RESEARCH IN THIS THESIS – CHAPTER 8*

##### **Receiving Informal Care**

Research predominantly suggests that informal care is protectively associated with care home use, for example, both Jette et al. (1995) and Banjee et al. (2003) reported that having an informal carer was associated with reduced chances of using a formal care home in their respective US and



UK samples. However, there are some studies which have found results to the contrary, such as Friedman et al. (2006) who found receiving informal care was not associated with care use in their US sample. Then Cations et al. (2020) found that older people using a transitional care programme in Australia were more likely to return home, rather than into institutionalised care, if they did not have an informal carer at home. Thus, there is some inconsistency across studies. Which could be to do with other factors such as customs of care, which were discussed above in relation to household structure. Ultimately, to draw conclusions for Scotland, research needs to be undertaken on a Scottish sample.

Moreover, where research has been carried out in Scotland, this has taken a greater focus on formal and informal care within the home, after certain aspects of formal in-home care were provided free in Scotland from 2002 (Lemmon, 2020; Pickard, 2012). Lemmon (2020) found that in Scotland, older people with informal carers were more likely to make use of complimentary home care services; they proposed that an informal carer may help them seek out care services. Therefore, this might also be true for care/nursing home care; informal carers could be advocating for older people's care needs, and so increasing the likelihood the older person uses care/nursing home services. Thus, the effect of informal care on care/nursing home use should be explored in Scotland, to help understand the role of informal carers here.

### **Providing Informal Care**

The literature review above showed that the association between providing informal care for others and a person's own risk of using care is under-researched. Caregiver health has received more attention - generally, the literature suggests that caregiving has a negative impact on the physical and mental health of caregivers (Gibbons et al., 2014; Ornstein et al., 2019; Reiss-Sherwood et al., 2002; Spillman & Long, 2009). For example, Ornstein et al. (2019) report that spouses who provide care in later-life are more likely to end up isolated, experience symptoms of depression and suffer negative

health outcomes. This suggests that caregiving could have negative implications, particularly on physical health. In their literature review on caregiving, health and mortality, Vlachantoni et al. (2013) found that the conclusions overall were mixed, and they suggested these mixed findings might be a result of “healthy self-selection bias” of caregivers – those who go on to provide care tend to have generally better health to begin with.

Despite the mixed results about caregiver health, if caregiving does result in declining physical health, this is a known predictor of formal care use, evidenced by the literature (Gaugler et al., 2007; Greene & Ondrich, 1990; Grundy & Jitlal, 2007; Hancock et al., 2002; Harrison, Walesby, et al., 2017; Hébert et al., 2001; Jette et al., 1992; Luppá, Luck, Weyerer, et al., 2010; McCallum et al., 2005; Miller & Weissert, 2000; Tomiak et al., 2000).

Therefore, given the evidence that caregiving negatively impacts caregiver’s physical and mental health, it is possible that providing informal care could put older people at higher risk of using care themselves, even if by virtue of providing care, they were a healthier group of people to begin with.

Moreover, research on caregivers primarily considers child caregivers, when in reality many older people’s caregivers are their spouse - who is also an older person at risk of entering formal care. There are some studies of older care givers such as spouse caregivers (Ornstein et al., 2019), however, there appears to be a gap in the research around caregiving and older people’s own care use. Thus, exploring the association between providing care and one’s own risk of entering a care home, could be an important contribution to the understanding of risk factors to independence in old age.

#### *AIMS AND OBJECTIVES OF CHAPTER 8*

The aim of Chapter 8 was to explore how providing informal care and receiving informal care are associated with older people using care homes in Scotland. It was predicted that providing informal care may be associated with increased risk, due to the literature review suggesting that providing informal care has negative physical and mental health outcomes. It was

predicted that receiving informal care would be associated with reduced chances of using a care home, as informal care might buffer older people from needing to use care homes, as was suggested by the literature.

## TWO SAMPLES

Glaser et al. (2003) investigated older women's transitions to 'supported environments' (care homes and private households with relatives/support) using the English and Welsh Longitudinal Study (ONS LS). They did this using data for two decades, 1971-1981 and 1981-1991; this allowed them to compare older women's transitions in the earlier and later decade (Glaser et al., 2003). Similar to this piece of research, this thesis aimed to carry out research on older people's care home status at follow-up over two different time periods. Comparisons could then be made similarly to how Glaser et al. (2003) compared their decades. More information will be given on how this will be done in the next chapter. But it is important to acknowledge this influential piece of research, which also compared two decades of longitudinal study data.

## CONCLUSION

In conclusion, this literature review has covered four areas of research about social care: socio-demographics, self-rated health and geography, sex/gender differences, household structure and informal care. For each of these topics, the background literature has been discussed, and this has informed a rationale for a piece of research, plus corresponding aims and objectives. Each of these forms a basis for the chapters of this thesis that follow on from here; having identified gaps in knowledge, remaining questions and areas where research could be expanded.

Primarily this thesis undertook research on social care, and the factors associated with social care outcomes using Scottish data. It aimed to ascertain whether the findings about factors identified by previous research in other populations can be generalised to Scotland. Additionally, this literature review chapter has highlighted where further research around certain factors

and their association with care use in old age was needed. Moreover, it has identified other gaps in the literature, such as whether caregiving impacts care use patterns of the caregivers, and whether there are sex/gender differences in how factors other than marital status and household structure are associated with formal social care use. Also, it has identified methods in the literature (e.g. using two decades of data and comparing results), and these were used to inform the methodology used in this thesis.

Ultimately, this review has informed the research questions, direction, aims and methods of this thesis research, with the aim of undertaking research which will be relevant to the field of social care in Scotland and beyond. In the next chapter, Chapter 3, the Methods for the analyses undertaken by this thesis are described.

## CHAPTER 3 – METHODOLOGY: USING ADMINISTRATIVE DATA

### CHAPTER SUMMARY

This chapter discusses the quantitative methods used throughout this thesis. While each analysis used a different analytic technique or sample, the underlying methods and data source were the same. This thesis used administrative data, so some of the advantages, limitations and ethical considerations of using this type of data for research are discussed. Then, the outcome of interest that this thesis looked at - use of care/nursing homes in Scotland - which was measurable via administrative data, is presented and discussed.

This thesis used the Scottish Longitudinal Study (SLS) (<https://sls.lscs.ac.uk/>) which is a 5.3% random sample of the Scottish population, to access a measure of care outcome, plus a range of socio-demographic, geographical, health and household variables. This data source is described, along with the data control procedures which were adhered to. The chapter then documents the administrative data variables, and how these were utilised to derive the factors of interest in answering the research questions.

Some issues in undertaking this research occurred, these include issues with changing attitudes to terms such as sex and gender, and the COVID-19 Coronavirus Pandemic. These issues are discussed, and how they were overcome in the research explained.

### INTRODUCTION

This thesis used a quantitative methodology - administrative data linkage was used to explore social care for older adults in Scotland. While each analysis in this thesis had its own specific methodology, the over-arching methodology used for the analyses was the same. In this chapter the general methodology

is presented, along with more specific methods for the individual chapters/analyses. But in this chapter, a more general overview of the administrative data used, procedures involved and data processing is also given.

This chapter is comprised of three sections:

1. An introduction to administrative data, and some of the advantages, limitations and ethical considerations of using this data.
2. A detailed description of the Scottish Longitudinal Study (SLS) (<https://sls.lscs.ac.uk/>), the source of administrative data used to complete the research presented throughout this thesis. This includes information on the procedures to access the data, the variables used and the analyses, including subsections with chapter specific analysis information.
3. Other issues/considerations - primarily the implications of the COVID-19 Coronavirus Pandemic, and how the problems this presented were overcome.

#### WHAT ARE ADMINISTRATIVE DATA?

Administrative data are information collected about individuals or groups for a purpose other than research; they are usually collected for the purpose of record keeping or providing a service (Timofte et al., 2018). Some examples include:

- National records like registrations of births, marriages and deaths
- Health records like those held by the NHS or cancer registries
- National insurance, tax and income records like those held by the Department for Work and Pensions
- Education records like those held by schools, councils and Education Analytic Services in Scottish Government
- Data held by private companies on customers/clients.

Research using this type of data has greatly increased in recent decades – this has been termed a ‘big data revolution’ (Connelly et al., 2016). Current interest has moved towards instances where different forms of administrative data can be linked. Administrative Data Linkage is where records for individuals from different time periods, different sources or about different family or household members can be linked together (Harron et al., 2017). Doing this might create datasets that would be otherwise unattainable or very expensive to curate. This means linked data potentially offers an opportunity to answer new research questions. However, like any other data collection method, secondary data like these have their own advantages, disadvantages and ethical considerations, which are discussed below.

#### *BENEFITS OF ADMINISTRATIVE DATA*

There are numerous advantages to using administrative data which have made it an attractive resource for research, particularly in fields such as medicine, epidemiology, psychology, sociology, social policy and human geography. First, administrative data often provide large samples (Mazzali & Duca, 2015); large sample sizes are beneficial for ensuring statistical power in analyses; this means the power to detect small effects (e.g. rare risk factors, interactions, etc.), plus greater precision for effect sizes and confidence intervals.

Second, some sources of administrative data provide representative samples and some datasets may even include the entire population, for example censuses. This is valuable when research needs the findings to be generalisable to the wider population – as is common in epidemiology, public health and social policy research. Administrative datasets can include hard to reach groups and individuals often systematically excluded from other research designs (Harron et al., 2017), making them an appealing option. However, even censuses can still exclude some groups, such as homeless or traveller populations. Nevertheless, administrative datasets are generally more representative than traditional primary research datasets curated for research purposes (Penner & Dodge, 2019).

Third, by using administrative data it is often possible to undertake research that would be unfeasible otherwise, either due to cost, ethics or feasibility (Holman et al., 2008; Timofte et al., 2018). In terms of cost, since the data are already collected for another purpose, this greatly reduces costs associated with recruitment, data collection and follow-up. Despite the initial costs for the infrastructure needed to safely store, manage, archive and make the data available, the returns on this type of research are high (Holman et al., 2008). In terms of ethics, administrative data can be used to conduct natural experiments – this is where two treatment groups naturally occur for reasons outwith the research design. Natural experiments are valuable in cases where it would be unethical to manipulate these conditions for the purposes of research, for example manipulating people’s smoking behaviour. Moreover, using administrative data for this research minimises the burden of participation. Thus, administrative data can offer an opportunity to undertake research where it would be unethical to do so by other methods.

In terms of feasibility, administrative data can also offer longitudinal datasets - this is where there are data from different time points across an individual’s life course. These time points can be from short intervals (months or years), larger intervals (decades) or more arbitrary follow-ups (say 20, 30 years later). Longitudinal datasets will be discussed in further detail below in relation to a specific longitudinal study dataset used for this thesis research.

Additionally, administrative datasets can offer information which would otherwise be unavailable (Holman et al., 2008; Walesby et al., 2017). For example, researchers might be interested in how a disease suffered in adulthood might be predicted from factors in childhood. It would be less feasible to follow a cohort of children through their lives and observe if they develop the disease in adulthood, as this would take a very long time and if the disease was rare, a very large sample. Moreover, from an ethical point of view, during this time many people could suffer from a possibly preventable disease. Instead administrative data linkage means for a group of individuals,



information from their childhood could be subsequently added, thus allowing the research to be undertaken.

In conclusion, administrative data offer researchers the chance to undertake high quality research which might otherwise be unfeasible. This methodology offers a valuable and specialist tool which can overcome problems inherent in other research designs. However, despite the benefits, this data source is not without its disadvantages, and these are discussed next.

#### *LIMITATIONS OF ADMINISTRATIVE DATA*

By definition, administrative data were not originally collected for research purposes. This causes some limitations when using them for research (Hashimoto et al., 2014). These limitations fall broadly under two headings: issues with data *quality* and issues with data *access*. Data quality refers to how good the data are – whether they are accurate, reliable and complete. Data access refers to gaining permission to access the data. Unlike in experimental research, consent for participation is not taken at the outset. Generally, consent has not been obtained for the use of administrative data for research purposes. Therefore, this adds a layer of governance, ethical consideration and precautions to responsibly undertake research using this data. Below these limitations are expanded on, with a focus on the types and sources of administrative data used within this thesis.

#### **Data Quality**

A key limitation stems from the lack of control the researcher has over the collection of the data. Important considerations like what is measured, how it is measured and when it is measured are all out of the control of the researcher (Hashimoto et al., 2014). This means that sometimes the administrative data may not contain the exact information the researcher needs to answer their research question and they may have to resort to using proxy variables (Administrative Data Research Scotland, 2021). Proxy variables are essentially inferences - assuming one thing is probable, based on another. For example, income, wealth, socio-economic status and deprivation are often inferred using proxies like owning a car, owning a house

and by rankings about level of job seniority/professionalism (Allik et al., 2016). However, these measures are not always valid – for example, what owning a car tell us about wealth is limited, first, owning a Ford Fiesta is not the same as owning a Tesla Model Y; then second, in rural areas it might be necessary to own a car, so car ownership may be prioritised at great cost to families (Allik et al., 2016). Accordingly, this can affect the research findings. Moreover, the lack of choice over measures affects replicability – different measures for variables such as different deprivation scales, may need to be used due to what data are available.

There can also be issues with the reliability of data. Like any data source, administrative data can suffer from errors in recording. Each type of administrative data will have its own possible sources of error and it is important to understand these and how they might affect the research. For example with census data, there are several possible ways that errors could affect the reliability of data, such as respondents misinterpreting questions, illegible handwriting, faulty readings or inputs during digitalisation (process for creating electronic records from paper records), an artefact of the question asked or even deliberate errors by the respondent. Deliberate errors in census data were demonstrated by the 2011 Scottish Census where there was a campaign by members of the public to record religion as “Jedi Knight” (a fictional rank within the Order of Jedi from the Star Wars expanded universe franchise (Lucas, 1977)). This was an elaborate joke, resulting in the 2011 Scottish Census showing that 11,746 people reported their religion as a Jedi Knight (Scotland's Census, 2014). This shows that even official statistics have issues of reliability, and it is important to be aware of this when conducting research using such data.

Missingness is also a problem for administrative records (Administrative Data Research Scotland, 2021). Data points can be missing for a variety of reasons depending on the particular source (Hashimoto et al., 2014; Holman et al., 2008). On occasion, how administrative data are collected may lead to missingness being non-random – and thus a source of bias within the

dataset. For example, a badly worded census question can lead to certain groups being unable to find a response applicable to them, and so may not respond to that question. This would then result in systematic bias, with that group more likely to have missing responses for that question. This has implications for methods of dealing with missingness – e.g. imputation, which should not be done when data points are not missing at random. Despite great care being taken to test census questions and address any issues, there are still cases where this might apply. In less rigorously collected datasets, there may be an even greater possibility of this happening.

These are just some general issues of data quality affecting research using administrative data. There will be specific quality issues which apply to each dataset. The large sample sizes often available when using administrative data may overcome some of these issues to an extent, but it is still important to be aware of these limitations. The impact of these limitations will vary depending on each research project, the research questions and the data source independently.

### **Data Access**

Data access is a hurdle for any research wishing to use administrative data because the individuals whose data will be used, frequently have not given consent for their personal data to be used for research purposes. There are some exceptions such as the Scottish Health Survey which explicitly states the data will be used for research purposes (Scottish Government, 2021). Lack of consent raises ethical debate over whether the data should or should not be used for research, and this will be discussed further below. However, where use of the datasets has been deemed appropriate, this is usually requires that certain procedures are adhered to, which aim to:

1. maintain the privacy and confidentiality of the people whose data is held within the administrative data sources (e.g. "the five safes" – five areas of data safety) (Administrative Data Research Scotland, 2021; Desai et al., 2016)

2. ensure that there is some public benefit or service/policy improvement resulting from the use of the data (Scottish Centre for Administrative Data Research, 2022)

Therefore accessing these datasets usually involves several layers of data governance processes and practices (Administrative Data Research Scotland, 2021). However, navigating these can be a limitation to conducting research this way, and this will be discussed here.

First, accessing data can be time consuming and the data required are not always available in time (Dattani et al., 2013; Harron et al., 2017; Lemmon, 2021). While there is no data collection process, there is usually at least one, if not multiple, ethics and data access application processes; so these applications can be lengthy and time consuming and do not necessarily save time compared to traditional experimental designs (Administrative Data Research Scotland, 2021). Research using administrative data frequently over-runs predicted timescales, and this can be particularly problematic if research is required in a timely fashion, such as when informing policy, evaluating interventions or for time-limited projects such as PhD theses (Lemmon, 2021). Time from application submission to approval for data release can vary substantially depending on data source and number of datasets linked (Administrative Data Research Scotland, 2021).

Consequently, the data source used for a particular project may not always be the best available – instead it might be datasets which can be accessed within the research timescale. For example, researcher may wish to use a 100% sample of Scottish data from the Scottish Census, but may use the 5% sample available from the SLS instead, as this could meet the projects needs in a far shorter timescale (Administrative Data Research Scotland, 2021).

Second, there is no guarantee that permission for data access or requested linkages will be granted. Sometimes partial permission is granted where data controllers and researchers reach a compromise. For example a less granular version of a location variable might be agreed where location is

important within the research, but detailed location variables might be considered too disclosive (Administrative Data Research Scotland, 2021). Sometimes the linkages requested for a particular project may not have been made before (Lemmon, 2021); consequently, the data that exist in practice are not always available for research use. The ideal research methodology is not always possible, and sometimes several compromises have to be made which can impact the quality of the analysis. Moreover, each project is very complex and has its own associated issues so the granting, or not, of permissions can appear subjective. This lack of consistency stems from decisions about access relying on subjective judgements, often made by committees, about the balance between the risk and the benefit of the research.

Finally, use of administrative data may have strict rules about how the data can be analysed and reported, as extra protections against potentially disclosive data being made publicly available. In some cases, datasets will only be available to researchers to analyse from within a safe-setting (also known as a secure lab or safe-haven), this is a strictly controlled physical environment that a researcher must travel to (although since the original time of writing, some safe-settings can now be accessed remotely via the internet due to COVID-19 adaptations) (Administrative Data Research Scotland, 2021). Within a safe-setting, pseudonymised data can be made available for research purposes; the computers have no internet access, and data must not leave this environment, researchers must adhere to strict rules when entering and accessing their data, and must have completed Data Governance training (UK Data Service, 2012). Once analyses are completed, to remove the results from the safe-setting requires a disclosure control process, where the data controller examines the output to check no disclosive data or results are being taken away (UK Data Service, 2012). These processes may take a number of days for each output, and again sometimes compromises have to be made about which results can be removed from the safe-setting, censoring or rounding of small cell counts in

tables, limits on similar statistical models, etc (Administrative Data Research Scotland, 2021). Therefore, the analysis process can be time-consuming and the results a researcher can report are sometimes restricted.

### **Summary of Limitations**

In summary, despite the advantages of administrative data research, there are also numerous limitations – the application processes, access is not always granted, the procedures around analysis, data quality and the overall time-consuming nature of all these aspects of the research. So while the potential of research with administrative data are great, in practice, these research projects are often constrained by these limitations outlined above. This is not an exhaustive account of the possible limitations, and each individual data source will have its own specific limitations to weigh up during research design phase of a project. However, despite these limitations, administrative data can be a valuable way to answer research questions and in many cases, the benefits can outweigh these limitations.

### *ETHICAL CONSIDERATIONS*

The ethical considerations with the use of administrative data are vast and have received detailed appraisals elsewhere (see Hand (2018) or Stiles and Boothroyd (2015) for more detailed discussions). In the UK, the importance of research using administrative data has been recognised by government, researchers, funding bodies and data controllers; as such efforts have been made to develop the infrastructure and procedures which can allow safe and secure access to and linkage of various administrative datasets (Brett & Deary, 2014). One such initiative is the Scottish Centre for Administrative Data Research (SCADR) (Scottish Centre for Administrative Data Research, 2021) which is a multi-centre organisation; it manages these ethical considerations by creating the infrastructure for administrative data research to be undertaken in a safe and secure way, consulting a panel of members of the public about research using administrative data and training researchers in safe usage of administrative data (Administrative Data Research Scotland,

2021; Iveson & Deary, 2019; Scottish Centre for Administrative Data Research, 2022).

So while many of the ethical considerations are managed and dealt with by initiatives to facilitate research, it is still important for researchers to understand these issues. Here, three of the main issues – consent, privacy and confidentiality, and beneficence – will be outlined to demonstrate the kind of considerations which must be made when choosing to use administrative data for research purposes.

### **Consent**

For most studies using human participants, informed consent is a prerequisite to undertaking the research. Consent is mandated in many ethical and practical guidelines for research with human subjects – for example, the Declaration of Helsinki (Declaration of Helsinki, 1964). However, with administrative data obtaining informed consent could be very costly, difficult, and in some cases impossible – e.g. where individuals have died or are otherwise untraceable (Academy of Medical Sciences, 2006). Therefore, in order to use administrative data without consent, alternative actions and principles must be followed instead, to protect the data used and carry out research with integrity (Brett & Deary, 2014; Regidor, 2004). Generally, this means stricter controls over the access to these data, to ensure the research maintains the privacy and confidentiality of the participants whose data will be used, and that the research justifies using these data with research impact and public benefit.

### **Privacy and Confidentiality**

Privacy and confidentiality must be maintained and one of the problems with administrative data is that individuals could possibly be identified from their data - even if the data are anonymised, it can be potentially disclosive (Goldacre, 2014). The risk of identification increases with the more information or linkages there are – as the more information about each individual, the more likely it is that they can be identified (Administrative Data Research Network, 2017). A further problem is the possibility of data leaks –

which would constitute a breach of privacy and confidentiality. Data leaks are extremely rare, especially within research uses of administrative data, but remain a possibility (Academy of Medical Sciences, 2006; Davies & Collins, 2006; Jutte et al., 2011). The impact of data leaks is considerable, affecting the reputation of the data controller, the researcher and data linkage research itself (Administrative Data Research Network, 2017). Therefore, to reduce these risks there are several measures which can be taken, such as having a robust infrastructure for securing the data, statistical disclosure checking any results/findings, and relevant data security training for researchers and staff (Desai et al., 2016).

### **Beneficence**

Beneficence is whether the burden of participation in research, is balanced with a benefit resulting from participation; in public health research this issue arises because usually the benefit is to the general public and not the individual (Charlton, 2001). However, as mentioned earlier, the burden to the individual of this type of research is far less than participation in more traditional human-subject research. Moreover, there is good evidence that the benefits to the public are considerable: Brook et al. (2008) reviewed the outcomes of data linkage studies in Western Australia and reported a significant impact on clinical practice and public policy resulting from this research. Therefore, if privacy and confidentiality are protected, the burden to the individuals whose data are used is negligible, while the impact of such research on clinical practice and policy can be considerable.

### **Summary**

In conclusion, this section has presented some key ethical considerations when undertaking administrative data research. Additionally there are ethical implications from not undertaking administrative data research.

Administrative data already exist and have great research potential – they are a valuable resource with the capacity to influence a multitude of factors in society, such as healthcare, social care, medical treatments and social policies. Therefore, it may be unethical *not* to make use of administrative



data for research purposes, if they exist and have such potential impacts across society (Jones et al., 2017). This notion is behind the “Data Saves Lives” initiative by the UK Government and the NHS (GOV.UK, 2021; NHSx, 2021). Moreover, as the use of administrative data does not involve active participation, compared to other research methodologies it is relatively non-invasive. Ultimately, despite the ethical concerns of using administrative data, failing to take advantage of the research potential of this data may be a more irresponsible action.

## SOCIAL CARE OUTCOMES

As outlined in previous chapters, this thesis will investigate the use of nursing/care homes in Scotland. Thus, data about whether or not older people are in a care/nursing home will be required. In Scotland there is no central register recording when or if people enter social care institutions like nursing and care homes (Burton & Guthrie, 2018). Therefore, to carry out research on this outcome, it will have to be measured by proxy through administrative data. There are only a few ways to do this currently, one of which is through Scotland’s Census (Scotland's Census, 2021b) which has a variable that reports if a person is living in a private or communal residence. If a person is living in a communal residence, with a few exceptions, this will indicate that a person is in a social care facility. This is the measure of care outcome that will be used throughout this thesis and more details on this and the exceptions, will be provided below.

Census data can be accessed via the SLS (<https://sls.lscs.ac.uk/>), along with other administrative data. This was the method of accessing the census data that I used throughout this thesis, so now the SLS, data extracts, variables, methodology and analyses will be described in more detail.

## SCOTTISH LONGITUDINAL STUDY (SLS)

The SLS (<https://sls.lscs.ac.uk/>) is a 5.3% random sample of the Scottish population. It contains linked information from the census, administrative data, vital events like death, birth and marriage registrations and education

data (Boyle et al., 2009; Hattersley & Boyle, 2007; Scottish Longitudinal Study Development & Support Unit, 2017). The variables available cover a range of socio-demographics, geography, migration, housing and some health measures. SLS members are selected randomly from the general population of Scotland, using twenty birthdates which remain secret. Data from different censuses can be linked for SLS members, providing longitudinal datasets.

The SLS is a project of the University of Edinburgh and sponsored by funding from National Records of Scotland (NRS) and UKRI ESRC; the University of Edinburgh and NRS are joint data controllers, and NRS own the datasets (with the exception of the education datasets) (Scottish Longitudinal Study Development & Support Unit – University of Edinburgh, 2023). The SLS is part of both the Census and Administrative Data Longitudinal Studies Hub (CALLS-HUB) and Longitudinal Studies Centre Scotland (LSCS) (Scottish Longitudinal Study Development & Support Unit – University of Edinburgh, 2023). There are equivalent longitudinal studies set up in England and Wales (ONS LS), and Northern Ireland (NILS); although there are some small differences between each longitudinal study.

### *SAMPLES*

For the research presented in this thesis, I applied for, and was granted permission to access two samples of SLS data:

1. 1991-2001 [N = 14,528]  
(people aged 65 and older at the 1991 census date; plus linked records for 2001)
2. 2001-2011 [N = 14,362]  
(people aged 65 and older at the 2001 census date; plus linked records for 2011)

These two samples are referred to as sample 1 (1991-2001) and sample 2 (2001-2011), or defined by the period they span, throughout this thesis. Access to a third sample was granted but this was not used for any of the

analyses presented in this thesis due to changes in scope of the project, some of which will be detailed later in this chapter. Sample 1 and sample 2 were equivalent, other than sampling eligible SLS members 10 years apart. Note: there will be some overlap in the samples, as the selection criteria which sample an SLS member aged 65 in sample 1, will also be sample that same SLS member aged 75 in sample 2. For all samples, some household members' data was also requested.

#### *LINKAGE*

Record linkage was performed by the SLS, however linked records were provided in extracts to the researcher, and each extract was a separate dataset. Note: Extracts are individual datasets from different SLS database holdings, e.g. the 2001 SLS members table, and 2001 SLS Non-Members table (household members). All individual SLS members have an SLS number, which allows the records from the different extracts/datasets to be joined by the researcher into longitudinal datasets using an appropriate statistics programme.

#### *APPLICATION PROCEDURE*

To access SLS data, an application form must be completed by the primary researcher, with guidance from an SLS Support Officer (Scottish Longitudinal Study Development & Support Unit, 2021b). The application must include details of the planned analyses, the research team, demonstration of ethical considerations and list the variables and samples the researcher wishes to gain access to. The application also requires that all members of the research team have valid data privacy and confidentiality training (e.g. SURE safe researcher training (Administrative Data Research Network, 2017)) and that ethics approval has been obtained from a relevant ethics board.

The main researcher also must complete an SLS Undertaking Form. In this form the researcher signs to say they are aware of their responsibilities when undertaking their analyses (Scottish Longitudinal Study Development & Support Unit, 2021b). This covers data privacy and confidentiality, ethics and disclosure; it binds the researcher to follow the SLS data processing rules.

The main researcher must also attain SLS Approved Researcher Status (Scottish Longitudinal Study Development & Support Unit, 2021b) which requires a further application to demonstrate they have completed appropriate training and have experience handling sensitive data. Additionally, for student researchers, an additional application form – the Student Accreditation Form – must be completed by the main supervisor.

Following these application procedures the National Records of Scotland (NRS) SLS Project Manager reviews the application before passing it to the SLS Research Board – a panel of independent researchers, NRS staff and lay individuals (Scottish Longitudinal Study Development & Support Unit, 2021b). The SLS Research Board then reviews the application and decide whether it should be supported. For a project to go ahead it must pass the Board's approval.

#### *ETHICS APPROVAL*

Ethics approval for this project was sought and received from the School of Philosophy, Psychology and Language Sciences (PPLS) Research Ethics Committee at University Of Edinburgh. The original ethics application was submitted on 07/11/2017 and permission was granted on 22/02/2018. The ethics form was amended due to some changes in the project, and all changes were approved. A copy of the final ethics form is available in Appendix A.

#### *VARIABLES*

The SLS variables for this thesis were requested in two samples, via two separate data applications. Details of the exact variables requested can be found in Appendix B (Sample 1) Appendix C (Sample 2). Administrative data were not created for research, so the variables available usually need recoding/processing for analysis. Where the variable of interest is not directly measured, this also needs to be derived from the available variables. Below, are the details of how the variables and outcomes were recoded and derived from the SLS variables.

## **Outcomes**

The outcome of interest was whether the SLS member was living at home or in a care/nursing home at follow-up. This was a binary outcome where 0 = Not in care, and 1 = in care. Outcomes were measured either in 2001 or 2011, depending on the analysis.

### *2001 Care Outcome*

The variable “pertyp0” codes whether the SLS member is living in a private or communal residence in 2001. Those living in a communal residence were determined to be in a care/nursing home, while those living in a private residence were not. Exclusions were made for SLS members who were in a communal establishment which was not likely to be care/nursing home (e.g. prisons) using a series of client type variables (“CETCLT\_”), which code what type of clients the communal establishment caters for e.g. older adults, prisoners.

### *2011 Care Outcome*

The variable “residence\_type1” codes whether the SLS member is living in a private or communal residence in 2011. Those living in a communal residence were determined to be in a care/nursing home, while those living in a private residence were not. Exclusions were made for SLS members who were in a communal establishment which was not likely to be care/nursing home (e.g. prisons) using a series of client group variables (“CLIENTS\_”), again this codes what type of clients the communal establishment caters for e.g. older adults, prisoners.

## **Variables**

The variables included a range of socio-demographics, geography, health, household features and carer/care recipient status, which were either informed by the literature review in Chapter 2, or were hypothetically important to care use in Scotland. These variables were all measured in the census prior to the outcomes, so respectively either in 1991 or 2001, depending on the analysis.

Note: where the SLS extract variables are in the same format at both censuses, only one description of how the variable was recoded/derived will be given. For the SLS variable identifiers, these will be presented in the format (1991/2001). Where two descriptions are required because the SLS extract variables differ, 1991 will be presented first and 2001 second.

### *Age*

Age provided by the SLS were continuous variables (ageten9/agep0) and were recoded into a categorical variable with four levels: 65-69, 70-74, 75-79 and 80+. Discrete binning of this variable was applied because age was not strictly a linear predictor, with older ages showing greater increases in the proportions of people using care at follow-up. Similar binning of age has been used throughout the literature.

### *Sex*

Sex was already provided in binary variables (sex/sex0), so accordingly this variable has two levels: Male and Female. Where sex was missing at the initial time-point, this was derived from the later time-point if available there. This was justified on the basis that sex/gender for the majority of people in this age group/generation, remains stable over time. See below in “Sex versus Gender” section for a further discussion about whether this variable refers to sex or gender, and how this will be handled throughout the thesis.

### *Marital Status*

How marital status was coded varied between censuses, but in both instances it was recoded into a variable with four levels: married, single, divorced and widowed. In 1991, the marital status variable (mstatt9) had five levels: single, married (first marriage), remarried, divorced and widowed; so here married (first marriage) and remarried were collapsed into one category to form the marital status variable. In 2001, the marital status variable (mstp0) had six levels: single (never married), married (first marriage), remarried, separated (but still legally married), divorced and widowed; this time married (first marriage) and remarried were again collapsed into one

category, as were separated (but still legally married) and divorced, this formed the equivalent marital status variable for 2001.

### *Education*

The SLS variable for highest level of qualification (qmlvhqt9), was used to determine further educational level. This was a three level variable with the levels: none, below degree level and degree or higher. Note: this was only available for 1991, see below in “Notes on Variables” for further information.

### *Long-term Illness*

Long-term condition was determined from a census question asking whether respondents had a long-term limiting illness, with a yes/no answer, so the variable was already binary (liti9/liti0). The long-term conditions variable has two levels: No Long-term Condition and Long-term Condition.

Note: in Chapter 4 a manuscript is presented and here the levels are ‘Healthy’ and ‘Longterm Condition’. However it should be noted that healthy has been chosen as it differentiates between those with a long-term condition and those without, so this has the caveat that it really only means freedom from a long-term limiting condition or that the person did not report a long-term limiting condition. It does not give any indication to the healthiness of the SLS member outside of this.

### *Deprivation*

Level of deprivation was determined from the Carstairs’s Population-Weighted Deprivation Decile variable estimates at the census dates (cardec9/cardec0). Carstairs’s Deprivation is an area-level deprivation measure based on car ownership, occupational social class, men’s unemployment and overcrowding in households (Carstairs & Morris, 1990; ISD Scotland, 2017). This was supplied by the SLS at output area level which is the smallest geography level in Scotland; per output area there are a minimum of 20 households and a maximum of 78 households. The recoded deprivation variable has five levels: Low, Low-Medium, Medium, Medium-High and High;

these were formed by collapsing two deciles into each level e.g. Deciles one and two into level one, and so on.

### *Housing Tenure*

Housing tenure was determined from the SLS variable for tenure (tenure9/tenh0), which comes from a census question about the tenure status of the house the respondent lives in. The housing tenure variable has two levels: Rent and Own. However in 1991, the original SLS variable had nine levels so these were recoded so that Rent included: Scottish special housing association/Scottish homes, With job/farm/shop and other business, Local Authority (Council), New Town Corporation, Housing Association or Charitable Trust, Private landlord – furnished and Private landlord - unfurnished; while Own included: Owner occupier – mortgage and Owner occupier - outright. Similarly, in 2001, the original SLS variable had ten levels, here Rent included: all levels stating “social rent”, “private rent” and lives rent free; while Own included: all levels stating “owned”.

### *Urban Rural Classification*

Urban Rural Classification is an area-level geographical variable, so was supplied at output area level as with deprivation. The original SLS variable (urshs60 for both 1991 and 2001) gave the Scottish Government 6-fold Urban Rural Classification at the census dates, this ranges from large urban settlements with over 125,000 people to remote rural settlements with less than 3,000 people (Scottish Government, 2014). The two small town (accessible small town and inaccessible small town) and two rural (accessible rural and inaccessible rural) categories were condensed, meaning the Urban Rural Classification variable had four levels: City, Urban, Small Town and Rural.

### *Population Density*

Population density is also an area-level geographical variable, so supplied at output area level. The original SLS variable (density9/density0) is continuous and measured in persons per square kilometre (ppkm<sup>2</sup>) at the census dates.



This was transformed into a categorical variable with three levels: High (>5000 ppkm<sup>2</sup>), Medium (1000-5000ppkm<sup>2</sup>) and Low (<1000ppkm<sup>2</sup>).

### *Flat*

Flat was derived from the original SLS variable for house type (bldtype9/acch0), which came from a census question asking respondents to report the type of house they lived in. The 1991 original SLS variable had eight levels: Caravan, Detached, Semi-detached, Terraced (including end terrace), Whole purpose built flat/maisonette – commercial block, Whole purpose built flat/maisonette – in block of flats, Part of a converted/shared house/flat with separate entrance and Part of a converted/shared house/flat with shared entrance. This was recoded into the variable, Flat, with two levels: Not a flat and Flat. Flat included both Whole purpose built flat/maisonette categories, and both Part of a converted/shared house/flat categories. The 2001 original SLS variable had seven levels: Detached, Semi-detached, Terraced, Purpose built block of flats or tenement, Part of a converted or shared house, Commercial Building and A caravan or other mobile or temporary structure. This time, Flat included: Purpose built block of flats or tenement and Part of a converted or shared house.

### *Recent Work*

Recent work was derived from the SLS variable (hrswrkd9/houp0) for the number of hours respondents report in the census that they work per week. This includes if the person is no longer working but held a job at any point in the last ten years. The variable 'recent work' is categorical, with two levels: No Recent Work and Recent Work; if respondents reported any number of hours >0, then this was coded as Recent Work.

### *Carer*

Carer was derived from the SLS variable about providing informal care (help0), this comes from census question asking respondents if they are a carer and how many hours care they provide. The variable carer has two levels: No and Yes; Yes was derived for any SLS member reporting providing hours of unpaid care. Note: this was only available from 2001 onwards.

### *Informal Care*

Informal care is a variable derived by proxy, and suggests an SLS Member was potentially receiving informal care from a household member, since the SLS also has census responses (i.e., help0) for people living in the same household. This variable has two levels: No and Yes. It was derived from the Household Members data extract for SLS Members, and Yes was inferred if any household member reported providing any hours of unpaid care (help0). Note: this was only available from 2001 onwards.

### *Household Structure*

Household Structure (HHS) is a variable referring to which relatives an SLS Member was living with, so this was also derived from the Household Members data extract. This variable was based on the variable used by McCann et al. (2011) to describe the living arrangements of older people in their own social care research. Creating an identical version of McCann et al. (2011)'s variable was not possible, due to low numbers in some of the categories in the SLS data, so some categories were collapsed. "Lives alone: Divorced" and "Lives alone: Widowed" were combined into one category - "Lives alone: Divorced/Widowed"; then "Lives with: Partner and children" and "Lives with: Partner and others" were also condensed into one category - "Lives with: Partner and others". This means that the variable devised by McCann et al. (2011) had 10 levels and the HHS variable used in this study had 8 levels. See Table 4 for a clearer breakdown of how the categories were collapsed from the variable McCann et al. (2011) used, to the version of the HHS variable used in this thesis.

Table 4.

Table Showing the Variable Levels for Household Structure Used by McCann et al. (2011) and this Thesis

A table showing the levels of the household structure (HHS) variable used by McCann et al. (2011) and the levels of the HHS variable this study will use. Some of the levels used by McCann et al. (2011), were combined due to low numbers in the Scottish data for these level. So the table shows how these levels translate between the studies.

McCann et al. (2011)'s Variable		This study's HHS variable	
Lives alone:	Single	Lives alone:	Single
	Married		Married
	Divorced		Divorced/Widowed
	Widowed		
Lives with:	Partner	Lives with:	Partner
	Partner and children		Partner and others
	Partner and others		
	Sibling(s)		
	Children		Children
	Others/complex		Others/complex

The SLS variable *Isrelat9/Isrelat0* is an SLS derived variable, which determines the likely relationship of each household member to the SLS Member from the relationship questions in the census. Where the SLS member is not the head of the household, this can be difficult to determine, as the census asks respondents for their relationship to the head of the household; therefore, determining how these household members relate to the SLS member via how they and the SLS member relate to the head of the household can be uncertain, thus there is a possibility for error. This variable and the marital status variable were both used to reproduce McCann et al. (2011)'s living arrangements variable.

If the SLS member has no household members, then their marital status variable was used to categorise them within the “lives alone” levels of HHS. If an SLS member had household members, then these were recoded as follows. Note: the *Isrelat9/Isrelat0* levels were different, but coded similar relations, therefore this was matched as closely as possible. If the only other household member was a partner/spouse, this was coded as “lives with Partner”. Where an SLS member lived with a spouse/partner and other people, this was coded as “lives with Partner and Others”. If a sibling was present in the household, this was then coded as “Lives with Sibling(s)”. If a Child was present in the household, then this was coded as “Lives with Child”. For all other households not already specified, where SLS member did not live alone, but had not met the criteria for any of the other HHS categories, this was coded as “Lives with Others/Complex”.

The coding was run in this order, which will have affected how HHS was derived. For example, if an SLS member lived with a partner and a sibling, their HHS would be “Partner and Others”, or if they lived with a child and a sibling, their HHS would be “Lives with Sibling” – due to the order the code was run. Thus, there could be some ambiguity in this variable, where the SLS member could have been in either category; but this was the method used in this thesis, as there was no variable for more complex HHS breakdowns like sibling and child in the original variable in McCann et al. (2011). The order was determined based on McCann et al. (2011); the categories they observed effects for, were put higher in the coding priority.

### **Exclusions**

SLS members were excluded from the analytic sample (subset of the original SLS extracts used for analysis) where there were missing data for any of the SLS variables used to derive the variables. This broad exclusion criterion was used to reduce the disclosure risks. If there were a different number of SLS members included in the samples for each analysis (due to missingness for the different variables included in each analysis), this could lead to outputs failing to adhere to the Statistical Disclosure Control procedures (if

the difference between the n in the samples/levels of variables was <10, these outputs would not be approved for removal from the safe-setting). Therefore, dealing with missingness this way ensured the samples remained consistent to minimise risks for Statistical Disclosure Control.

SLS members were also excluded from the analytic sample on the basis of a data quality check. This involved checking whether the recorded age at the two time points (initial census and follow-up census) differed by <8 or >12 years. If the ages differed by more or less than these criteria, true age could not be verified. Since age was used to select the sample (aged 65 and older) and was an important covariate, these cases were not included in the analytic sample. The age should have differed by 10 years, however, the +/- 2 year tolerance allowed for small disparities such as censuses not being completed exactly 10 years apart.

### **Notes on variables**

Due to the nature of the census, and questions evolving over time, some variables were different at each census. Therefore a new version of the variable was created for the analysis which tried to make the variable consistent across all time points. For example – marital status changes in each census due to the changing attitudes/trends in marriage, divorce, re-marriage and equality; such as changes in law around same-sex civil partnerships (Note: same-sex marriage was not legalised in the time periods studied in this thesis). Therefore, combining categories into single, married, divorced and widowed meant this could be harmonised across the samples.

Additionally, in 2001 the census changed how it recorded the highest level of qualification, which was used to derive the education variable used in this thesis. This variable was no longer recorded for people aged 75 years and older – meaning it was missing not at random, for all people over a certain age (75) in the sample, therefore education could no longer be included in analyses looking at predictors from 2001. Then for the 2001 census, variables on informal (unpaid) care were added; so this allowed new

variables (providing informal care and receiving informal care) to be derived for the second sample (2001-2011).

### *Variable Terminology*

The term factor is used to refer to the independent variables and variables controlled for in the analyses outside of this Methods chapter. As different variables are both independent variables and control variables in different models throughout the analyses, the word factor offers a way to refer to all of these variables more generally, in a way that makes intuitive sense to non-statisticians, non-quantitative researchers and lay persons. However, factor in the English language is defined as something that is influential or causative (Cambridge Dictionary, 2022). Therefore, it is important to clarify that its use throughout this thesis is not meant to imply causation. As determining causation is outside the remit of the analyses presented here. Alternative terminology suffers other problems, like not making sense in lay language, discussion or not having the same grammatical attributes. Moreover, factor is used frequently throughout the existing literature (for examples see Fernández-Carro and Evandrou (2014); Greene and Ondrich (1990); Grundy and Jitlal (2007); McCann et al. (2014); Tomiak et al. (2000)). Therefore, factor is used throughout the thesis with the caveat that it should not be interpreted to mean that the author believes the analyses are capable of determining cause and effect for these variables, relative to the outcome variable (care home use in old age).

### **Gender versus Sex**

Since a lot of the background research was undertaken, there has been a shift in awareness around the difference between sex and gender. So in this section, some clarification of how sex and gender was handled throughout the thesis is provided. Since investigating the difference between sex and gender in Scotland would be a PhD project or more in itself, this was outside the remit of this thesis. However, it is important to be transparent about how this was handled, so that the findings of this thesis can be understood in context.

Firstly, sex and gender as they were defined at the time of writing (2021-2022), are described:

### *Sex*

Sex is a binary assignment given at birth, either Male or Female, and it is usually based on primary sex characteristics such as genitalia (Stonewall, 2017). A binary split for sex is over-simplistic, while there are generally two sexes, there is still variation because sex is determined by four factors – chromosomes, gonads, genitalia and hormones; and there are not just two possible arrangements for all four of these factors (Ainsworth, 2015; Karkazis, 2019).

### *Gender*

Gender is a social construct referring the how feminine or masculine a person presents, or how they wish to identify; however it is commonly assumed to be binary and based on the sex people are assigned a birth (Stonewall, 2017). Generally there are two main genders – being a Man or being a Woman, however, there are a whole spectrum of genders in-between, which fall under non-binary gender.

### *Handling throughout this thesis*

This thesis used census data, and in the 1991/2001 census, the questions on sex/gender asked respondents to report their sex. But the question wording did not specify sex assigned at birth, so it is possible that respondents responded with their gender, or selected at random where their gender identity was not offered as an option. However, given that in the generations included in the samples, acceptance and legal protections were not afforded for trans or non-binary people, it is unlikely many were able to present authentically at the time. “Presenting authentically” will be used throughout this thesis to mean that people can identify as LGBTQ+, and live their lives freely under those characteristics; as opposed to trying to pass as straight/heterosexual or cis-gendered.

In all the SLS data, the variable is referred to as sex and the levels reported are female and male. Therefore, in tables and when referring to the variable derived from this SLS sex variable, this thesis will use the term “sex”, and level names Male and Female. Note: there was no non-binary gender options in censuses prior to 2022, so this binary split is not meant to be exclusionary, but is simply an artefact of the administrative data.

However, when discussing the effects of this variable, the term sex/gender will be used unless specifically discussing sex effects – effects believed to relate to biological characteristics of people determined male or female; or gender effects – effects believed to relate to gender roles and socially accepted norms of gender expression within society. Sex/gender is used to highlight the current ambiguity, as in 2021/2022 society seems to be at a precipice of change. Therefore, by using this deliberately ambiguous term, it is hoped that this communicates the indication of sex given by the administrative data; but also acknowledges that this might be a dated/simplistic understanding of sex/gender for people reading this research both at the time of writing in 2021/2022, and the future.

Moreover, this acknowledges that in most previous work, sex and gender terms have been used synonymously. So it bridges the divide between working in a manner consistent with the literature and field; but also acknowledging that there may soon be changes to this in future research and methods. By using sex/gender, this thesis will attempt to remain as transparent as possible about what is being discussed.

## *ANALYSIS*

### **Chapter specific analysis details**

First, descriptive statistics were produced to describe the sample and the number and percentage of older people who entered care at follow-up.

Whether this varied for older people with certain characteristics, explained by the variables (factors) which were explored in each chapter of this thesis, were also then presented. Note: the term factors will be used here to remain consistent with the analysis chapters.



#### *Chapter 4*

The analyses presented in Chapter 4 investigated the socio-demographic, self-rated health and geographical factors associated with care home use at follow-up for older people in Scotland using the 1991-2001 sample of SLS members. Logistic regression was used to model likelihood of being in care at follow-up in 2001. The models were built as follows:

1. Model 1 - a risk model was created including the established factors (factors associated with care use in other populations) including: age, sex, marital status, education/qualifications, deprivation, long-term illness, urban rural classification (URC) and housing tenure, and then an interaction term for marital status and sex (marital status:sex).
2. Model 2 – the risk model plus recent employment.
3. Model 3 – the risk model plus living in a flat.
4. Model 4 – the risk model plus population density (PD).
5. Model 5 – a full model including all of the established factors and all three lesser researched factors (called novel factors in the manuscript) – recent employment, living in a flat and PD.
6. Model 6 – the full model plus and interaction term between PD and URC (PD:URC). This model was then used to calculate combined odds ratios and accompanying 95% confidence intervals for the interaction term PD:URC.

#### *Chapter 5*

The analyses presented in Chapter 5 investigated the socio-demographic, self-rated health and geographical factors associated with care home use at follow-up for older people in Scotland using the 2001-2011 sample of SLS members. These analyses were very similar to those in Chapter 4, however repeated on the later cohort with some minor differences (detailed below). Again, logistic regression was used to model likelihood of being in a care home, this time at follow-up in 2011.

The models were built as follows:

1. Model 1 - a base model was created, including only the factors age and sex.
2. Model 2 - a risk model was created including the established factors (factors associated with care use in other populations) including: age, sex, marital status, deprivation, long-term condition, URC and housing tenure, and then an interaction term for marital status and sex (marital status:sex). (Note: education/qualifications was not included here as the equivalent 2001 variable was not available due to changes in the census questions).
3. Model 3 - a full model including all of the established factors and all three of the lesser researched factors - recent employment, living in a flat and PD.
4. Model 4 - the full model plus and interaction term between PD and URC (PD:URC). This model was then used to calculate combined odds ratios and accompanying 95% confidence intervals for the interaction term PD:URC.

### *Chapter 6*

The analyses presented in Chapter 6 also explored the socio-demographic, self-rated health and geographical factors associated with using a care home at follow-up ten years later, but in terms of the differences for men and women. There were two parts to the analysis, so accordingly, the chapter was split into two parts. All analyses were run on both the 1991-2001 cohort and the 2001-2011 cohort (separately).

For Part 1, the model results from Chapter 4, Model 5 (1991-2001 sample) and Chapter 5, Model 3 (2001-2011 sample), for the interaction term between marital status and sex, were explored further (see above for model outlines). Combined ORs were calculated for each level of the marital status and sex interaction term to illustrate this interaction between these variables and the care outcome at follow-up more clearly. These were then plotted on axes for presentation in the thesis.

For Part 2, because this chapter aimed to look sex/gender differences in the socio-demographic, self-rated health and geographical factors associated with using a care home at follow-up, the following models were ran separately for men and women:

1. Model 1 - a full model including all of the established factors (age, marital status, education/qualifications, deprivation, long-term condition, URC and housing tenure) and all three of the lesser researched factors - recent employment, living in a flat and PD. Model 1 was ran on the 1991-2001 sample.
2. Model 2 - a full model including all of the established factors (age, marital status, deprivation, long-term condition, URC and housing tenure) and all three of the lesser researched factors - recent employment, living in a flat and PD. Model 2 was ran on the 2001-2011 sample. Note: education/qualifications were not included for this cohort for reasons outlined above.

These models are presented as Model 1a and Model 1b, and then Model 2a and Model 2b, where the 'a' models were run on only the men in each sample, and the 'b' models were run on only the women in each sample. In addition to the usual ORs and 95% CIs, the significance level from ANOVA Chi square tests for each variable is reported for each of the men's and women's models.

### *Chapter 7*

The analyses presented in Chapter 7 explored how household structure (HHS) was associated with using a care home at follow-up ten years later, whilst controlling for the socio-demographic, self-rated health and geographical factors which were important when explored previously. The analysis in this chapter was a replication of an original study by McCann et al. (2011) which was carried out on an equivalent longitudinal study, the Northern Irish Longitudinal Study (NILS). The outcome data available in the Scottish data was different to that used in the original study, owing to the

limitations on data linkage applications imposed by the pandemic. So while the original study used Cox models with their time to event of care home admission outcome data (McCann et al., 2011), this study used logistic regression to model a binary outcome of care status at the following census date. For further information about the original study, see the literature review in Chapter 2; for further information about the HHS variable and type of households explored, see Variables section above.

Like in the previous chapter, the analyses are run on both the 1991-2001 sample and the 2001-2011 sample separately. The models built included:

1991-2001 sample:

1. Model 1, a risk model was run including: age, sex, marital status, long-term condition, housing tenure, house type, recent employment, deprivation, urban-rural classification and population density.
2. Model 2 was run including the factors from Model 1 plus HHS (excluding marital status).

2001-2011 sample:

3. Model 3, a risk model was run including: age, sex, marital status, long-term condition, housing tenure, house type, recent employment, deprivation, urban-rural classification and population density.
4. Model 4 was run including the factors from Model 3 plus HHS (excluding marital status).

Samples split by sex:

5. Model 2 was re-run for men and women from the 1991-2001 sample separately, including the factors from Model 1 plus HHS (excluding marital status and sex). This will produce Model 2a for men and 2b for women.
6. Model 4 will be re-run for men and women from the 2001-2011 sample separately, including the factors from Model 3 plus HHS (excluding

marital status and sex). This will produce Model 4a for men and 4b for women.

Note: Marital status was excluded from models including the HHS variable, because the HHS variable includes levels of marital status for people who live alone. Sex was excluded when samples were split by sex.

### *Chapter 8*

This chapter presents analyses which explored the associations of being an informal carer and receiving informal care, with the outcome of using a care home at follow-up ten years later. This was whilst controlling for important socio-demographic, self-rated health and geographical factors explored in the earlier chapters (to create a parsimonious model, only statistically significant predictors from prior analyses were included ( $p < 0.05$ )). These analyses were only carried out in the 2001-2011 sample, due to the variables for informal care provision and receiving informal care only being available from the 2001 census onwards. The models built included:

1. Model 1 – a parsimonious base model including the factors: age, sex, marital status, sex:marital status, long-term condition, housing tenure, recent work and house type.
2. Model 2 – included the factors from Model 1 plus the carer variable (identifying SLS members who reported providing informal care).
3. Model 3 - included the factors from Model 1 plus the informal care variable (identifying SLS members who might be receiving informal care from a household member).
4. Model 4 – included the factors from Model 1, plus both new factors, “Carer” and “Informal Care”. This will produce a fully adjusted model from which estimates for all factors and the new factors will be reported.

### *Model Fit*

Model fit was assessed by McFadden’s Pseudo- $R^2$  ( $R^2$ McF in tables), an appropriate statistic for logistic regression models where excellent fit is

denoted by values of 0.2-0.4 (McFadden, 1977), and Akaike Information Criterion (AIC in tables).

### **Undertaking Analysis**

All the analysis for this project was undertaken in the National Records of Scotland (NRS) safe-setting at Ladywell House, Edinburgh. The safe-setting is a strictly controlled environment where the datasets can be accessed. There are rules which must be adhered to such as no phones, bags, coats, paper, smart watches – anything which could be used to remove data is restricted. Each time a researcher attends the safe setting, they must complete and sign an SLS Safe-Setting Usage Guidance Form.

The computers in the safe-haven have most standard statistical software, although if additional packages/add-ons are required, these must be requested with an application form. For this thesis, all data processing was carried out in SPSS Version 24 (IBM Corp, 2013) or R/Rstudio Versions 3.0.0 through to 4.1.0 (R Core Team, 2013), and all analyses were carried out in R/Rstudio.

### **Output Guidance**

Once analyses are completed, all output must receive clearance from intermediate output disclosure checking. For each intermediate output, an Intermediate Output Statistical Disclosure Checking Form must be completed. Intermediate output checking takes up to 10 working days, after which the researcher will receive their cleared output as an encrypted file via email. For any final outputs (theses, papers, paper abstracts, conference presentations etc.), Final Output Statistical Disclosure Checking must be completed. This also requires a form to be filled out, and this takes up to 20 working days for clearance to be granted.

Statistical Disclosure Control is ensuring that no possibly disclosive data is removed from the safe-setting. For example, this means that none of the outputs can specify groups of SLS Members, where there are less than ten individuals - any cell counts (or percentages) must be for groups of greater

than ten. If this is not possible, there are several options to suppress these groups. This also means that graphical representations of individual data points (e.g. scatterplots) cannot be viewed outside the safe-setting. For full details about the Statistical Disclosure Control procedures and measures employed by the SLS, see the SLS-DSU SDC Protocol available from Scottish Longitudinal Study Development & Support Unit (2021b).

### COVID-19 CORONAVIRUS PANDEMIC

On 23rd March 2020, Scotland entered Lockdown meaning that everything but essential shops and services must close, and residents of Scotland were mandated to remain in their homes (Johnson, 2020; Sturgeon, 2020). The safe-setting at Ladywell House closed in the weeks prior to National Lockdown; but in terms of this thesis research, this meant that the data safe-setting was closed and progress could not be made on the analyses. Moreover, eDRIS warned all researchers either using or in the data application process for NHS linkages, that due to the ongoing pandemic, staff usually working on NHS data applications may be reassigned to manage the ongoing COVID-19 data requirements; consequently all data applications could expect delays (eDRIS NHS National Services Scotland, 2020).

Therefore, the planned NHS linkage applications (including a CHI flag for care home entry, NHS death registrations and NHS prescriptions for medications prescribed for dementia) for this project were not continued, due to the time-pressures of the studentship funding period. This meant that all analysis for this thesis would need to be carried out using the SLS datasets for which access had already been granted prior to the pandemic. Several contingency plans were made at this point, as the safe-setting was shut indefinitely with no indication of when the pandemic may be over. Some plans had to be made for completing the thesis even if no access to the SLS datasets was possible, as it was unclear if the safe-setting would reopen before the end of the studentship. There was a lot of uncertainty around the future of the PhD; initially the studentship funding management body, Scottish Graduate School for Social Sciences (SGSSS) allowed applications

for a month extension. However, as the months went on, the extensions which could be applied for were progressively longer; owing to the COVID-19 situation remaining uncertain and lockdown continuing.

In October 2020, the safe-setting re-opened. But from this point onwards, it had to operate at reduced capacity to adhere with social distancing measures and Scottish Government guidance, due to the ongoing pandemic. Additional measures were taken to manage the COVID-19 risk of attending the safe-setting; for example, the primary researcher reduced their social contact, as they lived alone this mean leaving their bubble during the period they attended the safe-setting, and then taking lateral flow testing when available.

To reduce the time researchers needed to spend in the safe-setting, and adhere to guidance on social distancing and working from home where possible; the option to generate synthetic datasets was offered to researchers. To allow this thesis research to be completed within the funding period, and to minimise the risk of the primary researcher contracting COVID-19, synthetic datasets were generated for this project. This required some sessions preparing datasets for synthesis in the safe-setting, and producing datasets compatible with the software package used by the SLS to generate synthetic data. Below synthetic data are described in more detail.

### *SYNTHETIC DATA*

Synthetic data are a form of data, which reflect sensitive microdata, but are technically fake – they are produced from statistical models and do not represent real individuals (Scottish Longitudinal Study Development & Support Unit, 2021c). Synthetic data can be analysed outside of national safe-havens, but it must still be analysed and stored securely, and measures must be taken to ensure it is safe and not mistaken for real data (Scottish Longitudinal Study Development & Support Unit, 2021d). The SLS synthetic data are produced using an R package called SynthPop (Nowok & Raab, 2020; Scottish Longitudinal Study Development & Support Unit, 2021a).



For this thesis, bespoke synthetic datasets were produced – which involved working with an SLS Support Officer to produce a dataset which meets certain requirements to allow the SynthPop package to work effectively. For example, only one variable with greater than fifteen levels can be included, the number of variables with large numbers of levels need to be minimised and the outcome variable and important predictors must be placed in the first columns of the dataset. Bespoke datasets should behave relatively similarly to the real data, when used for modelling and producing summary statistics (Scottish Longitudinal Study Development & Support Unit, 2021c). Bespoke synthetic datasets might in future reduce some of the barriers to researchers making use of the SLS data, if they can be guaranteed to behave similarly enough to the real data in statistical models.

Synthetic data were used so that visits to the safe-haven could be condensed into two weeks at the end of the analysis, minimising time spent at the safe-haven, in line with Scottish Government returning to work guidelines during the COVID pandemic (additionally, social contact before and after the safe-haven visit was minimised and complemented with lateral flow testing). So the analyses were prepared and run on synthetic data outside the safe-haven, and then relevant thesis sections were written. The primary researcher then went to the safe-haven to run the code for the analyses on the real data, and then output the intermediate output from this to populate the results sections of the final thesis.

However, unfortunately the results from the synthetic data were considerably different from the results when the analyses were run on the real data. The discrepancy in the findings meant large portions of the thesis had to be re-drafted. This setback extended the final writing up process and editing stages of the PhD; which had a considerable impact on completion. The timescale for completion was already tight due to other impacts of the COVID-19 pandemic and the funding period of the studentship coming to an end in September 2021. Therefore, the synthetic data behaving so differently to the real data presented a final unforeseen hurdle to overcome.

## THE RESEARCHER

This section of a methodology is more commonly seen in qualitative projects, however, despite quantitative projects aiming to be objective, there are areas of subjectivity. Rather than deny the existence of this subjectivity, it is better to be open and honest about it. The researcher and characteristics/experiences of the researcher can influence a quantitative project via their interpretation of the patterns they see in the data (Kritzer, 1996; Olteanu et al., 2019; Onwuegbuzie & Leech, 2005). While interpretations are discussed with a research team, including the supervisors, ultimately the researcher/PhD student is the one who writes up the findings into a thesis. Therefore to be open about this aspect of the methods, a brief overview of my background and expertise will be given here.

The primary researcher has their first degree in Psychology, a Masters in Clinical and Health Psychology and a further Masters degree in Public Health. The primary researcher is from a working class background and from a Northern Town in England. Both during and in-between these degrees they worked as a health care assistant for a social care agency in Northern England. During this time they provided in-home care, palliative care, support work and covered shifts in care homes, elderly mental health units, mental health hospitals and specialist care units; working with people of all ages and with a vast range of health conditions and diagnoses. After this they worked in a low-secure mental health hospital, also in Northern England, whilst primarily being based on an in-patient borderline personality disorder ward catering for women, they also covered shifts in units for people dealing with substance misuse, psychosis and a general admissions mental health unit.

The primary researcher was born in the early 90s, so their generation is one where feminism, mental health, equality, diversity, accessibility and many other socio-political issues are receiving more attention than previous times in history within the UK. So there is a greater awareness in this generation of the way in which history does not represent the experiences of minority groups, and how their experiences may differ from that of cis-het white men

whose experiences make up the majority of historical accounts. Any and all of these experiences could shape how results are interpreted by the primary researcher, and how they evaluate social care in Scotland.

## CHAPTER 4 – ANALYSIS 1A: SOCIO-DEMOGRAPHICS, SELF-RATED HEALTH AND GEOGRAPHY (1991-2001)

### CHAPTER SUMMARY

This chapter presents the initial scoping research into the factors associated with using care/nursing homes in Scotland for people aged 65 and older, looking primarily at socio-demographics, self-rated health and geography. In this chapter a manuscript is presented, this has been submitted to an academic journal for publication at the time of thesis submission. As such this thesis is a hybrid thesis. This chapter first describes the research aims addressed within the manuscript, then the manuscript is presented, followed by an extended discussion for the purpose of the thesis.

The piece of analysis presented in the manuscript explores several theoretical factors, identified in the literature review, but using a sample of Scottish Longitudinal Study (SLS) data. These factors included socio-demographics, self-reported health and geography. Additionally, it includes three factors previously investigated in unpublished research in Scotland: living in a flat, recent employment and population density. Throughout the manuscript these lesser researched factors will be referred to as “novel factors”, as the original research (Corby, 2017), is an earlier piece of my own research and this current piece supersedes it by additionally exploring an interaction between the geographical measures.

In addition to finding that nearly all of the theoretical factors and all of the lesser researched factors (called novel in the manuscript) were associated with care use in the Scottish sample, a novel interaction between urban rural classification and population density was found. In spite of previous research in other populations suggesting that urban areas posed the highest risk for care use, this research found that in Scotland, it was instead low-density urban areas which posed a higher attributable risk. In

higher density urban areas, the attributable risk was synonymous with rural areas.

#### AIMS AND OBJECTIVES

The aim of the research presented in this chapter, was to explore the association of socio-demographic, self-rated health and geographical factors with older people's use of care homes at follow-up (10 years later), using Scottish data. It aimed to expand on a previous piece of research I had conducted for a Masters dissertation, by investigating whether there was an interaction between the geographical factors: Urban Rural Classification (URC) and Population Density (PD). In the Masters thesis, significant associations with care outcome (being in a care/nursing home at follow-up) were found for three lesser researched factors: living in a flat, recently working (in the last 10 years) and population density (Corby, 2017). However, for PD the association was in the opposite direction to URC. This seemed paradoxical; while PD and URC are different measures of geography, since rural areas were associated with lower odds of older people being in a care home at follow-up, it was expected that low PD areas should also be associated with lower odds of being in a care home at follow-up (Corby, 2017). Instead, greatly increased odds of care use at follow-up were observed in low population density areas (Corby, 2017). Therefore, it was a main aim of this piece of research to explore these associations further, to see if PD and URC interact.

It was hypothesised that the three lesser researched factors (recent work, living in a flat and PD) would continue to be associated with care use; so recent employment would be associated with reduced odds of using care at follow-up, while living in a flat and low PD would be associated with increased odds. For PD and URC it was hypothesised that there would be an interaction between the two factors.

It was also an objective of this analysis to report the associations for the socio-demographic, self-rated health and geographical factors, which have

been explored elsewhere, including the other UK countries. This would produce Scotland-specific estimates for these associations in the 1991-2001 cohort (Sample 1, corresponding analyses for a cohort of older people in 2001-2011 (Sample 2) are presented in Chapter 5). It was hypothesised that these factors would have similar associations to the patterns described by the literature review in Chapter 2. More specific hypotheses are outlined in the manuscript itself below. A further aim of this research was to improve on the analysis strategy, as discussed in the Literature Review and Methods in Chapter 2 and Chapter 3, respectively.

#### *CHAPTER 4 RESEARCH QUESTIONS*

1. Which socio-demographics, self-rated health and geographical factors are associated with care use in the 1991-2001 cohort?
2. Is recent work associated with using care in the 1991-2001 cohort?
3. Is living in a flat associated with using care in the 1991-2001 cohort?
4. Is PD associated with care use in the 1991-2001 cohort?
5. Is there an interaction between PD and URC in the 1991-2001 cohort?

#### DECLARATION

This research was conducted with contributions from four authors. The contribution of each author will be declared here using the Contributor Roles Taxonomy (CRediT) (CASRAI, 2020).

D. Helen Corby – Conceptualization, data curation, formal analysis, methodology, project administration, interpretation, visualization, writing – original draft, writing – reviewing and editing.

Dawn Everington – Methodology, supervision.

John M. Starr – Conceptualization, methodology, supervision, interpretation, writing – review and editing.

Chris Dibben – Conceptualization, methodology, supervision, writing – review and editing.

MANUSCRIPT:

# LONGITUDINAL ANALYSIS OF THE FACTORS ASSOCIATED WITH RECEIVING FORMAL SOCIAL CARE FOR OLDER PEOPLE IN SCOTLAND: THE URBAN PARADOX

**Authors: D. Helen Corby, Dawn Everington, John M. Starr and Chris Dibben**

## *HIGHLIGHTS*

Evidence that three novel factors: recent employment, living in a flat and population density, are associated with care home use in old age.

Urban paradox – contrary to previous research, rural areas did not have lowest risk of care use, instead city/urban/town areas had both the lowest and highest attributable risk depending on the population density.

Remarkable interaction between urban-rural classification and population density.

## *ABSTRACT*

Three novel factors - recent employment, living in a flat and population density - were tested for an association with care home use in Scotland.

The Scottish Longitudinal Study provided a representative linked dataset (n=14,528). Accounting for established risk factors, logistic regression investigated associations between these novel factors and care use at the following census.

Care use was associated with all three novel factors. Contrary to previous research, rural areas did not have the lowest risk of care use; instead city/urban/town areas had both the lowest and highest attributable risk

depending on the population density – a remarkable interaction. Odds were nearly 13 times greater in low-density compared to high-density city areas.

This spatial variation might suggest supply and demand is not met across space, and have implications for future care home planning.

#### *KEYWORDS*

Social care; Care home; Old age; Spatial variation; Formal care; Administrative data linkage; Longitudinal Analysis.

#### *INTRODUCTION*

With almost 1 in 5 people aged 65+ in Scotland, social care for older adults is a prominent public health issue (National Records of Scotland, 2020; Scottish Government, 2017). By 2039, projections estimate the number of people aged 65-75 and 75+ will increase by 22% and 85% respectively (National Records of Scotland, 2017). This demographic change means the need for social care will increase - this argument is well documented throughout the literature (MacDonald & Cooper, 2007; The King's Fund, 2011; Wittenberg, Comas Herrera, Pickard, & Hancock, 2004).

By the end of their lives, around three in four people in the UK will require long-term social care (The King's Fund, 2011) – as such, it is a matter of interest for governments, local authorities and care providers alike. It also concerns older people, most of whom would prefer to remain in their own homes (Department of Health, 2001; Social Care Institute of Excellence, 2017). Therefore, understanding what factors make people vulnerable to entering care in old age is important. Longitudinal analyses of this have been conducted in Northern Ireland, England and Wales, however, no equivalent studies have been conducted in Scotland, and as such this study will fill this gap.

Previous research shows a range of socio-demographic, geographical and medical factors are associated with care use. Age and sex have consistently been associated (Gaugler, Duval, Anderson, & Kane, 2007; Harrison et al., 2017; Luppá et al., 2010), with women and older individuals at greater risk;



the sex difference is probably due to women generally having a longer and healthier life-expectancy. Marital status is also consistently associated with care use – married people have a lower risk than either single, divorced or widowed people (Gaugler et al., 2007; Luppá et al., 2010). However, Tomiak, Berthelot, Guimond, and Mustard (2000) found this protective association was only significant for men, and Nihtilä and Martikainen (2008) found a greater protective association of living with a spouse for men than women. Therefore, marital status might have a more complex, gendered effect.

Poorer health is consistently associated with an increased risk of receiving care (Gaugler et al., 2007; Grundy & Jitlal, 2007; Harrison et al., 2017; Luppá et al., 2010; Tomiak et al., 2000); regardless of how health is measured (previous research has included self-reports, administrative records, specific diagnoses and crude numbers of health conditions). Evidence also shows that low income/socio-economic status is associated with increased risk of care use (Gaugler et al., 2007; Martikainen et al., 2009; Mustard, Finlayson, Derksen, & Berthelot, 1999). However, since health and economic position are also causally linked, it is debated which best explains social care use – ultimately, this might depend on the populations and samples studied. Reduced risk of receiving care has also been found for people with higher educational attainment (Mustard et al., 1999; Woo, Ho, Yu, & Lau, 2000); homeowners (Grundy & Jitlal, 2007; Hancock, Arthur, Jagger, & Matthews, 2002; Tomiak et al., 2000) and people living in rural areas (Fernández-Carro & Evandrou, 2014; McCann, Grundy, & O'Reilly, 2014).

In addition to these established factors, care use in old age could be predicted by other factors. This study has identified and will explore three novel factors. Firstly, recent employment - Reday-Mulvey (2000) discusses how working beyond retirement age keeps older people integrated in both society and the workplace, which can help them maintain a sense of purpose, which in turn might bolster their physical and mental wellbeing. Consequently, recent employment might be protectively associated with receiving care.

Secondly, maintaining independence might be more difficult for older people living in flats. Access to flats is often via stairs, which might be challenging or dangerous for older people. Nihtilä and Martikainen (2008) concluded house type was unimportant in explaining entry to care; however, besides monetary value, there is little difference between a detached and semi-detached property, which could impact care entry. Therefore considering more simply, whether people live in a flat or not, might be a more important comparison to draw.

Thirdly, irrespective of other factors, living in rural areas is associated with lower chances of care use than urban areas. But urban-rural classification, used to determine rural and city areas, is a composite measure; it is made up of both the number of people living in a conurbation, and how accessible the nearest large conurbation is by road. So it is difficult to understand what aspect of urban-rural classification might be driving this association. Moreover, urban-rural classification might oversimplify the geography of an area, for example, the population density (PD) can be very different in areas with the same urban-rural classification. Therefore, looking at population density might help disentangle what aspects of place are important in this protective association. It is also possible that in high-density metropolitan areas, where there are a greater number of older people and fewer care homes, the risk of care use could instead be lower than previous research would suggest. To the best of the authors' knowledge, PD has not yet been investigated elsewhere.

Ultimately, Scotland is a good place to investigate spatial and socio-demographic differences in care use because health and social care provision is largely consistent across the country. Additionally, Scotland has a varied geography, with densely populated cities, rural highland areas and isolated islands, so allows a broad range of geographies to be considered.

### *AIMS AND OBJECTIVES*

This study aims to develop a risk model for formal longterm care home use by older people in Scotland. Based on previous studies, the model will include age, sex, marital status, deprivation, self-reported health, education, housing tenure and urban/rural classification; and produce estimates for these associations in Scotland. The study will explore whether these factors are important in Scotland, despite originalities in its geography, policies, history and politics. It is predicted that in the initial risk model, similar associations will be found as in the literature, outlined above.

Additionally, this study investigates three novel factors: recent employment, living in a flat and population density, producing estimates for the associations between these factors and care use in Scotland. It is hypothesised that recent employment will be associated with reduced odds of being in care, and living in a flat associated with increased odds of being in care. Including population density breaks geography down to a more granular level than simply urban versus rural, and it is hypothesised that care patterns at these different geographies might be more complex.

### *METHODS*

This study uses the Scottish Longitudinal Study (SLS), a 5.3% random sample of the Scottish population made up from the linkage of census, administrative, vital events and education data (Boyle et al., 2009; Hattersley & Boyle, 2007; Scottish Longitudinal Study Development & Support Unit, 2017). The linked dataset included data from the 1991 and 2001 censuses, allowing longitudinal analysis of factors in 1991, preceding care use in 2001. For further information about the SLS sample and 1991-2001 census linkage see: Hattersley and Boyle (2007, 2008, 2009); Hattersley, Raab, and Boyle (2007).

### **Sample**

The cohort used in this study included: all people aged 65+ and living at home at the 1991 census, and also present at the 2001 census. Exclusions were made for: 1) cases with missing data for the factors/outcomes

(n=1,228); 2) cases where recorded age differed by <8 or >12 years between 1991 and 2001 as true age could not be verified - the tolerance allowed for small disparities such as censuses not being completed exactly 10 years apart (n=144); 3) cases where SLS members have entered non-care establishments such as prisons during the 10 year period, see outcome for further details (n<10). This left a study sample size of n= 14,528.

### **Outcome**

The outcome was use of formal care (i.e. a nursing or residential home) at follow-up, based on the census in 2001. Since there is no specific record of care-entry in the UK census, care status was determined via a proxy – a census variable recording whether the person was living in a private residence e.g. at home or living in communal establishments e.g. care homes, prisons etc. Thus deriving a binary outcome variable for care status where: private residence = not entered care; communal establishment = entered care in 2001. Exclusions were made for communal establishments not likely to be social/nursing care establishments (eg prisons) through using a variable recording the “client type” of the communal establishment.

### **Independent Variables**

Independent variables included the established risk factors: age, sex, marital status, education/qualifications, deprivation, longterm illness, urban/rural classification and housing tenure; and the novel factors: recent employment, living in a flat and population density. These factors were all measured from the 1991 census, preceding the outcome measured in 2001. The reference level for each is displayed first in the tables with odds ratios of 1.00.

Age was recoded into four categories. For marital status, ‘married’ and ‘remarried’ were combined. Longterm illness was derived from respondents self-reporting if they suffered any longterm/limiting illnesses.

Education/qualifications were simplified into three categories: ‘none’ (only school-level education), ‘below degree level’ (college-level/equivalent) and ‘degree or higher’ (graduate-level/equivalent or higher). Recent employment was derived from reported hours worked per week within the last ten years,

responses >0 were taken as recent working. Housing tenure was simplified into two categories: homeowners and renters (including all forms of social housing and private lets). Flat was derived from housing type question, forming a binary variable for living in a flat or not (this included all non-flat house types).

Deprivation, urban/rural classification and PD were obtained from the SLS and provided at output area level - output area in Scotland is the smallest geography level, it has a minimum of 20 households and a maximum of 78 households. For deprivation the population-weighted Carstairs' Deprivation Quintiles were used, this is an area deprivation measure based on car ownership, occupational social class, male unemployment and overcrowding in households (Carstairs & Morris, 1990). For urban/rural classification, the Scottish Government 6-fold Urban-Rural Classification was used, this ranges from large urban settlements with over 125,000 people to remote rural settlements with less than 3,000 people (Scottish Government, 2014). The two small town and two rural categories were condensed to include both the accessible and inaccessible levels, this meant the study variable had 4 levels: city, urban, small town and rural. Population Density (PD) was a continuous variable and measured in persons per square kilometre (ppkm<sup>2</sup>). It was transformed into a categorical variable with three levels: High (>5000ppkm<sup>2</sup>), Medium (1000-5000ppkm<sup>2</sup>) and Low (<1000ppkm<sup>2</sup>).

### **Analysis**

Logistic regression was used to model likelihood of being in care in 2001. Firstly, a risk model was created, including the established factors and an interaction term for marital status and sex (marital status:sex) based on previous research suggesting an interaction. Then, each of the three novel factors were added independently to the risk model (models 2, 3 and 4). Finally, a full model was created with the risk model and all the novel factors (model 5), which gives the final estimates for each factor. The effects are expressed as Odds Ratios (ORs) with 95% Confidence Intervals (CIs).

Additionally, model 6 is the full model including an interaction term between urban-rural classification and population density. This will explore if care use is more complex at smaller geographies and what might be driving the urban-rural difference in care use discussed earlier. So combined ORs and accompanying 95% CIs were calculated for population density and urban-rural classification based on this model.

The model fit was assessed using Akaike Information Criterion (AIC) and the variance explained by each model was approximated using McFadden's pseudo  $R^2$  value ( $R^2_{McF}$ ). Statistical analyses were carried out in R (R Core Team, 2013).

## **RESULTS**

By 2001, 8.1% of the study cohort were receiving residential/nursing care; this represented 5.2% of the males and 9.7% of the females. The demographics and proportions of individuals in formal care in the sample by 2001 are summarised in Table 5.

*Table 5.*

*Table of Socio-demographic Characteristics and Care Outcomes of the 1991-2001 Sample*

*Table presenting the socio-demographic characteristics of the sample which consisted of older people aged 65 and older and still living at home in Scotland at the 1991 census date, who could then be traced in the 2001 census. This table shows the number and percentage of the sample in each level of the categorical factor variables (age, sex, marital status, deprivation score quintile, longterm illness, level of education, URC, housing tenure, PD, recently working, house type and the two interaction terms sex:marital status and PD:URC). Additionally, the number and percentage of the older people in each factor level who had entered care by follow-up is also presented. Source: Scottish Longitudinal Study.*

1991 Factor	Total sample		Entered care by 2001	
	N	%	n	%
<b>Age</b>				
65-69	6846	47.1%	201	2.9%
70-74	4288	29.5%	295	6.9%
75-79	2337	16.1%	354	15.1%
80+	1057	7.3%	328	31.0%
<b>Sex</b>				
Male	5158	35.5%	268	5.2%
Female	9370	64.5%	910	9.7%
<b>Marital Status</b>				
Married	8183	56.3%	407	5.0%
Single	1393	9.6%	179	12.8%
Divorced	322	2.2%	22	6.8%
Widowed	4630	31.9%	570	12.3%
<b>Sex:Marital Status</b>				
Male Married	4052	27.9%	154	3.8%
Male Single	***	***	***	***
Male Divorced	***	***	***	***
Male Widowed	682	4.7%	71	10.4%
Female Married	4131	28.4%	253	6.1%
Female Single	***	***	***	***
Female Divorced	***	***	***	***
Female Widowed	3948	27.2%	499	12.6%
<b>Deprivation Score</b>				
Quintile 1 - Low	2694	18.5%	172	6.4%
Quintile 2 - Low-Medium	3037	20.9%	252	8.3%
Quintile 3 - Medium	3245	22.3%	275	8.5%
Quintile 4 - Medium-High	3173	21.8%	270	8.5%
Quintile 5 - High	2379	16.4%	209	8.8%
<b>Longterm Illness</b>				
Healthy	10868	74.8%	755	6.9%
Longterm Condition	3660	25.2%	423	11.6%
<b>Education</b>				
School Only	13143	90.5%	1087	8.3%
College Level	886	6.1%	58	6.5%
Degree Level	499	3.4%	33	6.6%
<b>Urban/Rural Classification</b>				
City (≥125,000 people)	5750	39.6%	526	9.1%
Urban (≥10,000p people)	4107	28.3%	304	7.4%
Small Town (≥3,000 people)	1987	13.7%	157	7.9%
Rural (<3000 people)	2684	18.5%	191	7.1%
<b>Housing Tenure</b>				
Rent	7209	49.6%	691	9.6%
Own	7319	50.4%	487	6.7%
<b>Population Density</b>				
High (>5,000ppkm <sup>2</sup> )	5934	40.8%	226	3.8%
Medium (1000-5000ppkm <sup>2</sup> )	6572	45.2%	620	9.4%
Low (<1,000ppkm <sup>2</sup> )	2022	13.9%	332	16.4%
<b>Recent Work</b>				
No Recent Work	9222	63.5%	1021	11.1%
Recent Work	5306	36.5%	157	3.0%
<b>House Type</b>				
Other	9768	67.2%	672	6.9%
Flat	4760	32.8%	506	10.6%
<b>PD:URC</b>				
High:City	3185	21.9%	147	4.6%
High:Urban	1782	12.3%	48	2.7%
High:Small Town	637	4.4%	18	2.8%
High: Rural	330	2.3%	13	3.9%
Medium:City	2243	15.4%	274	12.2%
Medium:Urban	2013	13.9%	161	8.0%
Medium:Small Town	1163	8.0%	88	7.6%
Medium:Rural	1153	7.9%	97	8.4%
Low:City	322	2.2%	105	32.6%
Low:Urban	312	2.1%	95	30.5%
Low:Small Town	187	1.3%	51	27.3%
Low:Rural	1201	8.3%	81	6.7%
<b>Total</b>	14528	100.0%	1178	8.1%

(Note: \*\*\* denotes low values which have been suppressed for disclosure reasons).

### **Model 1: Risk Model**

The risk model, model 1 showed that increased age, being a woman and presence of a longterm health condition were associated with increased odds of receiving care; while owning a home, compared with renting a home, was associated with reduced odds. Being single, divorced or widowed were all associated with greater odds of receiving care compared to being married. This pattern was similar for men and women, however the odds were generally exaggerated for men; for example single men and women had 170% and 70% increased odds of receiving care, respectively. For urban-rural classification, living in urban or rural areas was associated with reduced odds of receiving care compared to living in a city; however, the evidence was inconclusive for living in small towns. The model shows little evidence for any effect of deprivation and education on care use at follow-up. This model accounted for ~13.3% of the variation in those receiving formal care at follow-up. For a full summary of ORs and CIs, see Table 6.

### **Model 2: Recent Employment**

When recent employment was added to the risk model, it was associated with 36% reduced odds of receiving care, but only marginally increased the variance explained by the model. There was some evidence of confounding with age and sex; the effects for both reduced slightly with recent employment in the model. This is probably because recent employment is more common in the younger age group, and less common for women in that generation.



### **Model 3: Population Density**

Including PD in the risk model showed that medium and low PD were associated with 3.4 and 9.6 times the odds of receiving care respectively; including this factor also increased variance explained by the model by 5.77%. Thus, PD had both large individual and population effect sizes. There was some evidence of confounding, as including PD meant that for both deprivation and urban rural classification, the observed effects for some levels became more extreme, and interval estimates no longer crossed the null value. For deprivation, this is likely due to clustering of deprived neighbourhoods in densely populated areas such as Glasgow and high-rise social housing which packs a lot of people into a small area. However, for urban-rural classification, this demonstrates a more complex association between measures of PD and urban-rural classification; especially since low PD is associated with greatly increased odds of care use while rural areas are associated with reduced odds.

### **Model 4: House Type – Flat**

Adding living in a flat to the risk model revealed it was associated with slightly higher odds of receiving care, but there was insufficient evidence that this was distinct from other house types. No evidence of confounding or effect modification was observed, and only 0.02% more variance was explained by including it in the model.

### **Model 5: Full Model**

Model 5, the full model, shows that both age and sex had considerable individual and population attributable effect sizes. Together they explained ~11.7% of the variance in receiving care, and those aged 70-74, 75-79 and 80+ had more than 2, 4 and 9 times greater odds of receiving care, respectively, compared with those aged 65-69. Likewise compared to males, women had 51% greater odds of receiving care.

Compared to being married, being single, divorced or widowed was associated with ~ 2.5, 3.4, and 1.9 times greater odds of receiving care, respectively. The interaction term for marital status and sex suggests that

unmarried men have greater odds than unmarried women of receiving care, however the interval estimates are not statistically distinct between men and women, see Table 6 for full sex specific results.

There was some evidence that experiencing deprivation was associated with increased odds of receiving care at follow-up; compared with experiencing low deprivation, experiencing medium, medium-high and high deprivation were each associated with 34%, 48% and 34% increased odds respectively. However, the interval estimates for these deprivation levels were not distinct, the ORs did not increase linearly with increasing deprivation and there was no evidence of an association for low-medium deprivation.

Both being a homeowner and recently working were found to be associated with 35% reduced odds of receiving care. Having a longterm condition was associated with nearly 50% increased odds of receiving care compared to being healthy. Living in a flat was associated with ~21% increased odds of receiving care, the effect of living in a flat became more pronounced in this model including all three novel factors. Whilst these factors all had substantial individual-level effect sizes, their population-level effect sizes were much smaller. For educational attainment, no evidence of an association was found.

Compared to living in a city, living in urban areas, small towns and rural areas had 35%, 37% and 65% reduced odds of receiving care, respectively. Whilst there was no evidence of any real difference between urban areas and small towns; the CI for rural areas suggests substantially reduced odds, different from those living elsewhere. The estimates for urban/rural classification are more extreme in this model than in the risk model, suggesting PD had previously confounded the association for urban-rural classification. However at a population-level, urban/rural classification only explains a small amount of variance in receiving care. Conversely, PD had both very large individual and population attributable effect sizes – it is thus an important predictor in the model. However, contrary to urban-rural

classification, where living in rural areas was associated with reduced odds, people living in medially and sparsely populated areas had nearly 3.3 times and more than 9 times the odds of receiving care, respectively, compared to people living in more densely populated areas. This fully adjusted model accounted for ~19.3% of the variance in receiving care at follow-up, for full model summary see Table 6.

*Table 6.*

*Table of Model Summaries for Models 1-5 on the 1991-2001 Sample*

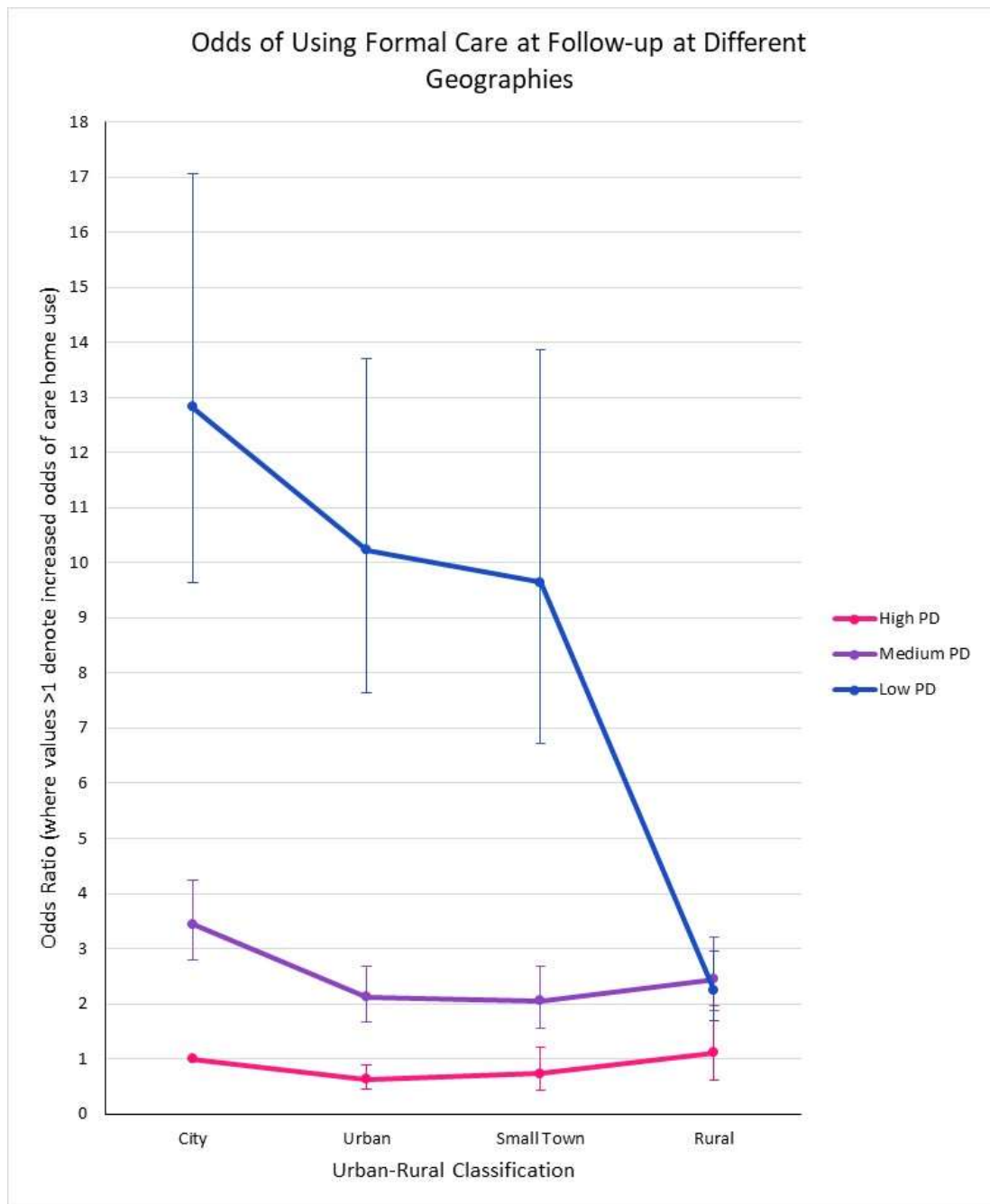
*Model summary table for models 1-5 showing ORs and CIs for all factors in each model and the model fit statistics: R<sup>2</sup>McF, percentage difference in variance explained compared with Model 1: Risk Model (based on R<sup>2</sup>McF) and AIC. The models presented here are logistic regression models for the outcome of being in a care home or not at follow-up in 2001, they include Model 1, the risk model, which included the factors: sex, marital status, deprivation score quintile, longterm illness, education, URC, housing tenure and the interaction term for sex:marital status; Model 2, the risk model plus recent employment; Model 3, the risk model plus PD; Model 5, the risk model plus living in a flat; then Model 6, a full model including all risk model factors plus recent employment, PD and living in a flat. Source: Scottish Longitudinal Study.*

1991 Factor	Model 1:	Model 2:	Model 3:	Model 4:	Model 5:
	Risk Model	Recent Employment	Population Density	Housetype - Flat	Full Model
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Age</b>					
65-69	1.00	1.00	1.00	1.00	1.00
70-74	2.30 (1.92, 2.78)	2.07 (1.72, 2.51)	2.26 (1.87, 2.73)	2.30 (1.91, 2.77)	2.04 (1.68, 2.48)
75-79	5.20 (4.32, 6.26)	4.35 (3.57, 5.32)	5.03 (4.18, 6.09)	5.17 (4.30, 6.23)	4.22 (3.45, 5.17)
80+	12.05 (9.86, 14.74)	10.01 (8.09, 12.43)	11.41 (9.29, 14.05)	11.94 (9.78, 14.62)	9.42 (7.56, 11.77)
<b>Sex</b>					
Male	1.00	1.00	1.00	1.00	1.00
Female	1.65 (1.34, 2.05)	1.46 (1.18, 1.82)	1.71 (1.38, 2.12)	1.65 (1.34, 2.04)	1.51 (1.21, 1.89)
<b>Marital Status</b>					
Married	1.00	1.00	1.00	1.00	1.00
Single	2.74 (1.80, 4.07)	2.63 (1.73, 3.91)	2.64 (1.71, 3.97)	2.71 (1.78, 4.02)	2.49 (1.61, 3.75)
Divorced	3.51 (1.59, 6.87)	3.47 (1.57, 6.83)	3.48 (1.54, 7.04)	3.46 (1.57, 6.77)	3.43 (1.51, 6.94)
Widowed	1.89 (1.38, 2.55)	1.81 (1.32, 2.45)	2.02 (1.47, 2.75)	1.87 (1.37, 2.53)	1.91 (1.38, 2.61)
<b>Sex Marital Status</b>					
Male					
Married	1.00	1.00	1.00	1.00	1.00
Single	2.67 (1.75, 3.95)	2.52 (1.66, 3.75)	2.62 (1.70, 3.94)	2.71 (1.78, 4.04)	2.48 (1.61, 3.75)
Divorced	3.30 (1.49, 6.50)	3.19 (1.44, 6.29)	3.27 (1.44, 6.64)	3.37 (1.52, 6.65)	3.21 (1.41, 6.55)
Widowed	1.89 (1.38, 2.58)	1.85 (1.34, 2.52)	2.02 (1.46, 2.77)	1.91 (1.39, 2.60)	1.97 (1.42, 2.71)
Female					
Married	1.00	1.00	1.00	1.00	1.00
Single	1.69 (1.34, 2.13)	1.73 (1.37, 2.18)	1.74 (1.37, 2.21)	1.66 (1.31, 2.09)	1.74 (1.36, 2.21)
Divorced	0.95 (0.50, 1.64)	0.97 (0.51, 1.69)	0.95 (0.50, 1.67)	0.93 (0.49, 1.61)	0.95 (0.50, 1.66)
Widowed	1.27 (1.07, 1.51)	1.28 (1.08, 1.52)	1.25 (1.05, 1.49)	1.25 (1.06, 1.49)	1.24 (1.04, 1.48)
<b>Deprivation Score</b>					
Quintile 1 - Low	1.00	1.00	1.00	1.00	1.00
Quintile 2 - Low-Medium	1.14 (0.93, 1.42)	1.15 (0.93, 1.43)	1.24 (0.99, 1.54)	1.13 (0.92, 1.41)	1.22 (0.98, 1.52)
Quintile 3 - Medium	1.09 (0.87, 1.36)	1.09 (0.87, 1.36)	1.38 (1.10, 1.73)	1.07 (0.86, 1.34)	1.34 (1.07, 1.69)
Quintile 4 - Medium-High	1.09 (0.87, 1.38)	1.10 (0.87, 1.38)	1.53 (1.21, 1.94)	1.07 (0.85, 1.35)	1.48 (1.17, 1.88)
Quintile 5 - High	1.03 (0.80, 1.33)	1.02 (0.80, 1.32)	1.42 (1.09, 1.84)	1.00 (0.78, 1.29)	1.34 (1.03, 1.74)
<b>Longterm Illness</b>					
Healthy	1.00	1.00	1.00	1.00	1.00
Longterm Illness	1.48 (1.29, 1.69)	1.45 (1.27, 1.66)	1.51 (1.31, 1.73)	1.48 (1.29, 1.69)	1.48 (1.28, 1.69)
<b>Education</b>					
School Only	1.00	1.00	1.00	1.00	1.00
College Level	0.89 (0.66, 1.19)	0.90 (0.67, 1.20)	0.80 (0.58, 1.07)	0.90 (0.66, 1.19)	0.81 (0.59, 1.09)
Degree Level	1.00 (0.67, 1.45)	1.03 (0.69, 1.50)	0.90 (0.60, 1.32)	1.01 (0.67, 1.46)	0.94 (0.62, 1.38)
<b>Urban Rural Classification</b>					
City (≥125,000 people)	1.00	1.00	1.00	1.00	1.00
Urban (≥10,000 people)	0.81 (0.69, 0.94)	0.80 (0.68, 0.93)	0.66 (0.56, 0.77)	0.82 (0.70, 0.96)	0.67 (0.57, 0.79)
Small Town (≥3,000 people)	0.88 (0.72, 1.06)	0.87 (0.71, 1.05)	0.64 (0.52, 0.79)	0.90 (0.73, 1.10)	0.67 (0.54, 0.82)
Rural (<3,000 people)	0.88 (0.68, 0.99)	0.82 (0.67, 0.98)	0.37 (0.30, 0.45)	0.85 (0.70, 1.04)	0.39 (0.31, 0.48)
<b>Housing Tenure</b>					
Rent	1.00	1.00	1.00	1.00	1.00
Own	0.81 (0.69, 0.93)	0.82 (0.71, 0.95)	0.74 (0.63, 0.86)	0.82 (0.70, 0.95)	0.77 (0.66, 0.90)
<b>Population Density</b>					
High (>5,000ppkm <sup>2</sup> )	-	-	1.00	-	1.00
Medium (1,000-5,000ppkm <sup>2</sup> )	-	-	3.44 (2.91, 4.09)	-	3.48 (2.94, 4.13)
Low (<1,000ppkm <sup>2</sup> )	-	-	9.63 (7.79, 11.93)	-	9.71 (7.85, 12.03)
<b>Recent Employment</b>					
No Recent Employment	-	1.00	-	-	1.00
Recent Employment	-	0.64 (0.53, 0.79)	-	-	0.66 (0.53, 0.80)
<b>House Type</b>					
Not a Flat	-	-	-	1.00	1.00
Flat	-	-	-	1.10 (0.95, 1.27)	1.21 (1.04, 1.41)
<b>R2McF</b>	0.1327	0.1350	0.1904	0.1329	0.1932
<b>Difference from Risk Model (%)</b>	-	0.23%	5.77%	0.02%	6.06%
<b>AIC</b>	7135.8	7118.6	6668.0	7136.3	6648.7

**Model 6: Full Model + Interaction Term**

Model 6 included an interaction term for population density and urban-rural classification, the combined ORs show evidence of an interaction between these measures of geography. See Figure 2 for these combined odds ratios plotted with 95% CIs as error bars.

For each urban-rural classification category, compared to high-PD areas, medium-PD areas show a fairly consistent increase in odds of receiving care. Then, low-PD areas show stark increases in odds for three of the four levels of urban-rural classification. The highest odds were observed in low density city areas (OR=12.83), followed by urban (OR=10.23) and small town areas (OR=9.65). However, rural areas were the exception, with odds similar to medium-PD rural areas (OR=2.24). Including this interaction term resulted in this model explaining 20.26% of the variance and having an AIC of 6584 - showing an improvement in explained variance and fit compared to the original full model (Model 5).



*Figure 2.*  
Plot of Combined Odds Ratios for the Interaction Term between Urban Rural Classification and Population Density for the 1991-2001 Sample  
 Plot showing the combined ORs, including interaction correction, for different geographies from the interaction term for URC and PD when regressed against the outcome of being in a care home at follow-up, for older people in Scotland. This means that an OR and corresponding 95% CI has been calculated for each level of PD (high, medium, low) within the URC levels (city, urban, small town, rural). For example within the URC level 'city', an individual estimate for 'high', 'medium' and 'low' PD areas is plotted in this figure. Source: Scottish Longitudinal Study.

## *DISCUSSION*

This study found that in Scotland: increased age, being a woman, being single, divorced or widowed, experiencing deprivation and having a longterm health condition was associated with increased odds of using formal care in old age; whilst, being a homeowner was associated reduced odds. All three novel factors investigated were associated with care use in old age. People living in flats were more likely to receive formal care and recently employed people were less likely to have entered care. Low PD was associated with greatly increased odds of receiving care, and a more complex interaction with urban-rural classification was found. The findings for the established factors broadly corroborate previous studies, however, no evidence of an association with educational attainment was found.

Despite women generally having greater odds of care use, this study found for unmarried men, the odds were greater than unmarried women. This supports a more complex interaction between sex/gender, marital status and care use, as previously described by Nihtilä and Martikainen (2008) and Tomiak et al. (2000). Both authors suggest married men's independence is maintained because their spouses provide informal care; and while unmarried men do not have this benefit, this might explain our result. McCann, Donnelly, and O'Reilly (2012) found controlling for partners' age attenuated this difference – they suggest that in heterosexual couples, men are generally older than their spouses, with poorer health and life expectancy; therefore, women are more likely to provide, but less likely to receive informal care. Therefore, this pattern could be a consequence of interplay between sex effects (life-expectancy and health) and gender effects (gender roles and traditions of marrying older men). This explanation fits with the patterns observed in Scottish data, but investigating partner's age was outside the scope of the current study, however, future studies could explore it further.

People living in flats were more likely to receive formal care; this likely because many flats have stairs, with no accessible entrances/lifts. This is

true of tenement buildings which are common in Scotland; built between the 1700s and 1900s, typically with 3-5 storeys, and access via dimly lit communal stairways. For older people who might have mobility issues, sight problems or general frailty, stairs might be problematic and consequently a push factor for moving into a care home.

Recently employed people were less likely to have entered care. Working could offer a sense of purpose and place in society, which might bolster older people's physical and mental wellbeing (Reday-Mulvey, 2000). However, older people in employment might be healthier – free from disabilities, injuries or illnesses making them unable or unfit to work. While self-reported longterm conditions were controlled for in the model, this was a crude measure and so could not account for severity or number of conditions. Moreover, continuing working might be easier for people in non-manual professions, so socio-economic status may play a role here too. Ultimately, there is more complexity than it is possible to explore in the current analysis.

PD was also associated with receiving care, but not as previous research has suggested. Previously, rural areas were shown to have a protective association (McCann et al., 2014); and typically, rural areas also have low PD, but in this study, low-density areas had greatly increased odds of care use. However, population density is simply a ratio between number of people and land space, usually measured in people per km<sup>2</sup>; while urban-rural classification is a composite measure, taking into account type of conurbation (city/town), conurbation size in terms of population, proximity to larger conurbations and accessibility by road. So the two measures are not synonymous; and even in city/urban areas there will be a range of densities, including areas of low-density.

This study explored this further finding evidence of a notable interaction between PD and urban-rural classification. It attributed highest risk of care use to low-PD city areas and lowest risk to high-PD urban areas. The elevated odds in low density areas was present in cities, urban areas and



small towns – so rather than urban areas posing a high risk, as suggested in previous research using only urban-rural classification; this heightened risk was limited to lower density areas of city/urban/town areas. This variation within urban areas is a key finding of this study.

We suggest several possible explanations why low-PD city/urban/town areas might pose such greatly increased odds of care use. First, in these areas, older people may be more isolated - further away from potential sources of informal care and support such as family, friends and neighbours; plus relocation closer to family/friends might be more difficult. The opposite of this would be true in high-density city/urban/town areas. Second, in these areas, older people are also further away from shops, healthcare services, wellbeing services and sources of social interaction. Additionally, transport links are not as good in low-PD areas. Struggling to take care of basic needs and health because services are not easily accessible could be push older people towards using a care home.

Thirdly, providing home-care services is more feasible where home-care clients live closer together. In low-PD areas, where providing home care services is more challenging, older people may be admitted to care homes sooner. Fourthly, this observed high risk might actually be where supply meets demand – there are enough care home beds. Instead it might signal a problem in high-PD areas, where the so-called “protective association” might be due to unmet need. In high PD areas, the expense of land and housing stock means there are few care homes. Consequently, older people living here might be unable to access care homes nearby, instead resisting care-entry longer; either by utilising home-care options or struggling on alone.

Ultimately, PD is a notable finding – with large effect sizes at both an individual and population level. In terms of how much variance in care use it explains, PD is comparable to age and sex - the established predictors with the biggest effect sizes. Accordingly, it is potentially relevant to policy and care provision in Scotland. The variation in risk within city/urban/town areas

might suggest that supply and demand is not matched across space, and this has implications for urban planning for future care homes and care services.

### **Limitations**

A limitation of this study is that the estimates produced might underestimate the associations for some factors. Care outcome could not be ascertained for SLS members who died between the censuses, so they were excluded from the analysis. This means for factors that are also associated with death, such as longterm conditions, SLS members with these factors were more likely to be excluded from the analysis. Consequently, the estimates for factors associated with death, will likely be under-estimates. This limitation could be overcome if care status for deceased individuals could be determined, however this is not currently possible for this time-period. The UK does not currently have a central register for care home admissions, making it difficult to determine care-entry (for further discussion of determining care status in the UK, see Burton and Guthrie (2018)).

Further limitations of this study include, firstly, the large amount of unexplained variance in care-entry remaining, with only around 20% explained by our model. Therefore, there may be other key factors which could explain more variance in care use which are not included in this study, such as living arrangements, local number of available care beds and local authority. Second, the generalisability of these findings for the novel factors to populations outside of Scotland is unknown. While the discussed probable mechanisms underlying these effects suggest they could be universal effects, this cannot be assumed without further investigation. Therefore, future research could investigate if these factors are universally relevant. This might be particularly important for the population density findings, as they have possible policy and urban planning relevance.

### **Conclusion**

This study has looked at the factors associated with formal care use for older people in Scotland using a nationally representative longitudinal dataset. This suggests Scotland has considerable similarities to other previously studied

populations despite political, social, demographic and geographical differences. Additionally, the study has identified three novel factors, recent work, living in a flat and PD, which might have important relationships with independence in old age.

Whilst all three factors are interesting, PD is a particularly profound finding given its large individual and population-level effects. This study also identified an interesting interaction between PD and urban-rural classification, showing the geography of care use is more complex than research had previously suggested. This study observed low density areas of cities and towns had the highest attributable risk of care use at follow-up. This variation across space might signal that in some areas, supply does not meet demand, and thus have implications for future urban planning for care homes and care services.

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## FURTHER DISCUSSION

### *HOW THIS PAPER ADVANCED OUR UNDERSTANDING*

So the three key points demonstrated by this piece of research are:

1. The factors associated with entry to care/nursing homes in Scotland were broadly the same as those in the other UK countries with the exception of educational attainment.
2. Three lesser researched factors were also associated with care-entry – there is evidence that having worked in the last ten years was associated with reduced odds of being in a care home at follow-up, while there were greater odds for those who lived a flat or lived in areas with low PD.
3. There was an important interaction between URC and PD – this research showed evidence that in Scotland, the geographical pattern of attributable risk for care use at follow-up is different to what was thought, based on previous research elsewhere. This new evidence concerning PD might be limited to Scotland, or it could apply to other populations too, but this has not yet been investigated in other populations.

This research built on my Masters thesis analysis in two key ways: first, by using a more appropriate analysis strategy. Using this strategy, the present analysis found significant associations for deprivation and living in a flat – suggesting these factors contribute to explaining care use in Scotland. Second, by exploring an additional interaction term between URC and PD. Exploring this interaction helped to understand the seemingly paradoxical association between care use at follow-up and these two measures of geography, PD and URC. This showed which levels of each factor were driving these associations, highlighting that within the URC categories, there was variation in the odds of being in a care home at follow-up. Therefore, this demonstrates that describing odds of care use using URC alone (as previous

studies have done), might not be granular enough to illustrate care patterns at these different geographies.

Rather than urban areas being high risk, and rural areas being low risk – as was previously concluded from studies including urban-rural classification (Coward et al., 1996; McCann et al., 2014); it is specifically lower density areas of cities and urban areas to which higher risk is attributable.

Meanwhile, for other city and urban areas, the attributable risk is not statistically different from rural areas. This built upon the initial findings of the Masters thesis by providing evidence that there are more complex patterns of care use at different geographies. However, there are still remaining questions about these effects observed in Scottish data.

To summarise, in terms of this thesis, this research has replicated the results of previous research elsewhere. This suggests that evidence from other populations that particular socio-demographic, self-rated health and geographical factors were predictive of using care homes in old age; is generalisable to Scotland. However, with the caveat that this applies to the cohort of people aged 65 and older in Scotland in 1991 and followed up in 2001, sampled for this analysis. Therefore, this could be limited to this particular time-period for reasons discussed in the introductory chapter, Chapter 1 (e.g. aspects of the place, politics, people or period in time which may have implications for care use). Notably, this research has also evidenced an interesting pattern of how the odds of using care homes at follow-up varies by geographies of where older people live. However, as with any research, it leaves further questions and these questions are discussed below.

#### *FURTHER QUESTIONS*

Firstly, a key question raised by these findings, is whether this interaction between PD and URC is found in other populations outside Scotland.

However, the focus of this thesis is conducting research on formal social care use in Scotland, thus investigating this is outside the remit of this current PhD



thesis. A large effect size was observed for this interaction – the impact of a policy change or intervention based on a factor with this magnitude of effect, could have a large impact on care outcomes. Therefore, understanding what is driving these geographical differences in odds of using care homes at follow-up, could be very useful for informing policy/service interventions. Therefore, the drivers behind this interaction warrant further investigation. Additionally whether this effect is found in populations outwith Scotland also warrants investigation.

Secondly, a further question raised by these findings is whether the observed patterns of association for the socio-demographics, self-rated health and geographical factors, continue to be important in later cohorts. For the findings of this research to be relevant to policy and practice in Scotland today, these observed effects need to be enduring – in other words they must continue over time to still be relevant. Therefore, it is warranted to investigate whether these effects continue in later cohorts of Scottish older people (people aged 65+) or whether the associations are different in later cohorts. Additionally, the geographical pattern of care use at follow-up observed by this piece of analysis should also be investigated in later cohort, to ascertain if the effect might be relevant to older people using social care in Scotland today. As discussed in Chapter 1, there are a multitude of reasons why care use patterns and effects may change over time. Since a later cohort of older people in Scotland was available from the SLS, this meant that it was possible to explore this for a cohort of older people in Scotland from 2001 to 2011. So this question was within the remit of this thesis, and analyses exploring this are presented in Chapter 5.

Thirdly, while associations were evidenced for the interaction between PD and URC, living in a flat and working in the last ten years, and possible explanations for these patterns were suggested in the manuscript; these associations are not fully understood. Therefore, further work to understand the drivers behind how these factors are associated with increased and reduced likelihood of using care homes in old age is justified. This type of

future research direction is outwith the scope of this thesis, but would be necessary to reliably inform interventions and policy directions.

Finally, there are other possible factors which may also be important in explaining care use in Scotland which were not explored as part of this analysis, which only focussed on socio-demographics, self-reported health and geographical factors. For example, McCann et al. (2011) found that living arrangements, specifically which relatives older people lived with, predicted care use in Northern Ireland. McCann et al. (2014) also suggested that the reason rural areas might be protectively associated with care use, could be due to older people living in rural areas experiencing more supportive household structures. Therefore, investigating the role of household structure in Scotland would be a beneficial next step in understanding patterns of using care homes here. As such, this will be the aim of a later analysis presented in this thesis, reported in Chapter 7; and the analyses in the other subsequent chapters will each aim to explore other factors around particular themes which were set out in the literature review (see Chapter 2), which may also have important associations with using a care home in Scotland.

### **Limitations**

There were several limitations to this research. Firstly, those who died were excluded from this piece of research because their care outcome was unknown. This challenges the validity of the estimates – as those who died may have entered care before their death, but they are not accounted for in the model. Consequently, the analyses may underestimate the contribution of factors which are also associated with death. It was a planned part of this thesis to link NHS records to the SLS data, in order to ascertain date of entry to a care/nursing home - this measure would not require sample members to be alive at the following census to have a care outcome. This would have allowed a different analysis strategy (survival analysis), and would have overcome this limitation.

However, due to the COVID-19 pandemic interrupting the research process, this data linkage was not acquired (see Chapter 3 for more information of how COVID-19 affected this research). The interruption and delays caused by the pandemic have meant that this was no longer feasible within the time constraints of my studentship, even with COVID-related extensions. So instead, NRS deaths data will be reported to remain transparent about the number of people excluded from the analyses due to death for Sample 2. Ideally, if time permitted, further sensitivity analyses could be conducted, to see which factors were associated with death in the sample. This would indicate if there was selection bias in which people were more likely to die between censuses and so be excluded from the analyses.

A further limitation of this research is with respect to one of the factors - recent work. This factor was found to be associated with being in a care home at follow-up in this piece of research, however, caution should be taken interpreting this factor. The variable "recent work", likely also relates to older people's health status and age. So their *ability to work*, rather than the recent work itself, might be behind this association.

In conclusion, despite these limitations, this research has demonstrated which socio-demographic, self-reported health and geographical factors are important predictors of care home use in Scotland. It has also built upon previous research, improving the analysis strategy and further exploring unexpected findings to provide evidence of a notable spatial interaction. Ultimately, these are valuable contributions to the research around care home use and the factors associated with it, especially in Scotland.

## CONCLUSION

In summary, the analyses presented in this chapter identified several key aspects of socio-demographics, self-reported health and geography which are important in predicting care home use for older adults in Scotland. It built on the findings of previous studies, by replicating many of the effects found in other populations, using Scottish data. It provided a Scottish study of the

socio-demographic, self-reported health and geographical factors associated care home use, where within the UK, the previous published studies had been carried out in England, Wales and Northern Ireland on equivalent longitudinal study datasets. Additionally, it has investigated the seemingly paradoxical effects of two measures of geography, which had previously been found in my Masters project; then it has presented evidence that three lesser researched factors (also previously explored in the same Masters project) were also associated with care home use.

First, this analysis found that the way geography is associated with care home use in Scotland appears to be more complex than has been found elsewhere. It is still unknown whether this applies only to Scotland, or other populations too; but testing this is outside the remit of this thesis (where only Scottish datasets are used). However, exploring whether this association persists in a later cohort in Scotland, will indicate whether this is purely a cohort (or period) effect, or whether it may be an enduring factor affecting care home use. So this is something this thesis aimed to test in future analyses (see Chapter 5).

Second, three lesser researched factors – PD, recent work and living in a flat – were evidenced to predict care home use in Scotland. While explanations for how these associations might be driven were suggested, ultimately this needs further investigation. These research questions are outwith the remit of this thesis, but could be a direction for future research. However, investigating the importance of these factors in a later Scottish cohort will be possible, and this informs the aims of a later analysis (see Chapter 5).

Finally, there are some methodological limitations in the analyses presented here. Some of these limitations cannot be addressed within the datasets that this thesis uses, but there could be more transparency about the number of people excluded due to death. Therefore, for the later cohort, when the data extract was defined deaths were not excluded so that they could be reported by this thesis – so this is presented in Chapter 5. Ultimately, whilst these are

limitations, the research presented here has made a valuable contribution to the understanding of the socio-demographic, health and geographical factors associated with care home use in Scotland; it has expanded the number of known factors associated with care use and demonstrated a notable more nuanced spatial association.

## CHAPTER 5 – ANALYSIS 1B: SOCIO-DEMOGRAPHICS, SELF-RATED HEALTH AND GEOGRAPHY (2001-2011)

### CHAPTER SUMMARY

This chapter presents a replication of the analysis from the previous chapter, which looked at the associations of socio-demographic, self-reported health and geographical factors with using a care home at follow-up for older people in Scotland. However, in this chapter the analysis is repeated in a later cohort of data which included people aged 65+ living in Scotland in 2001, with their care outcomes measured at follow-up in 2011. It also reports the number of SLS members who were lost from the sample in the period between the two census dates, 2001 and 2011. SLS members were lost either due to death, migration or some were untraced at the next census for unknown reasons. This had not been possible with the previous analysis because of the way the data extract for that cohort had been set up.

The analyses presented in this chapter show that there were important differences in the factors associated with using a care home in old age in this later 2001-2011 cohort, compared to what had been found for the earlier 1991-2001 cohort. Area-level factors including deprivation, urban rural classification (URC), population density (PD) and an interaction between PD and URC were no longer associated with care use in this later cohort. This chapter argues that the most plausible explanation for these changes might be the enactment of a new social care policy in 2002 – The Community Care and Health (Scotland) Act 2002 (Scottish Executive, 2002), which provided free personal and nursing care for people aged 65 and older living in Scotland. This policy aimed to provide a more standard level of social care to those who needed it across Scotland, which may have removed some of the area based variation in care availability/provision. Thus, it may explain why these area based measures

are not associated with care use in this later sample. However other possible explanations are discussed and further research is needed to ascertain whether this hypothesis is justified. Exploring differences between the cohorts is a further recommendation arising from these findings.

#### AIMS AND OBJECTIVES

The analyses presented in this chapter aimed to replicate the analyses from Chapter 4, exploring the socio-demographic, self-reported health and geographical factors associated with care home use at follow-up, but using a more contemporary cohort of older people living in Scotland. Whereas the original analyses were carried out on a cohort of people living in Scotland who were aged 65+ in 1991 and their care outcomes followed-up in 2001, the cohort used here included people living in Scotland who were aged 65+ in 2001, with their care outcomes measured at follow-up in 2011.

The objective of this research was to produce estimates for the associations of socio-demographics, self-reported health and geography factors with care home outcomes in this later cohort. It was hypothesised these would be similar in strength and direction as in the previous analysis using the earlier cohort. It also aimed to estimate the associations of the three lesser researched factors: recent work, living in a flat and PD, as well as the interaction of geographies explored in Chapter 4 – PD:URC. It was hypothesised that the three lesser researched factors - recent work, living in a flat and PD - would continue to be associated with care use. So recent employment would be associated with reduced odds of being in a care home at follow-up, while living in a flat and lower population density would be associated with increased odds. For the interaction between PD and URC it was hypothesised that this would remain the same as in the previous chapter. So it was predicted that in low density areas of urban settlements, higher attributable risk of using care at follow-up would be observed; while in

higher density areas, the odds would be much lower and fairly similar across the URC categories.

As there was a social care policy change between the two cohorts (which will be covered in greater detail later in the chapter), it was thought possible that some of the associations could have changed as a result of this. Since the policy removed the costs of certain types of social care (personal and nursing care), it was possible that differences might be more likely for certain groups. For example, for those for whom cost could have been a barrier to accessing care, there may have been greater access to these free social care services. In the previous analysis, the point estimate for the most deprived group showed slightly lower increased odds compared to the second most deprived group. This was not expected, given there was a pattern of increasing odds of using care with increasing deprivation for the other four deprivation groups. It is possible that this observed pattern could be due to monetary barriers in accessing social care for older people in this highest deprivation group, who generally may have lower assets/wealth than older people in the other deprivation groups. Thus, in the later cohort, following the enactment of this new policy, this pattern might be different.

An additional aim the research in this chapter was to report the attrition from the initial sample - people aged 65+ at the first census in 2001. In the last chapter it was unknown how many SLS members had been lost to attrition because of the way the data extract was defined. This replication aimed to improve this by reporting the attrition for this later cohort where these data were available.

#### *RESEARCH QUESTIONS*

1. How many SLS members are lost to attrition in this cohort, and for what reasons?
2. Which socio-demographics, self-reported health and geography factors are associated with care use in the 2001-2011 cohort?
3. Is recent work associated with using care in the 2001-2011 cohort?



4. Is living in a flat associated with using care in the 2001-2011 cohort?
5. Is PD associated with care use in the 2001-2011 cohort?
6. Is there an interaction between PD and URC in the 2001-2011 cohort?

## RESULTS

### *DESCRIPTIVE STATISTICS*

#### **Full Sample**

In the 2001-2011 cohort, 14362 SLS members were present and traced at both 2001 and 2011 census dates making up the analysis sample. This sample is taken from the full sample of SLS members, which included all SLS members aged 65 or older and still living at home on the 2001 census date. Table 7 shows the percentage of the full sample who were either: alive and still living at home; alive and in care; dead or untraced at the 2011 census (unknown). This shows that just under half the full sample had died by follow-up, and just over 5% were untraced. Note: the full sample of N=29014 in Table 7 is after exclusions (as detailed in the methods presented in Chapter 3) have been made; the original raw sample was N=40910 before exclusions were applied.

*Table 7.*

#### *Table of 2011 Outcomes for Full Sample*

*A table to present the outcomes for the full sample of older people aged 65 and older in 2001, who were still living at home. Since not all SLS members were traced at the following census in 2011, this table shows how many SLS members were traced and untraced. For those who were traced (and so alive in 2011), the table shows the number and percentage who were alive and in a care home or alive and not in a care home. For those who were untraced, the table shows the number and percentage who were recorded as dead or for whom their status was unknown. The table also shows these four possible outcomes when the sample was split by sex/gender, showing the numbers and percentages for men and women separately. Source: SLS.*

<b>Outcome in 2011</b>	<b>Full Raw Sample</b>		<b>Men</b>		<b>Women</b>	
	<b>N</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Alive (not in care)	13424	46.27%	5596	45.72%	7828	46.67%
Alive (in care)	938	3.23%	230	1.88%	708	4.22%
Dead	13073	45.06%	5757	47.03%	7316	43.62%
Unknown	1579	5.44%	658	5.38%	921	5.49%
<b>Total</b>	<b>29014</b>	<b>100.00%</b>	<b>12241</b>	<b>100.00%</b>	<b>16773</b>	<b>100.00%</b>

Table 7 also shows the outcome breakdown split by sex. This shows that a larger percentage of men had died by follow-up, which aligns with men's higher morbidity and shorter life-expectancy. However, roughly the same

percentage of men and women were untraced. While similar percentages of men and women were alive and still living at home, a greater percentage of women were in care at follow-up – nearly 2% of the sample of men and just over 4% of the sample of women.

### **Analytic Sample**

The analytic sample contained N=14362 SLS members (all alive and traced at follow-up, after exclusions were made). Of the analytic sample, 6.53% of the sample were in a formal care home at follow-up in 2011; this was 8.29% of the women and 3.95% of the men. Table 8 below shows the characteristics of the sample - the number and percentage of SLS members who are in each category level of the independent variables (factors); it also shows the number and percentage of those who were in care at follow-up for each factor level.

Table 8 shows that almost 60% of the sample are women, which fits with men's lower life-expectancy. There are considerably fewer older people in the highest deprivation quintile, suggesting fewer older people in this quintile have survived to follow-up, which fits with the social gradients in life expectancy. Table 8 also shows that nearly 40% of the sample reported having long-term conditions.

In terms of care outcome, Table 8 shows that an increasing proportion of the older age groups and the people living in the more deprived areas were in care at follow-up. The percentage in care at follow-up was also higher for single, divorced and widowed people, people with long-term conditions, people who rent their homes, people living in flats and people who have not recently worked. For the geography measures, PD and URC, there were no large differences between the different geography levels, only in low PD and rural areas there was a slightly lower percentage of older people in care at follow-up.

Table 8.

Table of Sample Characteristics in 2001 and Care Outcome in 2011

Table presenting the socio-demographic characteristics of the sample which consisted of older people aged 65 and older and still living at home in Scotland at the 2001 census date, who were then successfully traced in the 2011 census. This table shows the number and percentage of the sample in each level of the categorical factor variables (age, sex, marital status, deprivation score quintile, long-term illness, URC, housing tenure, PD, recently working, house type and the two interaction terms

sex:marital status and PD:URC). Additionally, the number and percentage of the older people in each factor level who had entered care by follow-up in 2011 is also presented. Source: SLS.

2001 Factor	Total sample		Entered care by 2011	
	N	%	n	%
<b>Age</b>				
65-69	6383	44.44%	126	1.97%
70-74	3931	27.37%	195	4.96%
75-79	2755	19.18%	306	11.11%
80+	1293	9.00%	311	24.05%
<b>Sex</b>				
Male	5826	40.57%	230	3.95%
Female	8536	59.43%	708	8.29%
<b>Marital Status</b>				
Married	8735	60.82%	333	3.81%
Single	999	6.96%	130	13.01%
Divorced	686	4.78%	41	5.98%
Widowed	3942	27.45%	434	11.01%
<b>Sex:Marital Status</b>				
Male Married	4600	78.96%	129	2.80%
Male Single	291	4.99%	39	13.40%
Male Divorced	250	4.29%	17	6.80%
Male Widowed	685	11.76%	45	6.57%
Female Married	4135	48.44%	204	4.93%
Female Single	708	8.29%	91	12.85%
Female Divorced	436	5.11%	24	5.50%
Female Widowed	3257	38.16%	389	11.94%
<b>Deprivation Score</b>				
Quintile 1 - Low	3436	23.92%	190	5.53%
Quintile 2 - Low-Medium	3045	21.20%	172	5.65%
Quintile 3 - Medium	3133	21.81%	220	7.02%
Quintile 4 - Medium-High	2937	20.45%	211	7.18%
Quintile 5 - High	1811	12.61%	145	8.01%
<b>Long-term Illness</b>				
No Long-term Condition Reported	8693	60.53%	420	4.83%
Long-term Condition	5669	39.47%	518	9.14%
<b>Urban/Rural Classification</b>				
City (≥125,000 people)	5231	36.42%	378	7.23%
Urban (≥10,000p people)	4166	29.01%	251	6.02%
Small Town (≥3,000 people)	2077	14.46%	155	7.46%
Rural (<3000 people)	2888	20.11%	154	5.33%
<b>Housing Tenure</b>				
Rent	3696	25.73%	366	9.90%
Own	10666	74.27%	572	5.36%
<b>Population Density</b>				
High (>5,000ppkm <sup>2</sup> )	5724	39.86%	405	7.08%
Medium (1000-5000ppkm <sup>2</sup> )	6415	44.67%	423	6.59%
Low (<1,000ppkm <sup>2</sup> )	2223	15.48%	110	4.95%
<b>Recent Work</b>				
No Recent Work	4280	29.80%	635	14.84%
Recent Work	10082	70.20%	303	3.01%
<b>House Type</b>				
Other	10959	76.31%	590	5.38%
Flat	3403	23.69%	348	10.23%
<b>PD:URC</b>				
High:City	2862	19.93%	227	7.93%
High:Urban	1915	13.33%	109	5.69%
High:Small Town	684	4.76%	49	7.16%
High: Rural	263	1.83%	20	7.60%
Medium:City	2161	15.05%	141	6.52%
Medium:Urban	2024	14.09%	132	6.52%
Medium:Small Town	1223	8.52%	95	7.77%
Medium:Rural	1007	7.01%	55	5.46%
Low:City	208	1.45%	10	4.81%
Low:Urban	227	1.58%	10	4.41%
Low:Small Town	170	1.18%	11	6.47%
Low:Rural	1618	11.27%	79	4.88%
<b>Total</b>	<b>14362</b>	<b>100.00%</b>	<b>938</b>	<b>6.53%</b>

## *MODELLING ANALYSIS*

Model 1 was a base model and included just age and sex. This model showed that increased age and being a woman were both associated with higher odds of care use at follow-up. The McFadden's pseudo- $R^2$  for this model was 0.1215 suggesting good model fit. For full model results of Model 1 see Table 9 below.

*Table 9.*

*Table of Model Summaries for Model 1 and Model 2 for 2001-2011 Sample*

*Model summary table for models 1 and 2 showing ORs (where the null value is 1) and 95% CIs for all factors in each model when regressed against the outcome of being in a care home at follow-up. The models presented here include Model 1, the base model, which included the factors: age and sex; and Model 2, the theoretical model, which included the factors: age, sex, marital status, deprivation score quintile, long-term illness, education, URC, housing tenure and the interaction term for sex:marital status. The model fit statistics, AIC and  $R^2$ McF, are also presented for each model. Source: SLS.*

2001 Factor	Model 1		Model 2	
	OR (95% CI)	Sig.	OR (95% CI)	Sig.
<b>Age</b>				
65-69	1.00	***	1.00	***
70-74	2.55 (2.03, 3.21)		2.41 (1.91, 3.04)	
75-79	5.87 (4.75, 7.29)		5.27 (4.25, 6.59)	
80+	14.37 (11.58, 17.95)		11.84 (9.41, 14.98)	
<b>Sex</b>				
Male	1.00	***	1.00	***
Female	1.72 (1.47, 2.02)		1.82 (1.45, 2.30)	
<b>Marital Status</b>				
Married			1.00	***
Single			5.01 (3.33, 7.40)	
Divorced			2.97 (1.67, 4.99)	
Widowed			1.43 (0.99, 2.04)	
<b>Sex:Marital Status</b>				
Male Married			1.00	***
Female Single			0.36 (0.22, 0.59)	
Female Divorced			0.34 (0.17, 0.70)	
Female Widowed			0.90 (0.61, 1.36)	
<b>Deprivation Score</b>				
Quintile 1 - Low			1.00	0.874
Quintile 2 - Low-Medium			0.94 (0.75, 1.17)	
Quintile 3 - Medium			1.04 (0.84, 1.29)	
Quintile 4 - Medium-High			0.96 (0.76, 1.20)	
Quintile 5 - High			1.02 (0.79, 1.32)	
<b>Long-term Illness</b>				
No Long-term Condition Reported			1.00	***
Long-term Condition			1.60 (1.39, 1.84)	
<b>Urban/Rural Classification</b>				
City ( $\geq 125,000$ people)			1.00	*
Urban ( $\geq 10,000$ people)			0.84 (0.71, 1.00)	
Small Town ( $\geq 3,000$ people)			1.05 (0.86, 1.29)	
Rural ( $< 3000$ people)			0.82 (0.66, 1.00)	
<b>Housing Tenure</b>				
Rent			1.00	**
Own			0.79 (0.67, 0.93)	
<b>Population Density</b>				
High ( $> 5,000$ ppkm <sup>2</sup> )				
Medium (1000-5000ppkm <sup>2</sup> )				
Low ( $< 1,000$ ppkm <sup>2</sup> )				
<b>Recent Work</b>				
No Recent Work				
Recent Work				
<b>House Type</b>				
Other				
Flat				
<b>PD:URC</b>				
High:City				
Medium:Urban				
Medium:Small Town				
Medium:Rural				
Low:Urban				
Low:Small Town				
Low:Rural				
<b>AIC</b>	6099.8		5974.0	
<b>R<sup>2</sup>McF</b>	0.1215		0.1440	

Note: Significance - \*\*\* <0.001, \*\* <0.01, \* <0.05, for >0.05 value will be given.

Model 2 was a theoretical model (called the risk model in equivalent analyses in Chapter 4 manuscript), and it included the predictors from the base model and established predictors of care use in old age from the literature. This model showed that increased age, being a woman, being single, widowed or divorced and having a long-term/limiting illness were all associated with increased odds of using care at follow-up, while homeownership was associated with reduced odds. Although URC was significant, with the point-estimates for urban and rural areas indicating reduced odds compared to cities, for both, the confidence intervals crossed 1 (the null value). This model had a greater McFadden's pseudo-R<sup>2</sup> value (0.1440) evidencing better model fit than the previous model (Model 1 McFadden's pseudo-R<sup>2</sup> = 0.1215). For full model results of Model 2 see Table 9 above.

Model 3 included the predictors from Model 2 and three lesser researched predictors: recent work, living in a flat and PD. For the established predictors, this model showed broadly the same associations in both direction and strength; with the exception of URC which was no longer a significant predictor, and housing tenure, for which the strength of the association reduced - possibly due to some confounding with living in a flat. Recent work was associated with reduced odds of care use at follow-up compared to not having worked recently; and living in a flat compared to other house types was associated with increased odds of care use at follow-up. This model had a greater McFadden's pseudo-R<sup>2</sup> value (0.1464) evidencing slightly better model fit than the previous model. For full model results for Model 3 see Table 10 below.

*Table 10.*

*Table of Model Summaries for Model 3 and Model 4 for 2001-2011 Sample*

*Model summary table for Models 3 and 4 showing ORs (where the null value is 1) and 95% CIs for all factors in each model when regressed against the outcome of being in a care home at follow-up. The models presented here include Model 3, which included the established predictors: age and sex, marital status, deprivation score quintile, long-term illness, education, URC, housing tenure and the interaction term for sex:marital status, plus the three lesser research predictors: recent work, living in a flat and PD; and Model 4, which included the established predictors and three lesser researched*

factors like in Model 3, but with the addition of an interaction term for PD and URC (PD:URC). The model fit statistics, AIC and R<sup>2</sup>McF, are also presented for each model. Source: SLS.

2001 Factor	Model 3		Model 4	
	OR (95% CI)	Sig.	OR (95% CI)	Sig.
<b>Age</b>				
65-69	1.00	***	1.00	***
70-74	2.38 (1.89, 3.00)		2.38 (1.89, 3.00)	
75-79	2.81 (1.71, 4.91)		2.84 (1.72, 4.95)	
80+	6.30 (3.80, 11.04)		6.39 (3.85, 11.20)	
<b>Sex</b>				
Male	1.00	***	1.00	***
Female	1.78 (1.42, 2.24)		1.78 (1.42, 2.25)	
<b>Marital Status</b>				
Married	1.00	***	1.00	***
Single	4.83 (3.20, 7.14)		4.85 (3.22, 7.17)	
Divorced	2.83 (1.59, 4.77)		2.84 (1.59, 4.78)	
Widowed	1.40 (0.97, 2.00)		1.41 (0.97, 2.01)	
<b>Sex:Marital Status</b>				
Male Married	1.00	***	1.00	***
Female Single	0.36 (0.22, 0.59)		0.36 (0.22, 0.59)	
Female Divorced	0.34 (0.17, 0.70)		0.34 (0.17, 0.70)	
Female Widowed	0.90 (0.60, 1.35)		0.89 (0.60, 1.35)	
<b>Deprivation Score</b>				
Quintile 1 - Low	1.00	0.885	1.00	0.882
Quintile 2 - Low-Medium	0.92 (0.74, 1.15)		0.91 (0.73, 1.15)	
Quintile 3 - Medium	1.01 (0.81, 1.26)		1.01 (0.81, 1.26)	
Quintile 4 - Medium-High	0.93 (0.73, 1.17)		0.93 (0.73, 1.18)	
Quintile 5 - High	0.96 (0.73, 1.26)		0.96 (0.73, 1.26)	
<b>Long-term Illness</b>				
No Long-term Condition Reported	1.00	***	1.00	***
Long-term Condition	1.61 (1.39, 1.85)		1.60 (1.39, 1.84)	
<b>Urban/Rural Classification</b>				
City (≥125,000 people)	1.00	0.181	1.00	0.181
Urban (≥10,000p people)	0.88 (0.74, 1.05)		0.78 (0.60, 1.00)	
Small Town (≥3,000 people)	1.12 (0.90, 1.38)		0.97 (0.68, 1.36)	
Rural (<3000 people)	0.98 (0.76, 1.25)		1.24 (0.73, 2.01)	
<b>Housing Tenure</b>				
Rent	1.00	*	1.00	*
Own	0.83 (0.71, 0.99)		0.83 (0.71, 0.99)	
<b>Population Density</b>				
High (>5,000ppkm <sup>2</sup> )	1.00	0.232	1.00	0.232
Medium (1000-5000ppkm <sup>2</sup> )	1.03 (0.87, 1.21)		0.94 (0.74, 1.19)	
Low (<1,000ppkm <sup>2</sup> )	0.82 (0.62, 1.09)		0.65 (0.31, 1.23)	
<b>Recent Work</b>				
No Recent Work	1.00	*	1.00	*
Recent Work	0.53 (0.33, 0.90)		0.53 (0.33, 0.91)	
<b>House Type</b>				
Other	1.00	**	1.00	**
Flat	1.27 (1.08, 1.50)		1.27 (1.07, 1.49)	
<b>PD:URC</b>				
High:City			1.00	0.470
Medium:Urban			1.30 (0.91, 1.86)	
Medium:Small Town			1.24 (0.80, 1.94)	
Medium:Rural			0.74 (0.41, 1.37)	
Low:Urban			1.15 (0.43, 3.06)	
Low:Small Town			1.79 (0.67, 4.84)	
Low:Rural			0.97 (0.42, 2.40)	
<b>AIC</b>	5965.3		5971.7	
<b>R<sup>2</sup>McF</b>	0.1464		0.1472	



Note: Significance - \*\*\* <0.001, \*\* <0.01, \* <0.05, for >0.05 value will be given.

Model 4 included predictors from Model 3 and an interaction term PD:URC. The associations for the established and lesser researched factors remained consistent with Model 3, except for URC and PD. The interaction term for PD:URC was not statistically significant. This model had a greater McFadden's pseudo-R<sup>2</sup> value (0.1472) evidencing slightly better model fit than the previous model. For full model results of Model 4 see Table 10 above.

The combined ORs calculated for the PD:URC interaction are plotted in Figure 3 below. There is no evidence of any interaction between PD and URC in this sample, 2001-2011. The combined ORs have been plotted on the same axes as the combined ORs from the first analysis using the 1991-2001 sample which was presented in Chapter 4. This previous plot is presented for comparison below in Figure 4. The plot from the current analysis (Figure 3) is almost completely flat unlike the strong evidence of an interaction from the first analysis in Chapter 4 (Figure 4). The same axes have been used for both plots to allow easier comparison – with a Y axis spanning from 0 to 15.

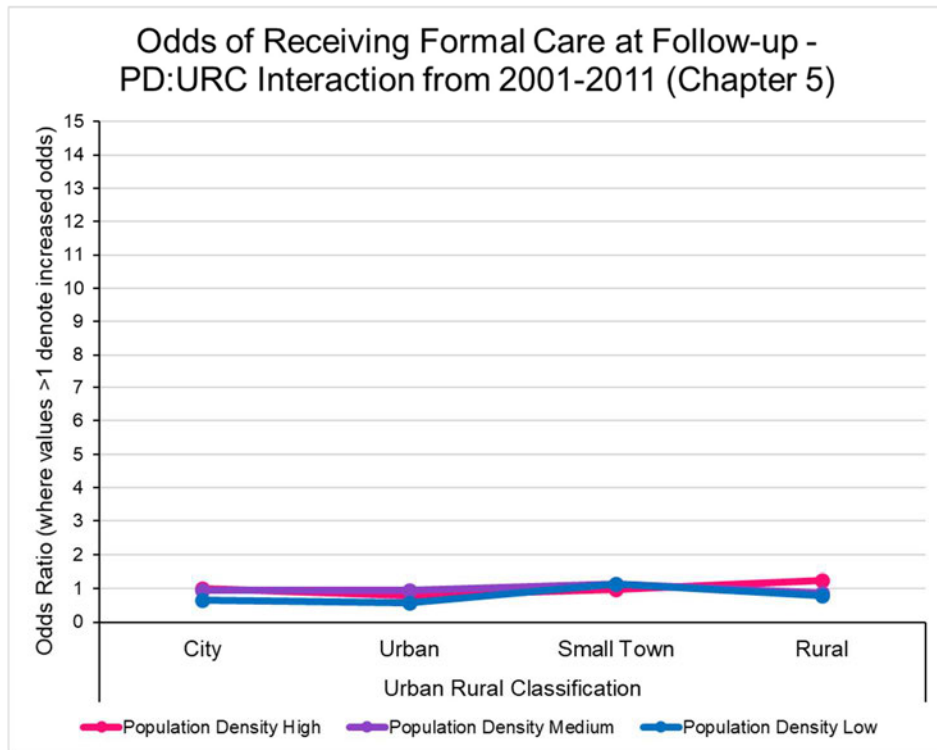


Figure 3. *Plot of Combined Odds Ratios for the Interaction Between Geographies (PD:URC) 2001-2011 Sample Plot showing the combined ORs, including interaction correction, for different geographies from the interaction term for URC and PD when regressed against the outcome of being in a care home at follow-up, for older people in Scotland in the 2001-2011 cohort (from Model 4). This means that an OR and corresponding 95% CI has been calculated for each level of PD (high, medium, low) within the URC levels (city, urban, small town, rural). For example within the URC level 'city', an individual estimate for 'high', 'medium' and 'low' PD areas is plotted in this figure. Source: SLS.*

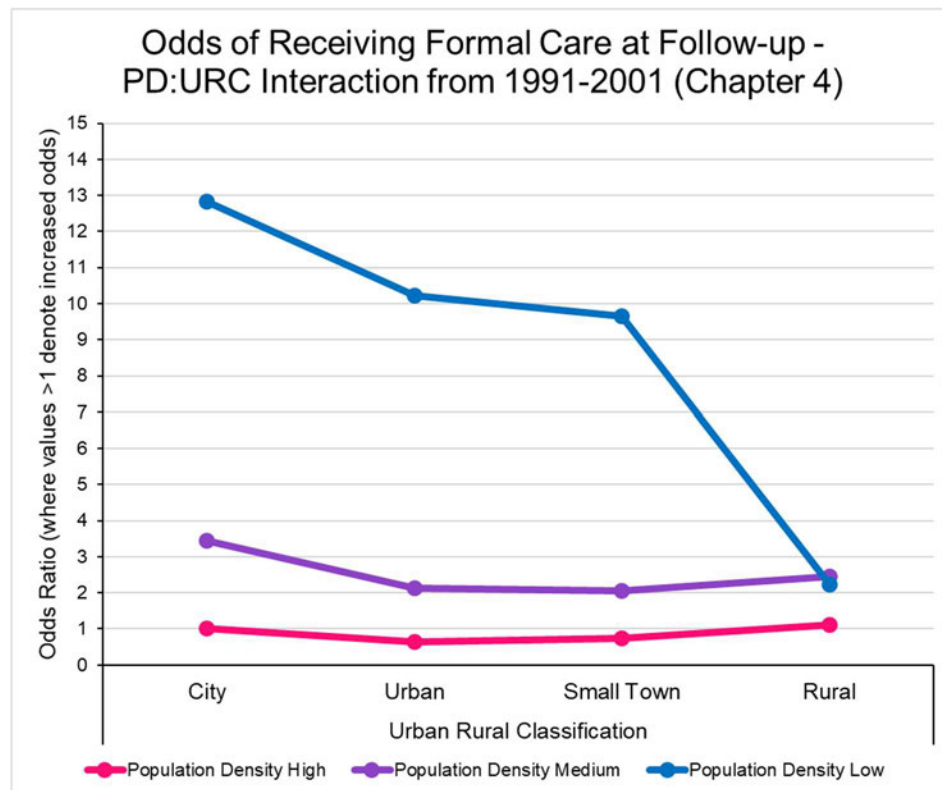


Figure 4. *Plot of Combined Odds Ratios for the Interaction Between Geographies (PD:URC) 1991-2001 Sample Plot showing the combined ORs, including interaction correction, for different geographies from the interaction term for URC and PD when regressed against the outcome of being in a care home at follow-up, for older people in Scotland in the 1991-2001 cohort (as presented in the analysis in Chapter 4). This means that an OR and corresponding 95% CI has been calculated for each level of PD (high, medium, low) within the URC levels (city, urban, small town, rural). For example within the URC level 'city', an individual estimate for 'high', 'medium' and 'low' PD areas is plotted in this figure. Source: SLS.*

## DISCUSSION

The analysis in this chapter repeated the analysis from the previous chapter, Chapter 4, on a more recent cohort. Where Chapter 4 used a cohort of Scottish people aged 65 and older in 1991, with follow-up in 2001, this chapter used a cohort of people aged 65 and older in 2001, with follow-up in 2011 - so ten years later. The results showed that age, sex/gender, marital status, long-term illness and tenure were also associated with being in a care home at follow-up for this later sample, but this time there was only a weak association for URC and no evidence was found for an association of deprivation with care use. For the three lesser researched factors, recent work and living in a flat were still associated with care use in this later sample, but PD was not. No evidence of an interaction between PD and URC

was found; this association, observed in Chapter 4, did not replicate in the later Scottish sample. To summarise, in this later sample of older people in Scotland, this analysis demonstrated that increased age, being a woman, being single, widowed or divorced, having a long-term condition/illness and living in a flat, were all associated with increased odds of being in care at follow-up. Being a homeowner and recent employment were associated with decreased odds.

These findings will now be discussed and interpreted in greater detail. First the socio-demographic, self-reported health and geographical factors which were associated with care use in this later sample are discussed, followed by the factors which were no longer associated with care outcome in this sample are discussed. The findings are interpreted regarding their differences compared to the previous analysis in Chapter 4, and what differences might mean in terms of the bigger picture of social care in Scotland. The strengths and limitations of these analyses are then presented, followed by a discussion of the possible policy implications and direction for future research. Finally, a conclusion is presented.

#### *SOCIO-DEMOGRAPHIC, SELF-RATED HEALTH AND GEOGRAPHICAL ASSOCIATIONS IN A LATER SCOTTISH SAMPLE*

This analysis showed that some of the factors found to be associated with care use at follow-up in the earlier cohort (1991-2001; Chapter 4), were not associated with care use in this cohort (2001-2011). While age, sex/gender, marital status, long-term illness, housing tenure, recent employment, house type and an interaction term between sex/gender and marital status, were associated with this outcome; the area measures (deprivation, URC and PD) were not. The effects which did replicate in the later sample showed the same patterns as in the original study (1991-2001; Chapter 4) – so increased age, being a woman, being single, widowed or divorced, having a long-term illness and living in a flat were associated with increased odds of being in a care home at follow-up, while being a homeowner and recent employment were associated with reduced odds. This corroborates with the findings from

Chapter 4 and previous research in other populations, suggesting these factors could be important regardless of time period or country.

However, the other main finding from Chapter 4, was an interesting spatial variation in care/nursing home use at follow-up. The spatial variation was evidenced by an interaction between PD and URC in the 1991-2001 cohort (Chapter 4). Despite previous research elsewhere suggesting urban areas posed the greatest risk of using care/nursing homes compared with rural areas, in the Scottish sample the heightened attributable risk was limited to the low PD parts of urban areas. However, this pattern was not found in the current analysis which used a later equivalent Scottish cohort. The effect sizes in the earlier cohort were very large, both at a population and individual level; suggesting the different findings in the later sample did not simply result from a lack of statistical power.

In Chapter 4, this thesis proposed several possible explanations for this spatial pattern from the interaction between the geographies, and some of these might be relevant in explaining why the effect was not replicated in the later sample. First, Chapter 4 reasoned that the greatly increased risk in low density urban areas could be due to sufficient provision of care home beds in these areas (plentiful supply might mean that care home services are chosen over other services, or there are smaller waiting lists). By comparison, in the higher density parts of cities/urban areas and rural areas where lower risk was observed, there are fewer care homes. This can be seen by looking at maps of towns and cities; where housing stock prices are higher in the city/town centres, there are fewer care homes. Therefore, the lower risk in these areas might signal that people here have unmet needs – so people with care needs are not receiving the social care they need due to under provision in high PD areas.

Second, Chapter 4 also proposed that these differences could be due to the differing availability of in-home care services. In-home social care is more practicable in areas where older people live closer together – there are a

number of difficulties to providing in-home care in low density areas. These so called “sparsity problems” include longer travel time and higher travel costs between service providers and service users, difficulties recruiting workforce and generally higher unit costs because of the economy of scale (fewer service users means higher cost per service user) (Hart & Lavis, 2017). Therefore in-home social care services are more likely to be available, and cost less for service users, in higher PD areas. Thus, on the basis that in-home care services might act as a buffer against needing to use a care home (Young et al., 2015), this might also explain part of this interaction. If in-home care services are more likely to be available to older people living in high PD areas, then care home use might also be less common here as their care needs can be managed at home. Whereas in low PD areas, where in-home care services might not always be available, for some older people this may mean they have to move to a care home to get their care needs met. This offers a plausible explanation for why care home use at follow-up may vary spatially as observed in Chapter 4.

This pattern failing to replicate in the analyses in this chapter, using the later sample (2001-2011), could also further support both of these arguments. Both arguments are based on care home provision and in-home care provision varying spatially, so if there was a reason that care home provision might be more equal across different areas of Scotland in this later sample, then this could explain why the effect was not observed in the later sample.

As mentioned in Chapter 1, an important social care policy change happened in 2002. The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002), is a policy which made some social care services, personal and nursing care, free in Scotland. The policy mandated that free personal and nursing care should be provided on the basis of a needs assessment to anyone over 65, and this included both social care in a care home and social care provided in the older person’s own home – ‘home care’. It is important to note that the policy covered only nursing and personal care – such as help toileting, showering/bathing, managing incontinence,

taking medication, dressing sores, mobility etc. but it did not cover all social care, e.g. help with shopping and the 'hotel' costs in care homes could still be charged for, usually based on a means-test (Scottish Executive, 2002, 2005; Scottish Government, 2019a). It was left up to each individual Local Authority to decide how they would deliver and charge for this. Also note that in Scotland, Local Authority refers to councils (local governments), of which there are currently 32 (in 2022 at the time of writing). For further information about the policy details see: Scottish Executive (2002, 2005); Scottish Government (2019a).

The introduction of the policy was in response to a report - The Sutherland Report (Sutherland Report, 1999) - which advised the UK Government to provide personal care for free (The Scottish Parliament, 2021). This change was suggested to address inequity in social care provision found in the UK, which was due in part to healthcare being provided free at the point of need by the National Health Service (NHS) while most social care was charged based on a means test; this meant that for older people with certain conditions like cancer, their social care costs were already met, as this care was considered healthcare not social care (Bell, 2018; Glasby & Littlechild, 2004). Inequity also existed in provision across the UK due to the costs associated with care - for some older people, despite the means test suggesting they should pay their own care costs, they could still not afford the care they needed, so they did not receive it (Dilnot, 2011). This became more nuanced depending on first, the mode of social care people needed, second, the amount of care people needed and third, the associated costs, as cost increased greatly for certain types of care like specialist care – as a result, the cost of care for each older person was highly variable and the means test did not account for this (Dilnot, 2011).

In Scotland, prior to the introduction of the policy, how social care was charged and delivered was determined by each individual Local Authority, so this varied, with some Local Authorities already providing social care free prior to the policy enactment (Audit Scotland, 2008; Bell et al., 2007; Bowes

& Bell, 2007). So, given this variation prior to 2002, the policy in theory, should have meant that a basic level of social care became universal throughout Scotland from 2002 onwards. The policy also should have meant that social care was provided based on need, rather than other factors which may have influenced care previously such as ability to pay, proximity to a care home, or availability of home carers in the local area (home care being less feasible in remote or isolated areas). Thus, the policy could have removed some of the variation in social care provision across Scotland by providing a universal basic level of social care, as it set out to do - which could have removed spatial inequalities, which may have been driving the spatial patterns of care home use at follow-up in Scotland, observed in Chapter 4 (1991-2001).

Moreover, allocating social care based on a needs assessment rather than a means test, could have increased access to social care, particularly for those experiencing higher levels of deprivation. Uptake of means-tested benefits tends to be lower for those in need and this has been suggested to relate to stigma, which creates a barrier to people accessing services and benefits that they are entitled to (Baumberg, 2016). Research on social security uptake in the UK by Rosato and O'Reilly (2006) concluded that uptake was highly nuanced, with lower uptake in low PD areas, areas with higher proportions of ethnic minorities and for people experiencing higher deprivation (with the exception of London). Rosato and O'Reilly (2006) suggested that since patterns of uptake of different benefits were highly correlated, these findings could be generalisable to other benefits too (Note: "benefits" in the UK is a term used to describe state provision). This could include the means tested social care, prior to The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002). Once the means testing was removed, this could have reduced barriers such as stigma and anxiety about proving asset worth, that resulted in non-uptake – so more people might have tried to access free social care.



Accordingly, after the policy was introduced, an increase in the demand for social care was evidenced by Bell et al. (2007). Bowes and Bell (2007) also report that representatives from Local Authorities felt that they had been forced to expand and supplement provision from private providers to meet the demand for social care provision, and said that this was in part due to the policy. Although the possible drivers of this increase were debated such as increased hospital discharge to social care to free up beds, underlying unmet care need was not ruled out (Dickinson & Glasby, 2006). Bell et al. (2007) also noted that most of the increase in demand for care services that they observed was in in-home care services. Therefore, a greater number of older people could be having their care needs met earlier with in-home alternatives, especially those who previously faced barriers to accessing this type of care either through lack of provision in their area, means to pay or non-uptake of the care they were entitled to. Thus, this could be why deprivation, and possibly area measures like PD, were not associated with care in this later sample.

However, there are caveats to these arguments, and several criticisms of the policy raised by other research. First, following the introduction of the policy, the needs assessments to determine what social care older people were entitled to needed to be carried out, however there were considerable delays and wait times for older people receiving their needs assessments (Audit Scotland, 2008; Dickinson & Glasby, 2006; Dickinson et al., 2007). The argument above suggests that social care was provided based on need, and this resulted in more equitable access across Scotland. But if access to social care was delayed by waiting time for an assessment, this might not have been the case. Capacity to carry out these assessments may have added another level of area based variation, as these would be carried out by the Local Authority, unless all Local Authorities struggled equally to meet the demand for assessments. Moreover, some areas had long wait times and this received criticism that wait times may have been used to ration personal and nursing care in these areas, especially for in-home services (Age

Concern, 2003, as cited in Dickinson & Glasby, 2006). This would not constitute equitable access to social care as posited in the earlier argument.

Second, while the policy set out to make social care access more equitable, in reality the social care provided to older people in each Local Authority still varied. Audit Scotland (2008) report several different interpretations of the policy due to ambiguity in the policy criteria; for example, definitions of personal care differ and whether personal care included services like food preparation was unclear. Additionally, since delivery of the policy was down to Local Authorities individually, there was ambiguity whether the social care was a universal entitlement or whether Local Authorities should only deliver within funding limits; this meant prioritisation where services or budget did not meet demand (Audit Scotland, 2008). Ultimately, these ambiguities mean that the policy did not result in a universal standard level of personal and nursing care being delivered across Scotland from 2002. Consequently, this may not support the argument above that this policy is why area-based variables like URC, PD and deprivation were no longer associated with care home use in the later sample. However, the provision after the policy introduction may still have been more equitable than the previous system, despite not really being a standard universal provision, and thus result in the differences observed in this chapter.

Then lastly, following the devolution of the UK governments in 1998, there were many changes happening in Scotland in the early 2000s; this means that there were several other co-occurring changes happening for social care at the same time as this policy was introduced in 2002 (Audit Scotland, 2008). For example, Scottish Executive were also trying to make other developments within health and social care like improving joint working between the two services, making care services with more choice and flexibility, increasing the standards of care delivered and working towards providing in-home care so people could remain at home longer (Audit Scotland, 2008). Therefore, the differences evidenced in this chapter could

be due to the changing social care landscape in Scotland at this time, rather than any one policy or development on its own.

In conclusion, the analyses in this chapter have shown that most of the factors in the previous analysis of a 1991-2001 cohort (in Chapter 4), found to be associated with using a care/nursing home at follow-up 10 years later for older people in Scotland, were also associated with care outcome in this later (2001-2011) Scottish sample. However, three area-level factors and an interaction between two of these factors were no longer associated with care home use in this later cohort. This coincides with the introduction of The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002), a social care policy which provided free access to personal and nursing care across Scotland. Possible mechanisms for how this policy may explain the differences observed in these analyses were discussed followed by a discussion of some caveats about the policy, which would not support this argument. Importantly, when the policy was introduced, there were other key changes occurring in health and social care in Scotland, and all of these changes in combination might explain why spatial variance in who uses care homes in old age is different in this later sample. This chapter provides evidence that some spatial inequalities in care home use no longer exist in this later Scottish sample, but it cannot tell us why this has happened. Ultimately, to understand more about what has driven this difference, further research would need to explore this.

#### *STRENGTHS AND LIMITATIONS*

The main strength of this research is that it is a replication of effects found in other populations and/or other earlier samples from the same population, which is part of undertaking good science. Replication studies explore effects in greater detail and allow us to understand more about what might drive them. While this replication study does not provide all the answers – for example we can only speculate the reasons why some effects replicated in this sample while others did not – it already tells us more about these effects. This replication study has shown that some effects are not present in this

sample and this knowledge can be used to inform future research questions. A further strength of this piece of research is the large representative sample used. Both this chapter and the previous chapter have completed comparable analyses on large representative samples of the Scottish population for their respective time periods.

A limitation of this research, like in the previous chapter, is with respect to one of the factors - recent work. This factor was found to be associated with being in a care home at follow-up in both pieces of research, however, caution should be taken when interpreting this factor. The variable “recent work”, likely also relates to older people’s health status and age. So their *ability to work*, rather than the recent work itself, might be behind this association.

However, the main limitation of this research is that it cannot be used to deduce the cause of the differences we have observed between the cohorts and populations. This limitation is not unique to this study – cause and effect cannot be assumed from associations even if one variable occurs before the outcome of interest (Abadie, 2005). However, future research could aim to explore these differences further by carrying out age period cohort analyses. While these analyses are still based on assumptions and still cannot definitively separate the effects of age, period and cohort, the greater focus on these effects and clearly stated assumptions is the best possible way to deal with such effects (Bell, 2020).

#### *IMPLICATIONS FOR POLICY AND PRACTICE*

In terms of policy recommendations, these findings suggest the difference in spatial risk for using care homes might have been influenced by the introduction of The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002) in 2002. It is possible that this policy successfully reduced some of the inequalities in access to care, which had led to patterns of care use being associated with socio-economic characteristics and where people lived in the earlier sample. While this

cannot be conclusively determined as a direct impact of this policy, the differences observed by the analyses presented in this chapter coincide with the introduction of this policy. This provides tentative evidence that enacting universal provision policies in Scotland, like this policy providing free personal and nursing care, may have the capacity to reduce inequalities. However, further investigation is needed to develop more robust evidence for this before conclusions about this can be drawn.

However, the analyses in this chapter also showed that some inequalities are more pervasive – women remain at consistently increased risk of entering care homes in both cohorts. While there have been biological explanations for this suggested, there are considerable societal and social explanations around gender roles and how these disadvantage women (Criado Perez, 2019). However, the scale of the disadvantages women face are still being realised and many biological explanations for the inequalities facing women have been recognised to be driven by social, political and economic factors, and wrongly attributed as solely biologically determined (Gannon, 1998, 2005; Kaufert, 1982). These issues were highlighted in Chapter 4 but are discussed in greater detail in the next chapter, so are not be expanded on further here (see Chapter 6). But ultimately, it is a recommendation that future care policy should focus on these more pervasive inequalities. The descriptive statistics presented here show older women make up the majority of the population of older Scottish adults. Therefore, future social care policies could be targeted towards the needs of women, who make up an increasing proportion of the older age groups.

In conclusion, the recommendations for care policy are that future policies should target relieving inequalities – particularly those facing women. This research provides evidence that such groups continue to experience excess risk of losing their independence in old age; which could be linked to pervasive gender roles in society. Additionally, there are many other marginalised groups, which are not present in large enough numbers in this study for similar conclusions to be drawn. However, feminist issues like this

are intersectional (Criado Perez, 2019) – so some people experience increased disadvantage due to being part of more than one marginalised group. Therefore, it is also a recommendation that future policies might focus on trying to reduce inequality for the groups who have faced systematic marginalisation throughout history, and continue to face a systematic disadvantage into old age. This recommendation aligns with the commitment of the Scottish Government to the United Nations Sustainable Development Goals (SDGs) – the 10<sup>th</sup> SDG is to reduce inequalities (Scottish Government, 2020).

#### *IMPLICATIONS FOR FURTHER RESEARCH*

In terms of future research direction, the differences between this analysis on the 2001-2011 cohort, and the original analyses on the 1991-2001 cohort, suggest some age, period or cohort effects are at play here. This chapter suggests a particular period effect which might explain this – policy changes following devolution including the introduction of The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002) in 2002. However, this current analysis cannot draw any firm conclusions about the co-occurrence of this difference, and the enactment of this social care policy in Scotland. It is notoriously difficult to separate age, period and cohort effects, however there are some methods of conducting age-period-cohort analyses which are posited to be generally better than others (Bell, 2014; Bell & Jones, 2014, 2015). Moreover, there were several changes to social care provision in Scotland at this time, and it would be difficult to separate out the effects of the multiple co-occurring changes (Audit Scotland, 2008).

Therefore, future research could use one of these age-period-cohort methodologies, to try and ascertain if there is evidence that policy changes in Scotland are an appropriate explanation for the differences evidenced in this thesis.

In order to test this hypothesis, it would be important to consider that different local authorities were managing social care for older people differently prior to the enactment of the policy in 2002 (Audit Scotland, 2008). But ideally if

the data were available, a Multilevel Survival Analysis could investigate this with the local authorities as levels, using representative cohorts from before and after the policy was enacted, looking at care outcome with time-to-event data for entry to a care home (Austin, 2017). With time-to-event data, there is also the possibility to use a competing risks analysis, to take into account death as an alternative (competing) outcome to care entry. If time-to-event data could be secured, these analyses would be feasible, and future research could investigate this hypothesis more comprehensively.

However, this would be difficult to do using the SLS data for the cohorts, because of the way the SLS selects the SLS members, this means that those aged 65-75 in the 1991-2001 sample would be the same people aged 75-85 in the 2001-2011 sample. Other possible longitudinal data sources would need to be explored to source distinct cohorts. With the available data from the SLS, the only way to ensure the two cohorts were distinct would be to use cohorts of SLS members in ten year samples – for example comparing 65-74 year olds from 1991-2001 with 65-74 year olds from 2001-2011.

Ultimately, there are several ways to develop the findings presented in this thesis chapter. The main findings show differences between the 1991-2001 and 2001-2011 cohorts and here several methods of developing this knowledge and testing the hypothesis that policy changes could have been responsible for these differences have been proposed. These suggestions are outside of the remit of this thesis as they are not feasible with the available data at the time of completing this PhD project. In summary, there are several options for how future research could build upon the findings of this chapter and explore why the spatial associations disappear in this later Scottish sample.

## CONCLUSION

In conclusion, the analyses in this chapter have shown differences in the factors that are associated with using a care home at follow-up in old age, in this later Scottish cohort (2001-2011). However, factors like age, sex/gender,

marital status, having long-term conditions, housing tenure, house type, recent employment and HHS have remained consistently associated with care use across the two cohorts of the Scottish population that this thesis has investigated. Therefore, the associations of these factors with care use do not seem to be influenced by period and cohort differences in Scotland over time.

For the novel interaction between PD and URC reported in Chapter 4, this chapter showed that this effect did not successfully replicate in this later sample of older people in Scotland. All three area-level factors, URC, PD and deprivation, were no longer associated with care use in this later cohort. A suggested explanation was the more uniform care provision caused by the enactment of the new social care policy, The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002), in 2002. However, further research is needed to assess the feasibility of this explanation, especially as some existing research raises questions about the real difference that this policy made to social care in Scotland.

The findings of the research in this chapter led to several recommendations for policy and future research. In terms of policy, it was recommended that future policies aim to target reducing the inequalities in who uses care homes in old age, identified by this thesis – such as for women who consistently experience increased risk of using care homes in old age. Policies focussed on groups known to experience systematic disadvantage could reduce such inequalities in Scotland – this aligns with Scottish Government’s commitment to the United Nations’ Sustainable Development Goals (Scottish Government, 2020). This thesis suggests this should include women and possibly other minority groups. This was based on evidence that women consistently experience increased risk to their independence in old age, and this is theorised to be a result of the inequity within older couples with regard to informal care - gender norms and differential life expectancy have led to women providing the most informal care, while not receiving as much informal care themselves. However, evidence for specific minority groups



was outside the remit of this thesis, but should be a priority for future research.

In terms of future research, several possible developments and research directions were proposed. The difference between the two cohorts which coincides with the enactment of The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002) warrants further investigation. Possible research methodologies were discussed, should additional data be made available to researchers in future.

## CHAPTER 6 – ANALYSIS 2: EXPLORING SEX/GENDER DIFFERENCES

### CHAPTER SUMMARY

Previous literature has evidenced that women are consistently more likely to use care homes in old age (Grundy & Jitlal, 2007; Harrison, Walesby, et al., 2017b; Luppá, Luck, Weyerer, et al., 2010; Luppá et al., 2012; McCann et al., 2011; McCann, Donnelly, et al., 2012; Woo et al., 2000). Other research has demonstrated that there is a more complex association between marital status, sex/gender and care home use in old age (Tomiak et al., 2000) – suggesting that marriage is more beneficial to men than women in terms of avoiding using a care home in old age. This interaction was replicated in Scottish data in Chapter 4 and Chapter 5. This chapter aimed to discuss and unpack this interaction between marital status and sex/gender evidenced in Chapter 4 and Chapter 5 further. It also aimed to explore whether there were sex/gender differences in the other sociodemographic, self-rated health and geographical factors associated with using social care for older people in Scotland.

This chapter presents evidence which supports a more complex interaction between marital status and sex/gender, then presents further discussion about this interaction, and why it might exist. The findings of this chapter also demonstrated that a different set of factors were important in explaining whether men and women were in a care home at follow-up. So it discusses the possible explanations why some of these factors were more important in explaining patterns of care home use for either men or women. The chapter concludes with some future directions for this thesis, and research outside of this thesis. Additionally, some relevant policy recommendations arising from the findings are discussed.

## AIMS AND OBJECTIVES

The broad aim of the analyses presented in this chapter was to look at the differences between men and women. This can be split into two main aims, so this chapter is split in to two parts, each based on an aim:

- Part 1 aimed to explore the interaction between sex and marital status evidenced in Chapter 4 and Chapter 5 further, with some extended data visualisation and discussion.
- Part 2 aimed to examine whether there were differences in the socio-demographic, self-rated health and geographical factors which predicted care use for men and women in Scotland, by creating separate models for men and women.

All analyses in Part 1 and Part 2 were carried out in both the earlier sample (1991-2001), and later sample (2001-2011). A further aim of this chapter was to report whether there were differences between the samples. Note: while it would not be possible to determine whether differences are due to sex, gender or both (see Chapter 3 for discussion of the differentiation); this research aimed to report the patterns and discuss the possible explanations for any observed differences, based on both sex differences and gender roles in society.

## *HYPOTHESES AND PREDICTIONS*

### **Women**

In Scotland, like other global-northern populations, a greater number of women than men live alone in old age (Forward et al., 2022; National Records of Scotland, 2020). Women are also more likely to spend longer at the end of their lives living with disability from multiple chronic conditions (Carmel, 2019). So it was predicted that long-term conditions might be more influential for women's subsequent care outcomes, as they are more likely to have multiple conditions which might lead to care needs. Moreover, in old age women more commonly have problems associated with daily living tasks such as climbing stairs, caused by their greater burden of chronic illnesses (Carmel, 2019). Thus, it was also a prediction that factors such as living in a

flat, (where stairs might be difficult, especially if living alone), might be a push factor for women to move to a care home in old age.

Additionally, homeownership has been evidenced to be associated with lower risk of care home admission, with homeowners less likely to use care homes; one proposed explanation for this was that for older people in the UK, their homes (potentially their children's/next of kin's inheritance) can be sold to cover the cost of living in a care home - something some older people may be reluctant to do (McCann, Grundy, et al., 2012). Since women are more commonly the last surviving member of a couple – out-living a partner/widowhood is more common for women than men in Scotland (One Scotland - Scottish Government, 2019) – therefore, homeownership may be more influential on women's care home outcomes than men's, as the decision about care versus the house will rest with them. In summary, for women, it was hypothesised that the factors: long-term conditions, living in a flat and homeownership would be associated with care home use in old age.

### **Men**

For men, it was hypothesised that homeownership is less likely to be an important variable in explaining whether they were in a care home at follow-up. As mentioned above, women more commonly outlive their partners, so men might be more likely to benefit from alternatives to selling the house to fund care in a care home, such as informal care from a spouse. Men generally marry women younger than themselves, so their partners would likely still be able to run their home and be more physically well and able to provide informal care (McCann, Donnelly, et al., 2012). Plus, their partners would also likely want to remain living in the home – thus home ownership may be less influential for men.

Also, socio-economic status might be important for men. Due to gender norms in society, men have conventionally been more likely to be part of the workforce (Office for National Statistics, 2022), and socio-economic status is an indicator of the physical characteristics of the jobs men were likely to have

(Warren et al., 2004). Particularly for men with lower socio-economic status, jobs have a more manual nature and less autonomy, leading to a greater chance of industrial injury and stress – for example, Warren et al. (2004) found that the physicality of jobs was associated with poorer health outcomes such as musculoskeletal problems. This manual aspect of work, indicated by socio-economic status, may influence ability/disability in old age, and thus socio-economic status might predict need for care in old age; and accordingly whether older people are in a care home at follow-up.

Additionally, previous research suggests being married is more protective against care home admission for men, possibly because their partners are more likely to provide informal care (as mentioned above), which buffers them from needing formal care (Tomiak et al., 2000). Therefore, it was hypothesised that for men, marriage would be more likely to be protectively associated with care home use in old age, as marriage would determine access to informal care provision, which could be a buffer against care home admission. In summary, for men, it was hypothesised that the socio-economic status and marital status might be important in explaining their care use at follow-up, but it was also hypothesised that it was less likely that homeownership would be an important predictor.

#### *RESEARCH QUESTIONS*

1. Part 1 - Is there an interaction between sex/gender and marital status in the 1991-2001 sample? Is this also found in the 2001-2011 sample?
2. Part 2 - Are different socio-demographic, self-rated health and geographical factors associated with care use in old age, for men and women in the 1991-2001 sample? Are these differences also found in the 2001-2011 sample?

#### **RESULTS**

Descriptive statistics and sample size have already been reported for both parts of this analysis using the 1991-2001 and the 2001-2011 samples, in Chapter 4 and Chapter 5 respectively. More detailed decomposition of

descriptive statistics by sex/gender was not possible, as small cell counts would violate statistical disclosure control procedure.

#### *PART 1: SEX:MARITAL STATUS INTERACTION*

For this interaction, to explore the care patterns in more detail, combined odds ratios are presented for the marital status and sex interaction from the models reported in the previous chapters for the socio-demographics, self-rated health and geographical factors models. For the 1991-2001 sample, this was from Model 5 presented in Chapter 4. For the 2001-2011 sample this was Model 3, presented in Chapter 5. This model was almost equivalent for both samples and included care outcome at follow-up regressed against: age, sex, marital status, deprivation, long-term illness, education (1991-2001 only), urban-rural classification, housing tenure, population density, recent employment, house type (flat or not) and the interaction term sex:marital status. Note: education data was only available for older people from the 1991 census as explained in the methods in Chapter 3.

#### **1991-2001 Sample**

In Chapter 4, Model 5 showed that compared to men, women were more likely to use care at follow-up (OR 1.51 (95%CI 1.21, 1.89)). It also showed that compared to married people, unmarried people had greater odds of using care at follow-up - single (OR 2.49 (95%CI 1.61, 3.75)), widowed (OR 1.91 (95%CI 1.38, 2.61)) and divorced (OR 3.43 (95%CI 1.51, 6.94)). Note: this model was reported in full in Chapter 4.

The combined odds ratios have been plotted as this demonstrates the patterns of odds associated with using care for men and women with different

marital statuses. These combined ORs are presented below in Figure 5 below.

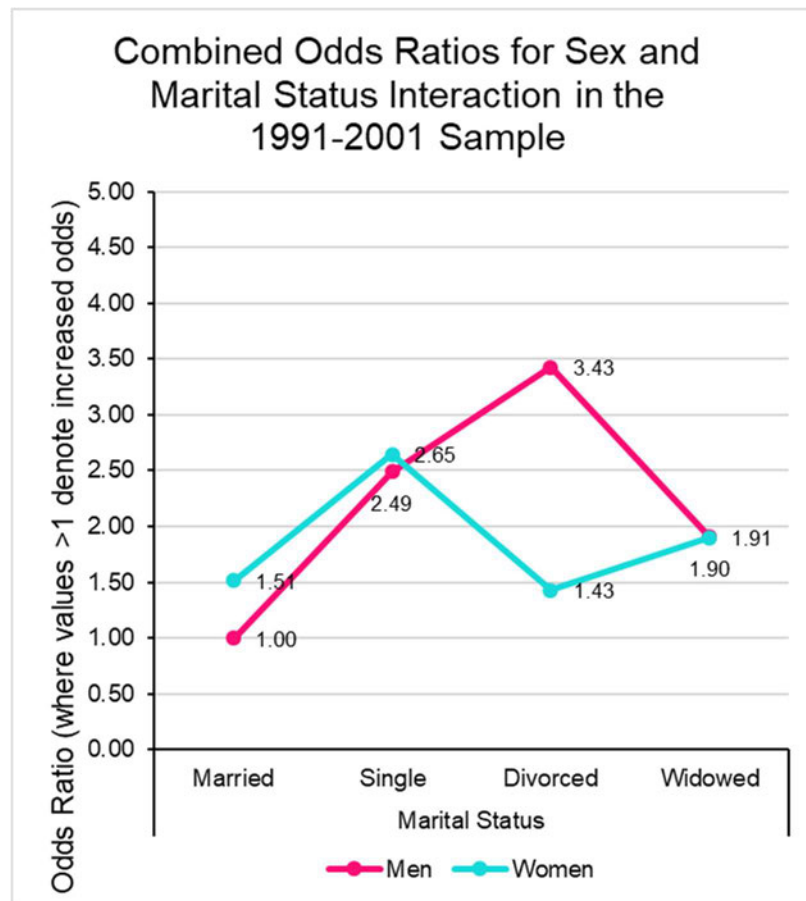


Figure 5. *Plot of Combined Odds Ratios for Care Outcome at Follow-Up for Marital Status and Sex Interaction in 1991-2001 Sample*

Combined odds ratios for marital status for men and women calculated from Model 5 (from Chapter 4 using the 1991-2001 sample), which regressed care outcome (being in a care home or not at follow-up 10 years later), against the socio-demographic, self-rated health and geographical factors: age, sex, marital status, deprivation, long-term illness, education, urban-rural classification, housing tenure, population density, recent employment, house type (flat or not) and the interaction term sex:marital status. Note: 95% CIs could not be calculated to form error bars for this plot as the number of SLS members in one or more category was too small for Statistical Disclosure Control to allow these figures to be reported outside the safe-setting. For combined ORs which are calculated from model output, the 95% CIs must also be hand calculated. Thus, without the number of SLS members in each category of the interaction, this was not possible. Source: SLS.

These combined odds ratios indicate that compared to married men, married women were 51% more likely to use care at follow-up. For single men and women, the odds of using care was similar - ~2.5 times more likely to use care at follow-up than married men. However, this means for women, the increase in odds due to being single rather than married is smaller, as

married women's odds are higher than men's to begin with. For widowed men and women, the odds are again similar with almost two times greater odds of using care compared to married men. But again, for widowed women compared to married women, this increase is smaller due to their higher odds when married. However, compared to married men, divorced men have nearly 3.5 times the odds of using care at follow-up, whilst for divorced women this risk is similar to that of married women.

Therefore, for men, being married is associated with the lowest odds of using care, and being single or widowed is associated with greater odds, but being divorced is associated with the greatest increase in odds. On the contrary, for women, being married or divorced offers the lowest odds, while being single or widowed is associated with increased odds. However, for married women, these odds are greater than for married men.

### **2001-2011 Sample**

In Chapter 5, Model 3 showed that compared to men, women were more likely to use care at follow-up (OR 1.78 (95%CI 1.42, 2.24)). It also showed that compared to married people, unmarried people generally had greater odds of using care at follow-up - single (OR 4.83 (95%CI 3.20, 7.14)) and divorced (OR 2.83 (95%CI 1.59, 4.77)), while for widowed older people, the point estimate was raised compared to married older people in this later sample, but the confidence interval crossed the null value - widowed (OR 1.40 (95%CI 0.97, 2.00)). Note: this model was reported in full in Chapter 5.

The combined odds ratios have been plotted as this demonstrates the patterns of odds associated with using care for men and women with different marital statuses. These combined ORs are presented below in Figure 6 below.



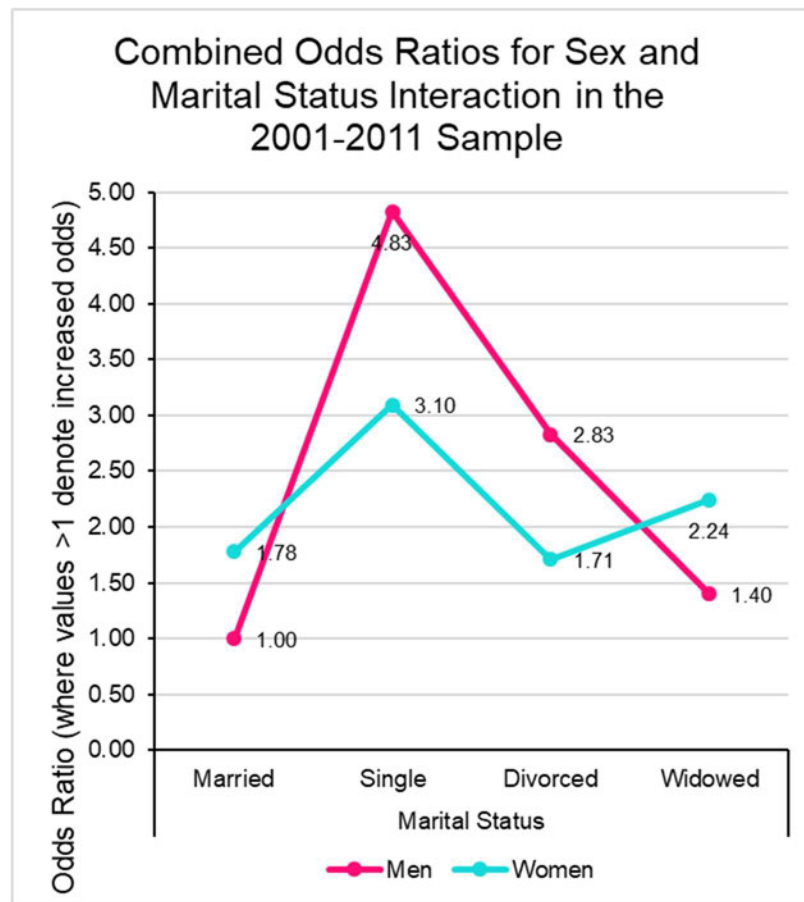


Figure 6.  
Plot of Combined Odds Ratios for Care Outcome at Follow-Up for Marital Status and Sex Interaction in 2001-2011 Sample

Combined odds ratios for marital status for men and women calculated from Model 3 (from Chapter 5 using the 2001-2011 sample), which regressed care outcome (being in a care home or not at follow-up 10 years later), against the socio-demographic, self-rated health and geographical factors: age, sex, marital status, deprivation, long-term illness, urban-rural classification, housing tenure, population density, recent employment, house type (flat or not) and the interaction term sex:marital status. Note: 95% CIs could not be calculated to form error bars for this plot as the number of SLS members in one or more category was too small for Statistical Disclosure Control to allow these figures to be reported outside the safe-setting. For combined ORs which are calculated from model output, the 95% CIs must also be hand calculated. Thus, without the number of SLS members in each category of the interaction, this was not possible. Source: SLS.

These combined odds ratios indicate that compared to married men, married women were almost two times more likely to use care at follow-up. For both single men and women, the odds of using care were increased, but this was greater for men, who had nearly 5 times the odds compared to married men, whereas single women had just over 3 times the odds compared to married men (again for women, this increase is smaller as married women had higher baseline odds). For divorced women, their odds were very similar to married

women, however for married men, the odds were nearly 3 times those of married men. For both widowed men and women, their odds were increased compared to married men; but again, for widowed women, this increase is smaller due to women's greater odds compared to married men to begin with.

Therefore, for men, being married is associated with the lowest odds of using care, and being divorced or widowed is associated with greater odds, but being single is associated with the greatest increase in odds. On the contrary for women, being married or divorced is associated with the lowest odds, while being single or widowed is associated with increased odds. However, while women generally have greater odds of using a care home than men, these combined odds ratios show that when sex and marital status were accounted for, the groups with the greatest odds of using a care home at follow-up were single and divorced men.

### **Comparison**

For both samples, the patterns of association are very similar for women: women generally have greater odds of using a care home at follow-up and while married and divorced women have similar odds, for women who are single or widowed, their odds are higher again. However for men, the pattern is different in each sample. While married men (the reference category) have the lowest odds of using a care home at follow-up of all the sex:marital status categories, in the earlier sample (1991-2001) divorced men had the highest odds, while in the later sample (2001-2011) single men had the highest odds. However, as women generally live longer and marry older men, there are fewer men than women in the unmarried categories, so the sample size for these associations is limited for men and this might be the reason for the difference between the samples.

### *PART 2: SEPARATE MODELS FOR MEN AND WOMEN*

Equivalent models were run on both the 1991-2001 (Model 1) and 2001-2011 (Model 2) samples on the subset of men ('a' models) and women ('b' models) separately. These models regressed the outcome of being in a care home at

follow-up ten years later against the socio-demographic, self-rated health and geographical factors: age, marital status, deprivation, long-term illness, urban-rural classification, housing tenure, recent work, house type (flat or not) and population density. Note that, because separate models were run for men and women, sex and the sex:marital status interaction term were not included. Furthermore, education was dropped from the earlier sample so that the models for each of the samples were equivalent (also it was not a significant predictor in the full sample).

### **1991-2001 Sample**

The results for Model 1 are shown in Table 11. This shows that different socio-demographic, self-rated health and geographical factors were significant predictors of being in a care home at follow-up ten years later for men and women aged 65+ in Scotland between 1991 and 2001. The factors which were important predictors for men were: age, marital status, deprivation, urban-rural classification, recent work and population density. While for women, these factors were: age, marital status, long-term illness, urban-rural classification, housing tenure, recent employment, house type and population density.

Table 11.

*Table of Model Summaries for Model 1a (Men) and Model 1b (Women) in the 1991-2001 Sample*  
 Model summary table for Model 1a and 1b which were run on the 1991-2001 sample, split by sex for men and women respectively. The results presented show the odds ratios (ORs) (where the null value is 1), 95% confidence intervals (CIs) and the significance level for all factors in the models when regressed against the outcome of being in a care home at follow-up ten years later. The models presented here included the socio-demographic, self-rated health and geographical factors: age, marital status, deprivation score quintile, long-term condition, Urban Rural Classification, housing tenure, recent work, house type (flat or not) and population density. The model fit statistic McFadden's pseudo-R square ( $R^2McF$ ) is also presented for both models. Source: SLS.

1991 Factor	1991-2001 Sample				
	Men (Model 1a)		Women (Model 1b)		
	OR (95% CI)	Sig.	OR (95% CI)	Sig.	
<b>Age</b>					
65-69	1.00	***	1.00	***	
70-74	1.68 (1.17, 2.40)		2.20 (1.75, 2.78)		
75-79	3.26 (2.18, 4.91)		4.62 (3.65, 5.88)		
80+	7.25 (4.51, 11.65)		10.30 (8.01, 13.32)		
<b>Marital Status</b>					
Married	1.00	***	1.00	***	
Single	2.49 (1.61, 3.76)		1.70 (1.34, 2.16)		
Divorced	3.21 (1.41, 6.55)		0.95 (0.50, 1.67)		
Widowed	1.98 (1.43, 2.72)		1.24 (1.04, 1.47)		
<b>Deprivation Score</b>					
Quintile 1 - Low	1.00	*	1.00	0.281	
Quintile 2 - Low-Medium	1.63 (1.05, 2.57)		1.11 (0.86, 1.43)		
Quintile 3 - Medium	1.75 (1.09, 2.82)		1.24 (0.95, 1.61)		
Quintile 4 - Medium-High	2.09 (1.30, 3.40)		1.34 (1.02, 1.76)		
Quintile 5 - High	2.06 (1.20, 3.55)		1.18 (0.87, 1.60)		
<b>Long-term Condition</b>					
No Long-term Condition Reported	1.00	0.342	1.00	***	
Long-term Condition	1.15 (0.86, 1.53)		1.58 (1.35, 1.85)		
<b>Urban Rural Classification</b>					
City ( $\geq 125,000$ ppoa)	1.00	***	1.00	***	
Urban ( $\geq 10,000$ ppoa)	0.60 (0.43, 0.84)		0.69 (0.57, 0.83)		
Small Town ( $\geq 3,000$ ppoa)	0.51 (0.33, 0.79)		0.72 (0.57, 0.92)		
Rural ( $< 3,000$ ppoa)	0.33 (0.22, 0.51)		0.42 (0.32, 0.53)		
<b>Housing Tenure</b>					
Rent	1.00	0.058	1.00	**	
Own	0.74 (0.55, 1.01)		0.77 (0.64, 0.92)		
<b>Recent Work</b>					
No Recent Work	1.00	**	1.00	**	
Recent Work	0.58 (0.41, 0.81)		0.68 (0.52, 0.89)		
<b>House Type</b>					
Not a Flat	1.00	0.886	1.00	**	
Flat	1.02 (0.74, 1.41)		1.28 (1.07, 1.52)		
<b>Population Density</b>					
High ( $> 5,000$ ppkm <sup>2</sup> )	1.00	***	1.00	***	
Medium (1,000-5,000 ppkm <sup>2</sup> )	3.76 (2.66, 5.40)		3.38 (2.79, 4.12)		
Low ( $< 1,000$ ppkm <sup>2</sup> )	9.26 (6.01, 14.36)		9.84 (7.70, 12.59)		
<b>R<sup>2</sup>McF</b>	0.1698		0.1904		

Note: Significance - \*\*\*  $< 0.001$ , \*\*  $< 0.01$ , \*  $< 0.05$  and above 0.05 the exact p-value will be reported.

### *Similarities*

Age was an important predictor for both men and women, but the age-related increase in odds for women in the higher age groups is greater than that of the men. Marital status was also important for both men and women, however the ORs show different patterns, as were seen in the combined ORs presented in Part 1 above. For men, being divorced is associated with the greatest risk (~3.2 times the odds compared to being married), however for women there is no evidence of any difference in odds between those who were married and those who were divorced. For both men and women, being single or widowed was associated with greater odds of care use, but this increase was greater for men – single men had 2.5 times the odds of care use compared to married men, while single women had 1.7 times the odds compared to married women; then the widowed men had nearly double the odds compared to married men, while widowed women had only 1.2 times the odds compared to married women. However, these odds are not directly comparable because these are two separate versions of Model 1. Additionally, the wide CIs for divorced men suggest insufficient sample size of divorced men to draw any firm conclusions, so this association should be interpreted with caution.

Both urban-rural classification and population density were important for men and women, with similar ORs. For both, rural areas were associated with lower odds of being in a care home at follow-up than city areas, while for population density, low-density areas were associated with greatly increased odds compared to high-density areas. Recent employment was also important for both men and women, with reduced odds of care use for those who had recently worked (~40% and ~30% reduction for men and women respectively, compared to men and women who had not reported recently working).

### *Differences*

Deprivation was only an important predictor of care use for men, where all levels of deprivation were associated with increased risk compared to quintile

1 – the lowest deprivation quintile; the ORs here showed a pattern of ordinal stepped change with the exception of the highest deprivation quintile. For women, while the ORs were higher for quintiles compared to areas with the lowest deprivation, there was only one level (quintile 4) where the CI did not cross the null value. So this lone significant association could be a spurious association or the effect size might be very small for women.

Presence of a long-term condition was only important for women, with reporting experiencing a long-term condition associated with nearly 60% greater odds of care use. For men there were slightly increased odds (~15%) indicated by the point estimate, but the CI crossed the null value, so there was insufficient evidence that long-term illness was associated with greater risk for men.

Housing tenure and house type were both only important predictors in the women's model, Model 1b. For women, being a homeowner was associated with 27% reduced odds and living in a flat was associated with 28% increased odds of care use at follow-up. For men, the point estimate for homeownership was similar to women's, but the evidence of an association was insufficient as the CI crossed the null value. However, even the point estimate for men living in a flat showed no evidence of any association with care use.

### **2001-2011 Sample**

The results for Model 2 are shown in Table 12. This again shows that different socio-demographic, self-rated health and geographical factors were significant predictors of being in a care home at follow-up ten years later, this time for men and women aged 65+ in Scotland between 2001 and 2011. The factors which significantly predicted being in a care home at follow-up for men were: older age, being single, divorced or widowed, having a long-term condition and living in a small town – which were all associated with increased odds. For women, these factors were: older age, being single or widowed, having a long-term condition and living in a flat – which were

associated with increased odds; then recent employment was associated with reduced odds of being in a care home at follow-up.

Table 12.

*Table of Model Summaries for Model 2a (Men) and Model 2b (Women) in the 2001-2011 Sample*  
 Model summary table for Model 2a and 2b which were run on the 2001-2011 sample, split by sex for men and women respectively. The results presented show the ORs (where the null value is 1), 95% CIs and the significance level for all factors in the models when regressed against the outcome of being in a care home at follow-up ten years later. The models presented here included the socio-demographic, self-rated health and geographical factors: age, marital status, deprivation score quintile, long-term condition, Urban Rural Classification, housing tenure, recent work, house type (flat or not) and population density. The model fit statistic  $R^2McF$  is also presented for both models. Source: SLS.

2001 Factor	2001-2011 Sample			
	Men (Model 2a)		Women (Model 2b)	
	OR (95% CI)	Sig.	OR (95% CI)	Sig.
<b>Age</b>				
65-69	1.00	***	1.00	***
70-74	2.06 (1.42, 3.00)		2.67 (1.99, 3.61)	
75-79	1.57 (0.23, 31.38)		3.22 (1.89, 5.81)	
80+	3.69 (0.54, 74.30)		7.05 (4.12, 12.79)	
<b>Marital Status</b>				
Married	1.00	***	1.00	**
Single	4.84 (3.18, 7.22)		1.56 (1.27, 2.22)	
Divorced	2.67 (1.48, 4.56)		0.97 (0.60, 1.50)	
Widowed	1.50 (1.02, 2.16)		1.21 (1.00, 1.48)	
<b>Deprivation Score</b>				
Quintile 1 - Low	1.00	0.319	1.00	0.998
Quintile 2 - Low-Medium	0.69 (0.44, 1.05)		1.03 (0.79, 1.34)	
Quintile 3 - Medium	0.93 (0.62, 1.40)		1.04 (0.80, 1.36)	
Quintile 4 - Medium-High	0.70 (0.44, 1.11)		1.02 (0.77, 1.35)	
Quintile 5 - High	0.84 (0.49, 1.42)		1.01 (0.73, 1.38)	
<b>Long-term Condition</b>				
No Long-term Condition Reportec	1.00	***	1.00	***
Long-term Condition	1.64 (1.24, 2.16)		1.58 (1.34, 1.87)	
<b>Urban/Rural Classification</b>				
City ( $\geq 125,000$ ppoa)	1.00	*	1.00	0.659
Urban ( $\geq 10,000$ ppoa)	0.82 (0.57, 1.18)		0.90 (0.73, 1.10)	
Small Town ( $\geq 3,000$ ppoa)	1.50 (1.00, 2.23)		1.00 (0.77, 1.28)	
Rural ( $< 3,000$ ppoa)	1.23 (0.77, 1.96)		0.89 (0.66, 1.19)	
<b>Housing Tenure</b>				
Rent	1.00	0.205	1.00	0.107
Own	0.80 (0.57, 1.13)		0.85 (0.70, 1.04)	
<b>Recent Work</b>				
No Recent Work	1.00	0.492	1.00	*
Recent Work	0.43 (0.06, 8.54)		0.49 (0.30, 0.86)	
<b>House Type</b>				
Not a Flat	1.00	0.162	1.00	*
Flat	1.29 (0.90, 1.82)		1.27 (1.05, 1.53)	
<b>Population Density</b>				
High ( $> 5,000$ ppkm <sup>2</sup> )	1.00	0.340	1.00	0.551
Medium (1,000-5,000 ppkm <sup>2</sup> )	1.05 (0.76, 1.46)		1.02 (0.84, 1.23)	
Low ( $< 1,000$ ppkm <sup>2</sup> )	0.74 (0.42, 1.26)		0.86 (0.62, 1.19)	
<b>R<sup>2</sup>McF</b>	0.1131		0.1429	

Note: Significance - \*\*\* <0.001, \*\* <0.01, \* <0.05 and above 0.05 the exact p-value will be reported.

### *Similarities*

Again, age was an important predictor for both men and women, but the age-related increase in odds for women in the higher age groups were generally greater than the men's, however, the CIs for the men in the oldest group were very wide so this is inconclusive. Having a long-term condition was also an important predictor of being in a care home at follow-up for both men and women. The increased odds of having a long-term condition were similar for men and women, although these are not directly comparable as they are from separate models.

Marital status was also an important predictor for both men and women, however, again the ORs show different patterns, as were seen in the combined ORs presented in Part 1 above. This shows that compared to married men, single men have nearly five times the odds of using care at follow-up, divorced men have 2.7 times the odds, and widowed men have 1.5 times the odds. Compared to married women, single women have 1.6 times the odds of using care at follow-up, divorced women have similar odds of using care to married women, and widowed women have 1.2 times the odds. The increase in odds for unmarried women compared to married women was smaller than that for unmarried men compared to married men. But as above, these odds are not directly comparable because these are two separate versions of Model 2. Additionally, the wide CIs for some of the category levels for men may result from insufficient sample size in these groups of men. This makes it difficult to draw any firm conclusions, and any interpretations made should be made with caution.

### *Differences*

Urban rural classification is only a significant predictor for men, although this could be spurious as it is only for one factor level (small town) and even then the CI for this level encompasses the null value. For women, living in a flat is associated with increased odds of using a care home at follow-up, but as the



CI crosses the null value for men, there is insufficient evidence of a similar association for them despite the point estimate being in the direction of increased odds. Also, for those who reported recent work, there is evidence that women have reduced odds of being in a care home at follow-up compared to those not reporting recent work. For men, the point estimate for recent working is in the same direction as for women, but the CI crosses the null value so this remains inconclusive for men.

### **Comparison**

Between the cohorts, there were some similarities and differences between the factors which were important in the models for men, compared to the models for women. For men and women in both cohorts, age and marital status were important factors in explaining the variance in who was in a care home at follow-up ten years later. In both cohorts (1991-2001 and 2001-2011), being divorced was not associated with greater odds for women, while it was associated with greater odds of being in a care home at follow-up for men. So, similar to the analysis in Part 1, marital status had a different magnitude and patterns of association for men and women.

Having a long-term condition was important for men and women in 2001-2011 and only women in 1991-2001. Recent work was important for both men and women in 1991-2001, but only women in 2001-2011. Living in a flat was associated with increased odds of being in a care home at follow-up for women in both cohorts, but not for men in either. Housing tenure was only associated with care home status at follow-up for women in the earlier cohort, however the point estimate for men in this cohort showed a similar direction of association, but there was not sufficient evidence to draw conclusions. In the later cohort, both women and men had similar point estimates, both below the null value, but again there was insufficient evidence of an association from the CIs which crossed the null value.

In terms of geographical/area-based factors, urban rural classification and population density were associated with care outcomes for both men and

women in the earlier cohort, but not the later cohort. Only one level of urban rural classification was associated with care outcome for men in the later cohort and the CI included the null value. Deprivation was also associated with care outcome for men in the earlier cohort, but not the later cohort.

## DISCUSSION

The first analysis in this chapter demonstrated evidence to support previous literature, in suggesting that there are sex/gender differences in how marital status is associated with care home use for men and women (McCann et al., 2011; McCann, Donnelly, et al., 2012; Tomiak et al., 2000). Additionally, this chapter has expanded on this by demonstrating that the sex/gender differences are not only present for marital status, but other socio-demographic, self-rated health and geographical factors too.

These findings and the implications will now be discussed in greater detail. The findings from Part 1 on marital status are discussed first, followed by the findings from Part 2 on which factors are important predictors for men and women separately. Here, the factors important for both men and women will be discussed first, followed by those with sex/gender specific patterns. Then the strengths and limitations are presented, followed by suggested directions for future research, then some policy recommendations arising from this piece of research, and finally, a conclusion is presented.

### *MARITAL STATUS*

Part 1 found evidence of an interaction between marital status and sex, in their associations with whether older people were in a care home at follow-up. McCann, Donnelly, et al. (2012) suggest that women face excess risk of being admitted to care homes, which was corroborated in this Scottish analysis; they suggest this results from the reduced ability of women's spouses (who are generally men, and the older member of the couple), to provide informal care and support. They argue that this is usually due to their own physical health and limitations, or due to their earlier deaths (McCann,

Donnelly, et al., 2012). This could also explain the similar patterns that we have observed in Scottish data in this chapter.

Unpacking this explanation a little further, these patterns may be due to both gender norms within society and sex differences in health and longevity. Women generally marry older men, making women the younger member of most married heterosexual couples (the gender aspect); then women also have a longer life expectancy (the sex aspect) (National Records of Scotland 2021). Ultimately, this means that within a heterosexual couple, men are more likely to suffer from age-related decline first, so receive informal care from their relatively healthier spouse (to clarify, by healthier it is meant healthier at the time, as women are generally the younger member of the couple). So generally speaking, by the time the woman in a heterosexual couple suffers from age-related decline, her partner is more likely to be too infirm or frail to provide care, or to have already passed away – possibly explaining the observed excess risk to women.

This explanation fits with the patterns we observed in this chapter:

- Married women have increased odds of using a care home at follow-up compared to married men – as married women would be less likely to benefit from informal care than married men.
- Unmarried men (single, widowed or divorced) have greater odds of being in a care home at follow-up compared to married men – as unmarried men would not benefit from informal care provided by a spouse.
- Unmarried women (single, divorced and widowed) have greater odds of being in a care home at follow-up compared to married men. However, the magnitude of increased odds for unmarried women is not as great as it is for unmarried men. In other words, for women the odds of using a care home at follow-up associated with the different marital statuses are relatively similar, but for men they are more variable – as marital status determines whether men might benefit

from informal care from a/their spouse, while for women their marital status has less bearing on whether they receive informal care from a spouse.

A caveat here is that the greater variability in the odds for unmarried men could be due to the smaller sample sizes for divorced men in the Scottish samples used for these analyses. However, these patterns still suggest that there is something about being married that has a protective association for men, which does not offer the same protective association for women, thus supporting McCann, Donnelly, et al. (2012)'s explanation. McCann, Donnelly, et al. (2012) provided further support for this explanation by controlling for older people's partner's age in their models – they reported that the excess risk for women was attenuated by this. While partner's age was not in the data extracts used for this research, it is something which could be requested and tested in a Scottish sample by future research.

#### *FACTORS IMPORTANT FOR BOTH MEN AND WOMEN*

In Part 2, separate models were created for men and women, which showed that in addition to marital status, there was evidence of sex/gender differences for other socio-demographic, self-rated health and geographical factors. Here, the factors for which there were similarities will be discussed, then below the factors for which there were differences (sex/gender specific factors).

In the earlier cohort from 1991-2001, age, marital status, recent work and the geographical factors (urban rural classification and population density) were important predictors for both men and women. For age, recent work and geography, these associations were similar for men and women, suggesting these factors affect everyone regardless of their sex/gender. Although, there was some evidence that older age was associated with a greater excess risk for women than men. Also, similar to Part 1 above, marital status was more complex, with different sex/gender effects for different marital statuses.

Then in the later cohort from 2001-2011, age, marital status and having a long-term condition were important for both men and women. Age and marital status were consistently important predictors for both men and women in both cohorts, suggesting these factors have larger and more stable associations. The geographical measures no longer being important predictors in the later cohort for the separate men's and women's models, fits with the finding from the previous chapter, Chapter 5, where these measures were also no longer important in the later cohort. Suggested explanations for this were about the changing social care landscape in Scotland (see Chapter 5 for full discussion of this).

### *SEX/GENDER-SPECIFIC FACTORS*

Now, the sex/gender differences will be discussed. The factors which were important predictors of being in a care home at follow-up for men are covered first, followed by those which were important predictors for women.

#### **Men**

Deprivation was an important predictor of using a care home at follow-up in the 1991-2001 sample, but this was only in the men's model. Deprivation might be a proxy for socio-economic position and the type of employment that men had; and manual occupations pose greater risk of industrial injury or physical decline from the physical demands of the job (Warren et al., 2004). Poorer physical health and mobility in later-life has been evidenced to make informal care less protective against care home entry (Bonsang, 2009; Kjær & Siren, 2020). This would be an issue for men in the present samples for two main reasons: 1) workplace health and safety may not have been as stringent as it is today, resulting in a greater number of work-related injuries than in more recent years (Health and Safety Executive, 2022), and 2) the nature of work was more physically laborious e.g. manufacturing jobs, mining, steel works etc. (Office for National Statistics, 2022). This would affect men more frequently than women, due to patriarchal traditions meaning that there were fewer women in the workforce than today (Office for National Statistics, 2022). Consequently, this could explain why experiencing

higher levels of deprivation predicts being in a care home at follow-up for men, but not women.

However, this sex/gender difference was not found in the 2001-2011 sample. This is consistent with the findings in Chapter 5, where deprivation was no longer an important predictor in the later sample of older people in Scotland. Chapter 5 argues that this may result from changes to the social care landscape in Scotland at this time and changing access to social care (see Chapter 5 for full discussion). This argument is not contradictory to the above argument (about gendered workforce participation explaining why deprivation was more important in explaining men being in a care home at follow-up than women), as offered explanations were about changing care provision across Scotland and how this may have removed inequalities.

### **Women**

For women, long-term illness and living in a flat were important factors in explaining the variance in whether women were in a care home at follow-up or not, in both the 1991-2001 and 2001-2011 samples. Both factors may impact women's ability to manage at home independently. As discussed above, married men were suggested to experience a lower risk of using formal care because they are more likely than women to benefit from informal care provided by a spouse (McCann, Donnelly, et al., 2012), thus informal care may allow men to remain living at home despite disability/poor health – it may act as a buffer against needing to move to a care home. Moreover, women are more likely than men to be living alone in later life (One Scotland - Scottish Government, 2019); so factors like living in a flat, where entry might be via stairs (particularly common in the tenements typical of Scotland (Morgan & Dauntton, 1983)), or long-term illness, which might cause disability, may then be more detrimental to women's independence. So being more likely to live alone, plus lack of informal care when living with a spouse, might explain why long-term illness and living in a flat are more important for women's odds of being in a care home at follow-up.

In the 1991-2001 sample, housing tenure was an important factor in explaining being in a care home at follow-up for women. The protective association for homeowners has previously been explained by McCann, Grundy, et al. (2012) as possibly resulting from reluctance to sell a house to subsidise care home costs, which might otherwise be passed on as inheritance to children/next of kin. However, this analysis showed that this factor was important predictor of women's care outcomes, but not men's. This might be explained by women's greater longevity, meaning that women are more likely to outlive their spouse (One Scotland - Scottish Government, 2019), thus the decision to sell the house and enter care would more commonly affect women. This suggestion is consistent with the descriptive statistics from Chapter 4 for the 1991-2001 sample, where the sample contains 3948 widowed women, compared with only 682 widowed men.

In the 2001-2011 sample, recent work was an important factor in explaining women's care home status at follow-up but not men's. It had previously been important for both in the earlier sample. This difference is likely due to the sample size of men in the 2001-2011 sample who reported recent work (as the point estimate for this association was similar but the confidence intervals were wide for the men's model), rather than any real sex/gender difference in the association of this factor. However, caution should be taken interpreting this factor as this, as the variable "recent work" likely also relates to health status and age (so ability to work), not only recent employment history.

### **Summary**

This analysis demonstrated evidence of sex/gender differences in which socio-demographic, self-rated health and geographical factors are important predictors of being in a care home at follow-up, using Scottish data. This analysis was also consistent with previous research demonstrating that the association of marital status is different for men and women, supporting the explanation offered by McCann, Donnelly, et al. (2012) about the differing availability of informal care from a spouse for men and women. Possible explanations for why these sex/gender differences might exist for these

factors have been suggested. The strengths and limitations of this analysis are presented below, followed by the implications of these findings for future research and policy.

#### *STRENGTHS AND LIMITATIONS*

The main strength of the analyses presented in this chapter is that they investigated sex/gender differences in the socio-demographic, self-rated health and geographical factors associated with being in a care home at follow-up, using representative Scottish samples of older people. Previously research has mainly looked at sex/gender differences in the association of marital status with care outcomes in later life, but this analysis looked at a much bigger selection of factors. To do this, rather than look at multiple interactions for which the sample size would not hold the power to investigate, the sample was split by sex/gender. This has offered an opportunity to see which factors are important in modelling care home status at follow-up for men and women separately.

However, this method is not without limitations of its own. It is possible that splitting the sample by sex/gender may reduce the power to detect the effect, or may have resulted in spurious estimates for these smaller groups. This is more of a concern for men, where due to their shorter life expectancy, the sample of men surviving the ten year follow-up period is smaller to begin with. Therefore further research with bigger samples is needed to confirm the findings reported here. Despite this, the contribution of this analysis is that it addressed important questions about sex/gender differences in care home use in old age.

Moreover, an additional limitation of the analyses here is that the samples are not distinct – most of the people aged 65-75 in the 1991-2001 sample will be present in the 2001-2011 aged 75-85. Therefore none of the analyses can draw firm conclusions about any differences seen between the cohorts (the sample from 1991-2001 and the sample from 2001-2011). Moreover, when the sample is split by sex/gender, the separate models cannot be statistically



compared for men and women, however, there wasn't the power to build an interaction model.

#### *FUTURE RESEARCH*

There are some remaining questions which could be explored in future research. Firstly, with regard to the sex/gender and marital status interaction, whether the excess risk for women can also be explained by controlling for partner's age, like in McCann, Donnelly, et al. (2012). Future research could explore whether accounting for partner's age attenuates the excess odds of women being in a care home at follow-up in a Scottish sample. This would indicate whether different life expectancy (sex effect), and men in heterosexual partnerships generally marrying younger wives (gender effect), sufficiently explains the greater chances of women using care home at follow-up here, by partialling out the partner's age effect (sex and gender effect combined) from the married effect.

Secondly, future research could investigate whether the sex/gender differences observed in these analyses, in which socio-demographic, self-rated health and geographical factors are important to men and women separately, replicate in other populations. For example, in other countries (where marriage rates might be different), or in different age cohorts (where occupational and socio-economic differences may have changed). This would explore the generalisability of these findings to older people in other populations, but also if the differences replicate, it would confirm that the differences are unlikely to be attributable to smaller effects and lack of power in the men's sample.

#### *POLICY RECOMMENDATIONS*

This analysis provided further evidence that some inequalities are more pervasive – women remain at consistently increased chances of using care homes at follow-up in both samples, relative to men. While there have been biological explanations for this suggested, there are considerable societal and social explanations around gender roles and how this also disadvantages women (this is discussed in greater detail elsewhere e.g.

Chapter 4 and Chapter 5). The scale of the disadvantages for women are still only just being realised, and change is slow, e.g. the 2020 report on gendered disadvantage by Sosenko et al. (2020). Therefore future care policy should aim to reduce these more pervasive inequalities. The descriptive statistics presented earlier in this thesis showed that older women make up the majority of the population of older Scottish adults, so targeting social care policies towards the needs of women should be a priority.

Moreover, the sex/gender differences evidenced here suggest that different factors might be more important to men and women, so different support in old age might be needed by men and women. While further research on these differences is needed, they do indicate that there may be grounds for adopting different approaches for supporting men and women in old age. Especially considering that the majority of the burden of providing informal care for older people is borne by women, (Del Bono et al., 2009; Neno, 2004), gender roles mean that unpaid care is seen as “women’s work” (Neno, 2004), and thus women caregivers may benefit from more targeted support. Ultimately, the pattern seems to be explained by a complex mix of sex and gender issues, but its persistence in different populations shows that this inequality is pervasive throughout societies, and likely to continue.

To summarise, the recommendations for care policy are that future policies should target relieving inequalities – particularly those facing women. This research provides evidence that such groups experience excess risk of losing their independence in old age; which could be linked to pervasive gender roles in society. Additionally, there are many other marginalised groups which are not present in large enough numbers in this study for similar conclusions to be drawn. However, feminist issues like this are intersectional – so some people experience increased disadvantage due to being part of more than one marginalised group (Scottish Government, 2022a). Therefore, it is also a recommendation that future policies might focus on trying to reduce inequality for the groups who have faced systemic marginalisation throughout history, and continue to face systemic

disadvantage into old age. This recommendation aligns with the commitment of the Scottish Government to the United Nations Sustainable Development Goals (SDGs) – the 10<sup>th</sup> SDG is to reduce inequalities (Scottish Government, 2020).

## CONCLUSION

In conclusion, this analysis corroborated previous research in demonstrating that the association of marital status is different for men and women, supporting the explanation proposed by McCann, Donnelly, et al. (2012) that the excess risk for women is due to the differing availability of informal care from a spouse for men and women. It has also demonstrated that while some socio-demographic, self-rated health and geographical factors are equally important in explaining the variance in care home status at follow-up for men and women, for some factors there is evidence of sex/gender differences. Possible explanations for why these sex/gender differences might exist for these factors have been proposed and include a mixture of sex effects (e.g. different life expectancy) and gender effects (e.g. gender roles in society). Then the limitations of these conclusions were discussed, followed by suggested directions for future research.

These findings are relevant to policy and practice around social care, so the implications of these findings have also been discussed – suggesting that future policy should focus on reducing the inequalities in who needs to use care homes in old age. Addressing this inequality may require gendered social care support packages, as women have been consistently evidenced to have greater excess attributable risk.

Ultimately, while previous research has looked at sex differences in marital status, the key contribution of this analysis is that it has expanded upon this to investigate sex/gender differences in other factors associated with being in a care home in old age. Highlighting these patterns, differences and inequalities is an important contribution to the understanding of care home use in old age.

## CHAPTER 7 – ANALYSIS 3: EXPLORING HOUSEHOLD STRUCTURE

### CHAPTER SUMMARY

This chapter explores the association between Household Structure (HHS), who older people live with at home, and whether they are in a care home at follow-up. The aim was to explore HHS in Scottish data, and for this both the 1991-2001 and the 2001-2011 samples were used. The analysis replicated an analysis conducted on a Northern Irish sample by McCann et al. (2011). However, due to the available data, not all of the different HHS categories could be explored in Scotland. Despite these methodological differences, for the types of HHS it was possible to investigate here, the findings for Scotland were similar to Northern Ireland – the effects replicated well. First, this supported the validity of the methods used throughout this thesis, as it provided evidence that this analysis produced comparable results to the time-to-event analyses used in the original study. Equivalent data for this type of analysis in Scotland were unavailable within the time scale of this thesis research.

Second, the results confirmed that McCann et al. (2011)'s findings were also applicable in Scotland, providing evidence that not all HHSs seem equally protective against being in a care home at follow-up in old age. Living alone and living with siblings were notably riskier HHSs - older people living in these HHS types were more likely to be in a care home at follow-up. There were also sex/gender differences, with women consistently having lower odds of using care in these riskier HHSs than men. However, this may be indicative of greater risk for married women who lived with a partner, which could suggest that the burden of providing informal care may have implications for women's own care outcomes in later life. Additionally, these patterns were found in both the 1991-2001 and the 2001-2011 samples, suggesting HHS continues to be an important

predictor of care outcomes in Scotland even in the different time periods studied here. Some policy and practice recommendations are then discussed in relation to these findings, such as provision of greater support to women providing informal care.

#### AIMS AND OBJECTIVES

The aim of this analysis was to perform a replication using Scottish data, of the original study by McCann et al. (2011), to see if living arrangements/household structure were associated with being in a care home in old age in Scotland. The methods were adapted accordingly for the available Scottish data (see Chapter 3 for more details), but the study aimed to undertake a piece of research as close to the original study McCann et al. (2011) as possible. This analysis also aimed to explore HHS in both samples (1991-2001 and 2001-2011) to investigate whether any associations are consistent in different periods. Then, based on the findings in the previous chapter, Chapter 6, where sex/gender differences were observed in which factors were significant in separate men's and women's models; it aimed to investigate if different HHSs were associated with using a care home at follow-up, when modelled separately for men and women.

It is predicted, based on previous research, that living alone will be associated with increased odds of being in a care home at follow-up compared to living with a partner. Based specifically on McCann et al. (2011)'s findings, it was predicted that (also compared to living with a partner), living with a partner and children would be associated with reduced odds of being in a care home at follow-up, while living with siblings would be associated with increased odds. It was also hypothesised that there would be sex/gender differences in which HHS categories would be important for care outcome, with possible differences for living alone and being divorced/separated and married, and for living with a partner and children.

Note: HHS refers to who older people live with in their homes/their living arrangements/who their cohabitants are, plus for people living alone, what

their marital status is. For further discussions and explanation of this, see the Literature Review in Chapter 2, and Methods in Chapter 3.

#### *RESEARCH QUESTIONS*

1. Is HHS associated with care use in Scotland?
2. Is living alone associated with reduced odds of using care at follow-up, compared to living with a partner?
3. Is living with siblings associated with increased odds of using care at follow-up, compared to living with a partner?
4. Are there sex/gender differences in the association of different HHS categories with care outcome?
5. Are these associations consistent between the two samples of Scottish data, the earlier sample 1991-2001, and the more recent sample 2001-2011?

#### **RESULTS**

The results for both samples are presented here in two sections, in the first section, the results for the 1991-2001 sample are presented, followed by the results for the 2001-2011 sample in the second section. Comprehensive descriptive statistics for each sample are provided in Chapter 4 and Chapter 5 respectively, but descriptive statistics for the HHS variable are presented here for each sample in the beginning of each section. Then each section shows the modelling results for the full sample, followed by the modelling results when the sample was split by sex/gender.

#### *1991-2001 SAMPLE*

The sample included 14,528 SLS members - this was the same sample as Chapter 4, so for full descriptive statistics see Chapter 4.

Table 13 shows the number and percentage of the sample SLS members living in each household structure category, and also gives a breakdown of these numbers and percentages for men and women separately. In 1991, nearly 35% of the sample were living alone, but a greater proportion of women were living alone than men, with over 44% of women living alone,

compared to only 16.5% of men. Nearly 47% of the sample were living in a two-person household with a partner, however, this was nearly 65% of men and only 37% of women. Women more often lived with other family/people than men – so a greater percentage of women lived in households falling into the categories: with a child, with sibling(s), and others/complex.

Table 13.

*Table of Descriptive Statistics for Household Structure in the 1991-2001 Sample*

*A table presenting the number and percentage of the 1991-2001 sample of older Scottish people who were living in the different household structure (HHS) categories for the HHS variable. These numbers and percentages are presented for the full sample, then for the men and women separately. The 1991-2001 sample was a representative sample of Scottish people who were aged 65+ in 1991 and still living at home, and then were traced to follow-up in the 2001 census. Source: SLS.*

Household Structure		Full Sample		Men		Women	
		N	%	n	%	n	%
Alone	Single	936	6.40%	214	4.10%	722	7.70%
	Widowed/Divorced	3931	27.10%	595	11.50%	3336	35.60%
	Married	146	1.00%	44	0.90%	102	1.10%
Not Alone	Partner	6802	46.80%	3335	64.70%	3467	37.00%
	Partner + Others	1207	8.30%	669	13.00%	538	5.70%
	Sibling(s)	141	2.80%	98	1.90%	316	3.40%
	Child	868	6.00%	140	2.70%	728	7.80%
	Others/complex	224	1.50%	63	1.20%	161	1.70%
<b>Total</b>		14528	100.00%	5158	100.00%	9370	100.00%

Table 14 shows the number and percentage of older people who had entered care at follow-up in 2001 from each HHS category, both for the full sample and then for men and women separately. This shows that for the full sample, 8.1% of older people were in care at follow-up (5.2% of men and 9.7% of women). However, in the reference category of HHS – living with a partner - for the full sample 5% were in care at follow-up, while for men this was 3.8% and for women 6.1%. See Table 14 below for a full breakdown of the numbers and percentages of older people in care at follow-up for the other HHS categories.

Table 14.

*Table of Care Outcomes by Household Structure for the 1991-2001 Sample*

A table presenting the number and percentage of the 1991-2001 sample of older Scottish people who were in a care home at follow-up in 2001, broken down by the different household structure (HHS) categories that they were living in, as per the HHS variable. These numbers and percentages are presented for the full sample, then for the men and women separately. The 1991-2001 sample was a representative sample of Scottish people who were aged 65+ in 1991 and still living at home, and then were traced to follow-up in the 2001 census. Note: for samples of men and women separately, some categories have been condensed for statistical disclosure control purposes, due to low numbers in some of the categories of the HHS variable. Source: SLS.

Household Structure		Full Sample		Men		Women	
		No. in care	%	No. in care	%	No. in care	%
Alone	Single	131	14.00%	24	11.20%	107	14.80%
	Widowed/Divorced	494	12.60%	73	11.40%	442	12.80%
	Married	21	14.40%				
Not Alone	Partner	338	5.00%	157	3.80%	211	6.10%
	Partner + Others	44	3.60%	24	3.60%	20	3.70%
	Sibling(s)	49	11.80%				
	Child	79	9.10%	20	6.60%	130	10.70%
	Others/complex	22	9.80%				
<b>Total</b>		<b>1178</b>	<b>8.10%</b>	<b>268</b>	<b>5.20%</b>	<b>910</b>	<b>9.70%</b>

**Full Sample Analysis - 1991-2001 Sample**

Table 15 shows the model results for Model 1 (a full parsimonious model including the factors: age, sex, marital status, long-term condition, housing tenure, house type, recent employment, deprivation, urban rural classification, population density and an interaction term for marital status and sex (ms:sex)) and for Model 2 (which included all the factors from Model 1, except marital status and the ms:sex interaction term, plus the HHS variable). Note: Marital status and the ms:sex interaction term were excluded in Model 2 because the HHS variable contains marital status for the categories where people live alone (this is based on a HHS variable used in other research by McCann et al. (2011) for further details see the full methods in Chapter 3).

Model 2 shows that compared to living with a partner, older people who lived alone had greater odds of being in a care home at follow-up. When living alone, single people had 2.21 times the odds of using care, widowed/divorced people had nearly 1.5 times the odds and those who were married but living alone had nearly twice the odds.

Model 2 also shows that compared to living with a partner, people who lived with a sibling had 1.8 times the odds of being in a care home at follow-up.



However, for people who lived with a partner and others (OR 0.94 (95%CI 0.67, 1.31)), with a child (OR 1.30 (95%CI 0.98, 1.71)) or in a complex/others household (OR1.55 (95%CI 0.93, 2.49)), there was no evidence that the odds were different to people living with a partner because the interval estimates crossed the null value.

There was some indication of HHS confounding with sex, as the point estimate for women dropped from 1.51 (95% CI 1.21, 1.89) in Model 1, to 1.20 (95% CI 1.02, 1.69) in Model 2. Given the disparities in HHS for men and women, this attenuation of the sex/gender association suggests that men's and women's different living situations may be underlying some of the increased odds of being in a care home at follow-up for women. The percentage of women living alone was nearly 3 times that of men, and since living alone is associated with increased odds of care use, this seems the more plausible explanation. There was also some slight change in the odds of being in a care home at follow-up associated with age, mainly in the older age groups. This might be due to a greater number of older people in the older age groups being widowed and thus living alone or in riskier HHSs. There was no evidence of HHS confounding with any other factors, as all the other estimates remained stable between the models.

Adding the HHS factor to the model increased the amount of variance in being in a care home at follow-up, explained by the model as the  $R^2$ McF increased and the AIC was reduced in Model 2, despite removing marital status and ms:sex. Full model results for Model 1 and Model 2 are presented below in Table 15.

Table 15.

*Table of Model Summaries for Model 1 and Model 2 for the 1991-2001 Sample*

*Model summary table for Model 1 and Model 2 showing Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for all factors in each model when regressed against the outcome of being in a care home at follow-up in 2001, for the 1991-2001 sample of older Scottish people. The models presented here include Model 1, a full parsimonious model, which included the factors: age, sex, marital status, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification, population density and the interaction term for sex:marital status (note: combined ORs are presented for marital status split by sex); and then Model 2, which included all the factors from Model 1 (except for marital status and the sex:marital status interaction*

term), plus the household structure variable. The model fit statistics, AIC and R<sup>2</sup>McF, are also presented for each model. Source: SLS.

1991 Factor	Model 1:	Model 2:
	Full Model OR (95% CI)	Full Model + HHS OR (95% CI)
<b>Age</b>		
65-69	1.00	1.00
70-74	2.04 (1.68, 2.48)	2.00 (1.65, 2.43)
75-79	4.22 (3.45, 5.17)	4.09 (3.35, 5.01)
80+	9.42 (7.56, 11.77)	9.05 (7.27, 11.28)
<b>Sex</b>		
Male	1.00	1.00
Female	1.51 (1.21, 1.89)	1.20 (1.02, 1.69)
<b>Marital Status</b>		
Married	1.00	-
Single	2.49 (1.61, 3.75)	-
Divorced	3.43 (1.51, 6.94)	-
Widowed	1.91 (1.38, 2.61)	-
<b>Marital Status:Sex</b>		
Female:Married	1.00	-
Female:Single	0.70 (0.44, 1.15)	-
Female:Divorced	0.28 (0.11, 0.74)	-
Female:Widowed	0.66 (0.46, 0.94)	-
<b>Long-term Illness</b>		
No Long-term Condition Reported	1.00	1.00
Long-term Condition	1.48 (1.28, 1.69)	1.47 (1.28, 1.69)
<b>Housing Tenure</b>		
Rent	1.00	1.00
Own	0.77 (0.66, 0.90)	0.79 (0.68, 0.92)
<b>House Type</b>		
Not a Flat	1.00	1.00
Flat	1.21 (1.04, 1.41)	1.18 (1.02, 1.38)
<b>Recent Employment</b>		
No Recent Work	1.00	1.00
Recent Work	0.66 (0.53, 0.80)	0.65 (0.53, 0.79)
<b>Deprivation Score</b>		
Quintile 1 - Low	1.00	1.00
Quintile 2 - Low-Medium	1.22 (0.98, 1.52)	1.22 (0.98, 1.52)
Quintile 3 - Medium	1.34 (1.07, 1.69)	1.35 (1.07, 1.70)
Quintile 4 - Medium-High	1.48 (1.17, 1.88)	1.49 (1.18, 1.89)
Quintile 5 - High	1.34 (1.03, 1.74)	1.35 (1.04, 1.76)
<b>Urban Rural Classification</b>		
City (≥125,000 people)	1.00	1.00
Urban (≥10,000 people)	0.67 (0.57, 0.79)	0.67 (0.57, 0.79)
Small Town (≥3,000 people)	0.67 (0.54, 0.82)	0.66 (0.54, 0.81)
Rural (<3,000 people)	0.39 (0.31, 0.48)	0.39 (0.32, 0.49)
<b>Population Density</b>		
High (>5,000ppkm <sup>2</sup> )	1.00	1.00
Medium (1,000-5,000ppkm <sup>2</sup> )	3.48 (2.94, 4.13)	3.45 (2.91, 4.10)
Low (<1,000ppkm <sup>2</sup> )	9.71 (7.85, 12.03)	9.70 (7.84, 12.02)
<b>Household Structure</b>		
Alone	Single	-
	Widowed/Divorced	-
	Married	-
Not Alone	Spouse	-
	Spouse and Others	-
	Sibling(s)	-
	Child	-
	Complex/Others	-
<b>R<sup>2</sup>McF</b>	0.1932	0.2025
<b>AIC</b>	6648.7	6586.9

### **Analysis Split By Sex/Gender - 1991-2001 Sample**

The results for Model 2 when subset by sex are presented in Table 16. When the sample was split by sex: compared to living with a partner, men who lived alone had greater odds of using care at follow-up; single men had nearly three times the odds, widowed/divorced men had 2.4 times the odds and married men had nearly twice the odds. For women there was a similar pattern, compared to women living with a partner, women living alone also had greater odds of using care at follow-up, albeit with a smaller effect size; single women had nearly twice the odds, widowed/divorced women nearly 1.3 times the odds and married women almost twice the odds. However, while for women the odds increased when living alone, for men the increases in odds when living alone were greater. This could suggest one of two things: that compared to men, women living alone are less likely to use care at follow-up, or alternatively, that women living with a partner might have greater chances of using care at follow-up than men living with a partner. When the models are separate like this however, we can't directly compare the estimates.

Compared to living with a partner, there was no evidence of a difference in odds for living with a partner and others, with a child or in a household classed as others/complex for either men or women. For both men and women, living with siblings was associated with greater odds of using care compared to living with a partner. However, similar to the pattern for those living alone, the magnitude of the association was greater for men – for example, for men there were almost 2.5 times the odds of using care at follow-up when living with a sibling, but for women this was 1.5 times the odds. Across all the levels of HHS where odds are increased compared to living with a partner, these estimates appear to be consistently greater for men by a magnitude of 100%. For full results for the HHS variable, see Table 16 below.

Table 16.  
Table of Model Summaries for the Household Structure Variable Split by Sex/Gender in the 1991-2001 Sample

Household structure (HHS) variable summary table showing the model results from Model 2a and Model 2b, where the separate models were for men and women respectively. This shows the Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable, in each model where it was regressed against the outcome of being in a care home at follow-up in 2001, for the 1991-2001 sample of older Scottish people. The models presented here included the factors: age, sex, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification, population density and the HHS variable (note: only the ORs and 95% CIs for the HHS variable are presented here, see Chapter 6 for sex/gender differences in the other factors). Source: SLS.

Household Structure in 1991		Model 2a	Model 2b
		Men	Women
		OR (95% CI)	OR (95% CI)
Alone	Single	2.93 (1.73, 4.80)	1.90 (1.43, 2.51)
	Widowed/Divorced	2.40 (1.71, 3.35)	1.27 (1.05, 1.54)
	Married	1.85 (0.42, 5.68)	1.86 (1.00, 3.30)
Not Alone	Partner	1.00	1.00
	Partner and Others	1.14 (0.70, 1.80)	0.81 (0.48, 1.30)
	Sibling(s)	2.49 (1.13, 4.99)	1.56 (1.03, 2.31)
	Child	0.93 (0.32, 2.17)	1.23 (0.91, 1.66)
	Others/Complex	1.53 (0.44, 4.01)	1.45 (0.81, 2.48)

Note: For both men and women, the HHS variable was significant with a p-value <0.001.

### 2001-2011 SAMPLE

The sample included 14,362 SLS members - this was the same sample as Chapter 5, so for full descriptive statistics see Chapter 5.

Table 17 shows the number and percentage of the sample SLS members living in each household structure category, and also gives a breakdown of these numbers and percentages for men and women separately. In 2001, nearly 32% of the sample was living alone, but a greater proportion of women were living alone than men; with over 42% of the women living alone, while only 16.2% of the men lived alone. Nearly 53% of the sample were living in a two-person household with a partner, however, this time this was nearly 68% of the men and only 42% of the women. Women more often lived with other family/people than men – so a greater percentage of women lived in households falling into the categories: with a child, with sibling(s), and others/complex.

Table 17.

Table of Descriptive Statistics for Household Structure in the 2001-2011 Sample

A table presenting the number and percentage of the 2001-2011 sample of older Scottish people who were living in the different household structure (HHS) categories for the HHS variable. These numbers and percentages are presented for the full sample, then for the men and women separately. The 2001-2011 sample was a representative sample of Scottish people who were aged 65+ in 2001 and still living at home, and then were traced to follow-up in the 2011 census. Note: for samples of men and women separately, some categories have been condensed for statistical disclosure control purposes, due to low numbers in some of the categories of the HHS variable Source: SLS.

Household Structure		Full Sample		Men		Women	
		N	%	n	%	n	%
Alone	Single	743	5.17%	199	3.42%	544	6.37%
	Widowed/Divorced						
	Married	3824	26.63%	742	12.74%	3082	36.11%
Not Alone	Partner	7551	52.58%	3948	67.77%	3603	42.21%
	Partner + Others	1110	7.73%	632	10.85%	478	5.60%
	Sibling(s)	212	1.48%				
	Child	616	4.29%	305	5.24%	829	9.71%
	Others/complex	306	2.13%				
<b>Total</b>		14362	100.00%	5826	100.00%	8536	100.00%

Table 18 shows the number and percentage of older people who had entered care at follow-up in 2011 from each HHS category, both for the full sample and then for men and women separately. This shows that for the full sample regardless of HHS category, 6.5% of older people were in care at follow-up, while for the men's sample this was almost 4% and for the women's sample this was 8.3%. However, in the reference category of HHS – living with a partner - for the full sample 3.9% were in care at follow-up, while for men this was 2.9% and for women 4.9%. See Table 18 below for a full breakdown of the numbers and percentages of older people in care at follow-up for the other HHS categories.

Table 18.

*Table of Care Outcomes by Household Structure for the 2001-2011 Sample*

*A table presenting the number and percentage of the 2001-2011 sample of older Scottish people who were in a care home at follow-up in 2011, broken down by the different household structure (HHS) categories that they were living in, as per the HHS variable. These numbers and percentages are presented for the full sample, then for the men and women separately. The 2001-2011 sample was a representative sample of Scottish people who were aged 65+ in 2001 and still living at home, and then were traced to follow-up in the 2011 census. Note: for samples of men and women separately, some categories have been condensed for statistical disclosure control purposes, due to low numbers in some of the categories of the HHS variable. Source: SLS.*

Household Structure		Full Sample		Men		Women	
		No. in care	%	No. in care	%	No. in care	%
Alone	Single	99	13.32%	28	14.07%	71	13.05%
	Widowed/Divorced	418	10.93%	53	7.14%	365	11.84%
	Married						
Not Alone	Partner	291	3.85%	114	2.89%	177	4.91%
	Partner + Others	28	2.52%	13	2.06%	15	3.14%
	Sibling(s)	30	14.15%				
	Child	44	1.14%	22	7.21%	80	9.65%
	Others/complex	28	9.15%				
<b>Total</b>		<b>938</b>	<b>6.53%</b>	<b>230</b>	<b>3.95%</b>	<b>708</b>	<b>8.29%</b>

**Full Sample Analysis - 2001-2011 Sample**

Here Model 1 and Model 2 are equivalent to Model 1 and Model 2 for the analysis of the 1991-2001 sample above, however this time run on the 2001-2011 sample. Table 19 shows the model results for Model 1 (which included the factors: age, sex, marital status, long-term condition, housing tenure, house type, recent employment, deprivation, urban rural classification, population density and an interaction term for marital status and sex (ms:sex)) and the model results for Model 2 (which included all the factors from Model 1, except marital status and the ms:sex interaction term, plus the HHS variable). Note: As above, marital status and the ms:sex interaction term were excluded in Model 2 because the HHS variable contains marital status for the categories where people live alone (this is based on a HHS variable used in other research by McCann et al. (2011) for further details see the full methods in Chapter 3).

Model 2 shows that compared to living with a partner, older people who lived alone had greater odds of being in a care home at follow-up. When living alone, single people had 2.3 times the odds of using care, widowed/divorced people had 1.4 times the odds and those who were married but living alone 2.6 times the odds.

Model 2 also shows that compared to living with a partner, people who lived with a sibling had 2.6 times the odds of being in a care home at follow-up. Older people living in a household categorised as complex/others had 1.7 times the odds of being in a care home at follow-up, compared to older people living with a partner. Then for people who lived with a partner and others (OR 0.78 (95%CI 0.51, 1.14)) or with a child (OR 1.01 (95%CI 0.71, 1.41)) there was no evidence that the odds were different to people living with a partner because the interval estimates crossed the null value.

Again, there was some indication of HHS confounding with sex, as the point estimate for women dropped from 1.78 (95% CI 1.48, 2.24) in Model 1, to 1.41 (95% CI 1.19, 1.67) in Model 2. Given the disparities in HHS for men and women, this attenuation of the sex/gender association provides further evidence that men's and women's different living situations may be underlying some of women's increased odds of being in a care home at follow-up. The percentage of women living alone in this sample was again nearly three times that of men, and since living alone is associated with increased odds of care use, this could be a plausible explanation. There was also some slight change in the odds of being in a care home at follow-up associated with age, mainly in the older age groups. This might be due to a greater number of older people in the older age groups being widowed and thus living alone or in riskier HHSs. There was no evidence of HHS confounding with any other factors, as all the other estimates remained stable between the models.

Adding the HHS factor to the model and removing marital status and the interaction term  $ms:sex$  resulted in a slight decrease in the amount of variance in care use explained by the model as the  $R^2McF$  decreased and the AIC increased in Model 2. This was only slight but could signal that interaction of marital status and sex/gender explains more of the variance in care outcome at follow-up than HHS. Full model results for Model 1 and Model 2 are presented below in Table 19.

Table 19.

Table of Model Summaries for Model 1 and Model 2 for the 2001-2011 Sample

Model summary table for Model 1 and Model 2 showing Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for all factors in each model when regressed against the outcome of being in a care home at follow-up in 2001, for the 2001-2011 sample of older Scottish people. The models presented here include Model 1, a full parsimonious model, which included the factors: age, sex, marital status, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification, population density and the interaction term for sex:marital status (note: combined ORs are presented for marital status split by sex); and then Model 2, which included all the factors from Model 1 (except for marital status and the sex:marital status interaction term), plus the household structure variable. The model fit statistics, AIC and  $R^2McF$ , are also presented for each model. Source: SLS.



2001 Factor	Model 1:	Model 2:
	Full Model	Full Model + HHS
	OR (95% CI)	OR (95% CI)
<b>Age</b>		
65-69	1.00	1.00
70-74	2.38 (1.89, 3.00)	2.33 (1.85, 2.93)
75-79	2.81 (1.71, 4.91)	2.59 (1.57, 4.52)
80+	6.30 (3.80, 11.04)	5.73 (3.46, 10.04)
<b>Sex</b>		
Male	1.00	1.00
Female	1.78 (1.42, 2.24)	1.41 (1.19, 1.67)
<b>Marital Status</b>		
Married	1.00	-
Single	4.83 (3.20, 7.14)	-
Divorced	2.83 (1.59, 4.77)	-
Widowed	1.40 (0.97, 2.00)	-
<b>Marital Status:Sex</b>		
Female:Single	1.00	-
Female:Single	0.36 (0.22, 0.59)	-
Female:Divorced	0.34 (0.17, 0.70)	-
Female:Widowed	0.90 (0.60, 1.35)	-
<b>Long-term Illness</b>		
No Long-term Condition Reported	1.00	1.00
Long-term Condition	1.61 (1.39, 1.85)	1.62 (1.41, 1.87)
<b>Housing Tenure</b>		
Rent	1.00	1.00
Own	0.83 (0.71, 0.99)	0.85 (0.72, 1.00)
<b>House Type</b>		
Not a Flat	1.00	1.00
Flat	1.27 (1.08, 1.50)	1.26 (1.07, 1.49)
<b>Recent Employment</b>		
No Recent Work	1.00	1.00
Recent Work	0.53 (0.33, 0.90)	0.51 (0.31, 0.87)
<b>Deprivation Score</b>		
Quintile 1 - Low	1.00	1.00
Quintile 2 - Low-Medium	0.92 (0.74, 1.15)	0.91 (0.73, 1.14)
Quintile 3 - Medium	1.01 (0.81, 1.26)	1.01 (0.81, 1.26)
Quintile 4 - Medium-High	0.93 (0.73, 1.17)	0.92 (0.73, 1.17)
Quintile 5 - High	0.96 (0.73, 1.26)	0.98 (0.74, 1.28)
<b>Urban Rural Classification</b>		
City ( $\geq 125,000$ people)	1.00	1.00
Urban ( $\geq 10,000$ people)	0.88 (0.74, 1.05)	0.87 (0.73, 1.04)
Small Town ( $\geq 3,000$ people)	1.12 (0.90, 1.38)	1.11 (0.90, 1.38)
Rural ( $< 3,000$ people)	0.98 (0.76, 1.25)	0.97 (0.75, 1.24)
<b>Population Density</b>		
High ( $> 5,000$ ppkm <sup>2</sup> )	1.00	1.00
Medium (1,000-5,000ppkm <sup>2</sup> )	1.03 (0.87, 1.21)	1.02 (0.86, 1.20)
Low ( $< 1,000$ ppkm <sup>2</sup> )	0.82 (0.62, 1.09)	0.83 (0.62, 1.10)
<b>Household Structure</b>		
Alone		
Single	-	2.33 (1.78, 3.02)
Widowed/Divorced	-	1.43 (1.20, 1.71)
Married	-	2.56 (1.14, 5.16)
Not Alone		
Spouse	-	1.00
Spouse and Others	-	0.78 (0.51, 1.14)
Sibling(s)	-	2.63 (1.68, 3.98)
Child	-	1.01 (0.71, 1.41)
Complex/Others	-	1.74 (1.11, 2.62)
<b>R<sup>2</sup>McF</b>	0.1464	0.1452
<b>AIC</b>	5965.3	5975.4

### Analysis Split By Sex/Gender - 2001-2011 Sample

The results for Model 2 when subset by sex are presented in Table 20. When the sample was split by sex: compared to living with a partner, men who lived

alone had greater odds of being in a care home at follow-up; single men had nearly five times the odds; widowed/divorced men had 1.7 times the odds and married men had over three times the odds. For women there was a similar pattern, compared to women living with a partner, women living alone also had greater odds of being in a care home at follow-up, albeit with a smaller effect size; single women had nearly 1.7 times the odds and widowed/divorced women 1.2 times the odds. For married women there wasn't sufficient evidence of a difference compared to women living with a partner, although the point estimate suggested increased odds consistent with the pattern observed previously and for men (OR 2.14 (95%CI 0.76, 5.13)). While for women the odds increased when living alone, for men the increases in the odds when living alone were greater. Like above, this could indicate one of two possibilities: 1) that compared to men, women living alone are less likely to be in a care home at follow-up, or 2) women living with a partner might have greater odds of being in a care home at follow-up compared to men living with a partner. When the models are separate like this however, these estimates cannot be directly compared.

Compared to living with a partner, there was no evidence of a difference in odds of being in a care home at follow-up for those living with a partner and others, with a child or in a household classed as others/complex for either men or women. For both men and women, living with siblings was associated with greater odds of being in a care home at follow-up compared to living with a partner. However, similar to the pattern for those living alone, the effect size was greater for men. For men there were almost five times the odds of being in a care home at follow-up when living with a sibling, but for women this was only 1.9 times the odds. So across all the levels of HHS, where odds are increased compared to living with a partner, these odds appear to be consistently greater for men; however, again these estimates are from separate models so cannot be directly compared. For full results for the HHS variable, see Table 20 below.

Table 20.

Table of Model Summaries for the Household Structure Variable Split by Sex/Gender in the 2001-2011 Sample

Household structure (HHS) variable summary table showing the model results from Model 2a and Model 2b, where the separate models were for men and women respectively. This shows the Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable, in each model where it was regressed against the outcome of being in a care home at follow-up in 2011, for the 2001-2011 sample of older Scottish people. The models presented here included the factors: age, sex, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification, population density and the HHS variable (note: only the ORs and 95% CIs for the HHS variable are presented here, see Chapter 6 for sex/gender differences in the other factors). Source: SLS.

Household Structure in 2001		Model 2a	Model 2b
		Men	Women
		OR (95% CI)	OR (95% CI)
Alone	Single	4.99 (3.05, 7.96)	1.68 (1.22, 2.29)
	Widowed/Divorced	1.72 (1.18, 2.47)	1.24 (1.01, 1.53)
	Married	3.15 (0.72, 9.64)	2.14 (0.76, 5.13)
Not Alone	Partner	1.00	1.00
	Partner and Others	0.87 (0.46, 1.52)	0.69 (0.38, 1.16)
	Sibling(s)	4.87 (2.15, 9.95)	1.91 (1.11, 3.14)
	Child	1.16 (0.40, 2.68)	0.88 (0.60, 1.28)
	Others/Complex	1.94 (0.83, 3.95)	1.56 (0.91, 2.56)

Note: For men and women HHS variable was significant with a p value < 0.001 and <0.01, respectively.

#### COMPARISON WITH MCCANN STUDY

The results of this study are not directly comparable to McCann et al. (2011), as each study has used different statistical analyses - this study produced ORs while McCann et al. (2011) produced hazard ratios. This is due to the type of outcome data each study used: McCann et al. (2011) had care home admissions over a 6 year follow-up period, which allowed for time-to-event analyses; then this study used a snapshot follow-up (measured on census day 10 years later) which gave a binary outcome of whether the older people were living in a care home or not (for further information on this see methods in Chapter 3). Nevertheless, in this section, the general patterns of attributable risk observed in the two studies will be compared.

#### Full Samples

Table 21 shows the results for the full samples (including both men and women) of each study; the hazard ratios (HR) reported by McCann et al. (2011) are displayed in the second column, and ORs from this chapter's

analyses are displayed in the third and fourth columns for the 1991-2001 and 2002-2011 samples respectively.

In the full sample, like McCann et al. (2011) this study found that living alone was associated with a greater likelihood of care home admission (note: for the full sample they only reported a HR for living alone, not each category within living alone but stated there was little difference between those who had been married and those who were unmarried). In this chapter, both samples showed that those living alone had greater odds of being in a care home at follow-up compared to older people living with a partner. For those who were never married and those who were separated/divorced or widowed, the estimates between the two samples were very similar. Then the estimate for living alone when married was slightly higher in the later sample but not distinctly different.

In McCann et al. (2011)'s study, living with a partner and child was associated with a reduced likelihood of care home admission by follow-up compared to living with a partner; while there was no evidence of any association for living with a partner and others. However, in the analyses presented here, these categories had been contracted into "partner and others" which included children and others. No evidence of an association for this category was found in either of the Scottish samples. This may indicate a genuine difference between the Northern Irish and Scottish samples, or it may be due to the "partner and others" level having no association (which was the case in McCann et al. (2011)), thus diluting any association of "partner and child"; meaning no difference in odds was observed when these categories were combined in this analysis using samples of Scottish data.

For older people living with siblings, McCann et al. (2011) found an increased likelihood of care home admission. Similarly, in both samples these analyses found living with a sibling was associated with increased odds of being in a care home at follow-up. McCann et al. (2011) also noted the peculiarity of this finding given the similarity between the socio-demographics of partners

and siblings. These analyses also corroborated McCann et al. (2011)'s results for living with children, with all models showing no evidence of a difference compared to living with a partner. Then for living in a complex/other household, McCann et al. (2011) and the analysis of the 1991-2001 sample found no evidence of any difference compared to older people living with a partner, but in the 2001-2011 sample, increased odds of being in a care home at follow-up were found.

Table 21.

*Table Comparing the Household Structure Results from McCann et al. (2011) with the 1991-2001 and 2001-2011 Samples from Analyses on the Full Samples*

*Household structure (HHS) variable summary table showing the model results from the original study using an equivalent longitudinal study sample of older people in Northern Ireland by McCann et al. (2011); plus the results from the analyses from this thesis chapter, with one model run on the 1991-2001 Scottish sample and the other on the later 2001-2011 Scottish sample. The HHS variable for this study was derived based on that used by McCann et al. (2011), however some contractions of variable levels have been made where there was low n within that category in the Scottish samples (see methods chapter, Chapter 3, for further information). For the model presented from McCann et al. (2011), this was adjusted for age, sex and health status, then admission to a care home in a 6 year follow-up period was regressed against the HHS variable. Hazard Ratios (HR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable in McCann et al. (2011) are reported here in the second column. The results are reproduced with permission (License Number: 5450770264619), for full license see Appendix D. For the models from this thesis chapter, age, sex, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification and population density were adjusted for, then the outcome of whether older people were in a care home at follow-up 10 years later (a snapshot on the census date in the case of these analyses), was regressed against the HHS variable. Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable are reported here in the third and fourth columns for the 1991-2001 and 2001-2011 samples respectively. For more information on the original study by McCann et al. (2011), see the literature review in Chapter 2 and the methodology in Chapter 3. (Note: only the ORs and 95% CIs for the HHS variable are presented here, see Chapter 6 for sex/gender differences in the other factors). Source: SLS.*

Household Structure		Full Samples		
		McCann Study	1991-2001 Sample	2001-2011 Sample
		HR (95% CI)	OR (95% CI)	OR (95% CI)
Lives alone	Never married		2.21 (1.73, 2.80)	2.33 (1.78, 3.02)
	Widowed	1.66 (1.48, 1.87)	1.49 (1.26, 1.76)	1.43 (1.20, 1.71)
	Separated/divorced		1.99 (1.14, 3.33)	2.56 (1.14, 5.16)
	Married		1.00	1.00
Lives with	Partner	1.00	1.00	1.00
	Partner and children	0.70 (0.55, 0.89)	0.94 (0.67, 1.31)	0.78 (0.51, 1.14)
	Partner and others	0.93 (0.57, 1.54)		
	Siblings	1.78 (1.44, 2.21)	1.80 (1.26, 2.54)	2.63 (1.68, 3.93)
	Children	0.96 (0.80, 1.15)	1.30 (0.98, 1.71)	1.01 (0.71, 1.41)
	Others/complex	1.17 (0.95, 1.44)	1.55 (0.93, 2.49)	1.74 (1.11, 2.62)

### **Samples Split By Sex/Gender**

When the samples were split by sex/gender, this study observed a similar difference between women and men as was present in McCann et al. (2011)'s findings. The findings for McCann et al. (2011) and both Scottish samples, when models were subset by sex/gender, are presented in Table 22 and Table 23 for men and women, respectively.

All analyses observed that the effect size for men was greater than for women in the HHSs indicative of increased risk - living alone and living with siblings, compared to the respective reference categories of living with a partner. The only exception, in all analyses, was living alone while married, where there seemed to be little difference between the size of the association compared to the reference category for women and men – but the interval estimate suggests that for married people who live alone the attributable risk is similar to that of the reference category. Also, these estimates can't be directly compared because they are from different models, but the pattern is consistent across both studies.

There are two patterns observed by McCann et al. (2011) that could not be investigated in this study because of modifications to the HHS variable required due to the sample size for some categories in the Scottish data. First, McCann et al. (2011) found that the hazard of entering care for "Living alone: Widowed" was similar for men and women (HR was 1.44 and 1.47, respectively); but for "Living alone: Divorced" the hazard was much greater for men than women, with a hazard ratio of 2.4 for men and 1.2 for women. Since in this study these two levels were collapsed, the difference between these categories cannot be ascertained. However, for the combined factor level "Living alone: Divorced/Widowed" used in this study, the point estimate for men was higher than for women (for example, from the 1991-2001 samples the ORs were 2.4 and 1.3, respectively).

Second, for "partner and children" McCann et al. (2011) found a protective association for men but not women, but no association for "partner and

others". In this study, again these two categories were combined, and no association was observed. This might be because the association of "partner and children" for men was diluted by the "partner and others", or there may have been no such association in Scotland. Due to the way the categories were combined for this study, this effect can't be commented on in Scotland.

While these statistics are not directly comparable, the similarity in the patterns observed across all analyses lends support to the credibility of the results. It also provides evidence that despite the different methodology used by the analyses in this thesis, all analyses have reliably picked up the same associations of HHS.

Table 22.

Table Comparing the Household Structure Results from McCann et al. (2011) with the 1991-2001 and 2001-2011 Samples from Analyses on Men

Household structure (HHS) variable summary table for men, showing the model results from the original study using an equivalent longitudinal study sample of older people in Northern Ireland by McCann et al. (2011); plus the results from the analyses from this thesis chapter, with one model run on the 1991-2001 Scottish sample and the other on the later 2001-2011 Scottish sample. The HHS variable for this study was derived based on that used by McCann et al. (2011), however some contractions of variable levels have been made where there was low n within that category in the Scottish samples (see methods chapter, Chapter 3, for further information). For the model presented from McCann et al. (2011), this was adjusted for age and health status, then admission to a care home in a 6 year follow-up period was regressed against the HHS variable. Hazard Ratios (HR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable in McCann et al. (2011) are reported here in the second column. These results are reproduced with permission (License Number: 5450770264619), for full license see Appendix D. For the models from this thesis chapter, age, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification and population density were adjusted for, then the outcome of whether older people were in a care home at follow-up 10 years later (a snapshot on the census date in the case of these analyses), was regressed against the HHS variable. Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable are reported here in the third and fourth columns for the 1991-2001 and 2001-2011 samples respectively. For more information on the original study by McCann et al. (2011), see the literature review in Chapter 2 and the methodology in Chapter 3. (Note: only the ORs and 95% CIs for the HHS variable are presented here, see Chapter 6 for sex/gender differences in the other factors). Source: SLS.

Household Structure		Men		
		McCann Study	1991-2001 Sample	2001-2011 Sample
		HR (95% CI)	OR (95% CI)	OR (95% CI)
Lives alone	Never married	2.57 (1.99, 3.32)	2.93 (1.73, 4.80)	4.99 (3.05, 7.96)
	Widowed	1.44 (1.14, 1.82)	2.40 (1.71, 3.35)	1.72 (1.18, 2.47)
	Separated/divorced	2.39 (1.55, 3.68)		
	Married	1.94 (0.96, 3.93)	1.85 (0.42, 5.68)	3.15 (0.72, 9.64)
Lives with	Partner	1.00	1.00	1.00
	Partner and children	0.61 (0.43, 0.85)	1.14 (0.70, 1.80)	0.87 (0.46, 1.52)
	Partner and others	1.38 (0.77, 2.47)		
	Siblings	2.39 (1.66, 3.45)	2.49 (1.13, 4.99)	4.87 (2.15, 9.95)
	Children	1.05 (0.69, 1.58)	0.93 (0.32, 2.17)	1.16 (0.40, 2.68)
	Others/complex	1.19 (0.78, 1.84)	1.53 (0.44, 4.01)	1.94 (0.83, 3.95)



Table 23.

*Table Comparing the Household Structure Results from McCann et al. (2011) with the 1991-2001 and 2001-2011 Samples from Analyses on Women*

*Household structure (HHS) variable summary table for women, showing the model results from the original study using an equivalent longitudinal study sample of older people in Northern Ireland by McCann et al. (2011); plus the results from the analyses from this thesis chapter, with one model run on the 1991-2001 Scottish sample and the other on the later 2001-2011 Scottish sample. The HHS variable for this study was derived based on that used by McCann et al. (2011), however some contractions of variable levels have been made where there was low n within that category in the Scottish samples (see methods chapter, Chapter 3, for further information). For the model presented from McCann et al. (2011), this was adjusted for age and health status, then admission to a care home in a 6 year follow-up period was regressed against the HHS variable. Hazard Ratios (HR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable in McCann et al. (2011) are reported here in the second column. These results are reproduced with permission (License Number: 5450770264619), for full license see Appendix D. For the models from this thesis chapter, age, long-term illness, housing tenure, house type, recent employment, deprivation score quintile, urban rural classification and population density were adjusted for, then the outcome of whether older people were in a care home at follow-up 10 years later (a snapshot on the census date in the case of these analyses), was regressed against the HHS variable. Odds Ratios (OR) (where the null value is 1) and 95% Confidence Intervals (CI) for each category of the HHS variable are reported here in the third and fourth columns for the 1991-2001 and 2001-2011 samples respectively. For more information on the original study by McCann et al. (2011), see the literature review in Chapter 2 and the methodology in Chapter 3. (Note: only the ORs and 95% CIs for the HHS variable are presented here, see Chapter 6 for sex/gender differences in the other factors). Source: SLS.*

Household Structure		Women		
		McCann Study	1991-2001 Sample	2001-2011 Sample
		HR (95% CI)	OR (95% CI)	OR (95% CI)
Lives alone	Never married	1.86 (1.52, 2.27)	1.90 (1.43, 2.51)	1.68 (1.22, 2.29)
	Widowed	1.47 (1.26, 1.72)	1.27 (1.05, 1.54)	1.24 (1.01, 1.53)
	Separated/divorced	1.18 (0.73, 1.90)		
	Married	1.74 (1.12, 2.70)	1.86 (1.00, 3.30)	2.14 (0.76, 5.13)
Lives with	Partner	1.00	1.00	1.00
	Partner and children	0.82 (0.59, 1.14)	0.81 (0.48, 1.30)	0.69 (0.38, 1.16)
	Partner and others	0.47 (0.18, 1.27)		
	Siblings	1.52 (1.17, 1.98)	1.56 (1.03, 2.31)	1.91 (1.11, 3.14)
	Children	0.90 (0.73, 1.11)	1.23 (0.91, 1.66)	0.88 (0.60, 1.28)
	Others/complex	1.11 (0.87, 1.42)	1.45 (0.81, 2.48)	1.56 (0.91, 2.56)

## DISCUSSION

The analyses presented in this chapter found that for older people living in Scotland, living alone was associated with greater odds of being in a care home at follow-up, compared to living with a partner. This was the case for people living alone regardless of whether they were single, married or widowed/divorced. Older people living with siblings also had increased odds of being in care at follow-up compared to people living with a partner. For these HHSs associated with increased odds of care use, the increase in odds was consistently greater for men than women with one exception – those married but living alone. Meanwhile, the odds of being in a care home at

follow-up were similar for older people living with a partner, living with a partner and others, and living with children; and this pattern was the same for both men and women. For all of the HHS categories, the findings were consistent between the two samples with the exception of households categorised as complex/other; in the earlier sample (1991-2001), no association was found compared to living with a partner, but in the later sample (2001-2011), increased odds of being in a care home at follow-up were observed.

Below, how these findings compared to those of McCann et al. (2011) is discussed. The seemingly paradoxical results for siblings which was originally highlighted by McCann et al. (2011) and replicated here, has its own discussion section, followed by a further separate discussion section for the sex/gender differences observed in this study. Subsequently, a more general discussion about the strengths and limitations of these analyses and the wider implications of this piece of research is presented, before a final conclusion.

#### *COMPARISON TO MCCANN STUDY*

The findings presented in this chapter, from both samples of older Scottish people, corroborated the patterns observed by McCann et al. (2011) who explored HHS in a Northern Irish sample. The HHS variable used in this study was based on that used by McCann et al. (2011) (with some slight changes to the HHS levels as described above). All of the effects they reported which were possible to explore in the available Scottish data were replicated in these Scottish samples. All analyses found that living alone or with siblings was associated with greater attributable risk of using a care home at follow-up than living with a partner, while for other household structures like living with a partner and others or living with children, there was no observed difference compared to living with a partner. Interestingly, both studies found that these increases in risk were greater for men than for women in all but one household category. The only slight difference between these analyses were for households categorised as others/complex – where

McCann et al. (2011) and the 1991-2001 sample showed no evidence of an association with using a care home at or by follow-up, but the 2001-2011 sample showed evidence of greater odds of being in a care home at follow-up associated with this HHS.

Overall, the results presented in this chapter were remarkably similar to those from McCann et al. (2011) despite using different sample populations, controlling for different factors in the model and using different analysis techniques/statistical models. The consistency of the HHS associations across these two populations provides good evidence that the association between HHS and care use is robust in spite of policy, cultural, societal or other differences between the countries. This suggests that the finding for HHS might be generalisable to other populations outside Scotland and Northern Ireland.

Moreover, in both studies, the modelling strategies differed as McCann et al. (2011) controlled for age, general health and long-term conditions in their models, while in this study many more factors were controlled for, including: age, sex (in models not split by sex), deprivation, long-term illness, recent employment, urban/rural classification, population density, house type and housing tenure. The consistency of the HHS association, regardless of the factors controlled for in the model, suggests that the association is correctly attributed to HHS and not a result of confounding or effect modification from other factors. This is a strength of this study as it provides evidence that the HHS association is correctly being attributed to some aspect of HHS.

Now the association of different HHS categories will be discussed in more detail individually. First the associations which were found in both this study and McCann et al. (2011), then the differences between the HHS associations in the different analyses will be discussed. Following this, the implications of these similar findings (having been observed using different methodologies), will be covered.

## **Sibling Paradox**

This chapter found that living with a sibling, compared to a partner, was associated with greater odds of being in a care home at follow-up; the same pattern was observed by McCann et al. (2011) in their Northern Irish cohort. They too noted that this association was strange – siblings and partners share similar socio-demographic profiles and are both close relations. McCann et al. (2011) suggest this means the difference must therefore be explained by some aspect of the relationship and marriage itself.

McCann et al. (2011) suggest three possible explanations for this effect:

1. In a marital/romantic relationship, partners could be more likely to provide personal care than in a sibling relationship.
2. The commitment of marriage means partners might provide a greater level of informal care/support, which they supported with evidence that cohabiting siblings generally had better physical health than those cohabiting with a partner.
3. There are financial benefits to being married, and given the social-gradient in virtually all adverse outcomes, this financial advantage may be protective.

These are all reasonable suggestions why living with a sibling might not be so beneficial. However, for older people living in households categorised as other/complex – meaning they might live with people who are possibly unrelated - the odds of being in a care home at follow-up were similar to living with a partner in both the 1991-2001 sample and the original study by McCann et al. (2011). This suggests that even when there may be no familial relationship, it is still better than living with a sibling. Therefore, McCann et al. (2011)'s explanations about commitment and partners being more likely to provide personal care, plus the financial benefits of being married, may not fully explain why living with a sibling is seemingly so much riskier. So below, two alternative/additional possibilities are proposed: 1) looking at why older

people may choose to cohabit with siblings in the first place, and 2) looking at possible effects of living with a sibling.

*Why do older people live with their siblings?*

An alternative justification for this pattern might come from looking at why older people may choose to live with their siblings in the first place. Firstly, older people may live with a sibling because one of them is experiencing situations that make living independently difficult, for example, experiencing mental health problems or financial difficulties. Secondly, siblings might live together to prevent loneliness especially if neither sibling has a partner of their own. All of these situations themselves, the adversity or difficulty with independence, could instead be what is driving the increased likelihood of being in a care home at follow-up for those living with siblings.

Moreover, in this generation, marriage served a different purpose to marriage today. Over the twentieth century the purpose of marriage has changed from being “*institutional*” - where marriage was a form of social organisation which was controlled by laws, religion, social/societal norms etc. – to “*companionate*” - where marriage is based on the emotional connection and the shared life goals of two autonomous people (Amato, 2004; Burgess & Locke, 1945; Kiernan, 2004). This distinction suggests that while marriage today is more of a choice, marriage for the older people in the samples studied by this thesis and McCann et al. (2011), may have been influenced by necessity; this might be especially true for women. Historically, women could only access some rights and services through being married – for example women in the UK could not open their own bank account until 1975 (UK Government, 1975) and unmarried women could not access the contraceptive pill when it was first introduced (Igliskowski-Broad, 2021). Thus for women (including the older women in the samples used by this research), marriage may have been necessary condition to take part in society or access amenities reserved for men by society.

Ultimately, this means that remaining unmarried, especially for women, could have resulted in them experiencing adverse consequences and forgoing access to some rights and services. Thus, choosing to remain unmarried in society at this time may indicate substantive underlying motivations for non-compliance with societal norms. The laws and human rights for most of this cohort's lifetime (e.g. Same-sex civil partnerships were only legalised from 2005 onwards (UK Government, 2004a)), mean that people who would now identify as LGBTQ+ could not marry or easily live openly as their authentic selves; thus one such example of a substantive motivation to remain unmarried might be for individuals who may now identify as LGBTQ+. For this and possibly a multitude of other reasons, in a time when the norm was to marry, some unmarried people may have lived with their siblings to prevent loneliness, avoid harassment, and/or mitigate some of the adversity of being unmarried.

Consequently, it might be that the adverse situations which lead older people to live with a sibling offer an explanation for this excess risk of care use. These situations might be linked to care use in later life through mechanisms such as poorer health, reduced capacity for independence, harassment, discrimination, loneliness and mental health problems such as depression. Evidence for this in terms of the example given above, for individuals who may identify as LGBTQ+, is provided by Yarns et al. (2016) who report that older LGBTQ+ identifying individuals have experienced higher rates of discrimination and mistreatment through living in a less accepting society for most of their lives; and by Pachankis and Bränström (2019), who report that being unable to live authentically as your correct gender or sexuality is also associated with poor mental and physical health outcomes. Therefore, it is a plausible explanation that people who choose to live with siblings may have reasons behind their choice to live with a sibling, such as unaccepted LGBTQ+ identities, and so experience excess adversity, which could lead to the increased likelihood of being in a care home in old age, as observed in this chapter and by McCann et al. (2011).

*Are there possible effects of living with a sibling?*

A further alternative or additional consideration for the excess risk of being in care at follow-up for those living with siblings, might come from the psychological effects of watching a sibling age, compared to watching a partner age. While watching the ageing process affect a partner may be upsetting/distressing, the knowledge of genetic similarity with an ageing sibling may be more ominous. Watching close relatives like siblings suffer illness, frailty, or death, could make a person's own health and mortality more salient; Moyer (1992) states that the first sibling death removes the protective mentality which stops people considering their own mortality. Living with a sibling, these ageing processes may be more visible than for siblings who lived in separate households, which may lead older people to be more pessimistic about their own health and life expectancy; causing them to opt for social care earlier, or decline faster.

Moreover, self-efficacy is a person's perceived ability to change the events/circumstances of their lives, and one of the four ways self-efficacy is influenced is through vicarious experiences (Bandura, 1997). So an older person's self-efficacy may be influenced by watching cohabitants' experiences of aging and loss of independence – but this might be particularly salient if the person they watch is a sibling due to the perceived similarity to themselves. Furthermore, Mendes de Leon et al. (1996) reported that in their sample of community-dwelling older people, there was a protective association of higher levels of self-efficacy on functional status (ability to perform tasks of daily living independently). Therefore, since watching other cohabitants decline or age could impact older people's own independence, and this might be particularly influential for siblings, this is a further possible explanation for why living with a sibling was associated with excess odds of being in a care home compared to living with a partner, as observed in this thesis.

### *Summary*

In summary, possible explanations for the excess attributable risk of being in a care home at follow-up for those living with sibling have been discussed. McCann et al. (2011)'s suggestions have been critiqued, and some alternative/additional explanations offered; one focused on why older people may live with siblings in the first place, and another on the possible effects of living with an aging sibling. It is outside the scope of this thesis to explore these suggested mechanisms further, but they are offered as a direction for future research to explore.

### **Differences Between Men and Women**

The socio-demographics for Scotland showed that there were many more women living alone than men in both the 1991-2001 and 2001-2011 samples. This was despite women being more likely to live with other family or unrelated others than men. In previous literature, and the previous chapter, women were also more likely to use formal social care – so this demographic difference might be one of the factors contributing to the excess risk experienced by women. Living alone means older people do not benefit from informal social care from household members, and this could be why they are at greater risk of needing formal care. This will be important in Scotland, where in this sample from 1991, five times more older women were living alone than older men (women: n=4160, 44.4% vs men: n=853, 16.5%). Since then, one-person households in Scotland have overtaken two-person households, making up 35% of all Scottish households by 2011 (National Records of Scotland, 2018); which stands to be higher in the older age group with so many widowed people.

This study found that the association of HHS with care use, showed similar patterns for men and women and these matched the findings of McCann et al. (2011). However, while the patterns of increased risk were the same, the magnitude of that increased risk was different for men and women, which was also found by McCann et al. (2011). In all HHSs associated with increased odds, with one exception, the effect size for women was



consistently lower than the effect size for men. This probably reflects that odds are higher for women living with a partner, than men living with a partner (the reference categories in this case). This fits with the explanations provided in Chapter 4, which suggest that in marital/civil/cohabiting heterosexual relationships, women benefit less from informal care provided by a partner due to complex effects of sex differences and gender norms (see Chapter 4 and Chapter 5 for a more detailed discussion of this). Consequently, for women, the shortfall of informal care is likely made up with formal social care, resulting in women's odds of using a care/nursing home being higher. Therefore, this consistently smaller effect size for women in all other categories is probably due to women's higher attributable risk when married and living with a partner.

However, there was one HHS category – married but living alone - which was associated with increased odds but did not show this sex/gender difference in both the analyses presented in this chapter and McCann et al. (2011). We propose this might be because of the situations in which people would be married but live alone in old age, and what this means for the older persons' health. Given that at the reference level (living with a partner), women appear to have higher odds of using care than men; this means the similar estimate for both women and men for married and living alone, actually indicates a greater increase in chances of using a care/nursing home for women than men. Situations where a married woman might live alone might arise from her being too frail/ill herself to provide informal care, so her partner has been moved into a care home. Comparatively, due to gender roles in society, men would be less likely to provide informal care, so their partner having entered a care home bears less reflection on their physical state and subsequent chance of using care, therefore explaining why the sex/gender difference in effect size is not present for this category.

All of these sex/gender differences discussed in this section were also found in McCann et al. (2011). This suggests these patterns are robust across these populations, and are less likely to be a product of chance. While some

explanations have been offered for these observed patterns, this is by no means an exhaustive discussion of all the possibilities. Below, the effects from McCann et al. (2011) which were not replicated in this study will be discussed.

#### *STRENGTHS AND LIMITATIONS*

The first limitation of the research carried out in this chapter, is that some effects were not reproduced in this study because of changes made to the HHS variable. These changes were due to the sample size - rather than analyse groups too small to draw any conclusions (as CIs would likely be wide and inconclusive for small categories), some smaller levels of HHS in the Scottish data were condensed. The effects for living with a partner and child (lower attributable risk), and being divorced (greater attributable risk for men than women) that McCann et al. (2011) reported, could not be tested in our Scottish data due to these categories being combined with others. In this study, no difference compared to the reference category was shown and this is probably because the association was diluted when the level with the association was combined with a level without an association. This means this study cannot comment on any difference in effects between being divorced or widowed (including sex/gender differences for this), and the protective association of living with a partner and child that McCann et al. (2011) reported. However, given how the other HHS associations have replicated in the Scottish sample, it is likely these findings from Northern Ireland also apply to older people in Scotland.

A further limitation of this research might be the length of time since the Census data used were collected. The first sample spanned from 1991-2001, and this is over 20 years ago, and the second sample spanned from 2001-2011 which is over 10 years ago. Therefore, more up-to-date analyses could be carried out on more contemporary cohorts, and this would be better to inform policy and practice in the contemporary period. However, more recent samples of this data (from the Scottish Longitudinal Study) are not yet available because the 2021 census was postponed into 2022 due to the

COVID-19 pandemic. Moreover, these 2022 census data for Scotland will need to be digitalised, linked and made available for research, which will take time outside the scope of my studentship. As such, this analysis makes use of the available data. Moreover, the associations observed are consistent in both samples, and corroborated in the original Northern Irish study by McCann et al. (2011). Therefore, this could suggest that the association of HHS seems stable over time, even if the demography (number of people living in each type of HHS) is changing. While further research would be needed to confirm this, the age of the data may not be a problematic limitation in this regard, and the conclusions would still be applicable.

A strength of this research is that it carried out replication work – and replicating findings is an important part of science as it supports the validity and reliability of the results. This study replicated the findings of McCann et al. (2011) and this is notable for two main reasons. First, based on the available datasets, this study used an alternative analysis technique to the one used by McCann et al. (2011). With the availability of care home entry dates for their sample, McCann et al. (2011) could perform a survival analysis of a “true cohort”; in other words they could observe the event of interest (entering a care home by follow-up) for individuals at each different age across the sample of people aged 65+. This study did not have event data with dates of care home entry owing to interruptions in the research process from the COVID-19 pandemic (for further information see Chapter 3).

Instead, this study used a snap-shot of whether this event had occurred on a single follow-up date (i.e. the following census 10 years later). Therefore, this study forms a “pseudo-cohort”, which uses logistic regression to look at groups of people of different ages. The chances of an event for individuals at each age can be inferred from this, as these groups will contain people of a range of different ages. Despite this being a theoretically inferior methodology, it replicated the findings of McCann et al. (2011) very closely. This suggests it may be unnecessary to employ such high-level methods, as

the methods used by this study were both appropriate and adequate for investigating these effects/associations/events.

A further strength is that both studies controlled for different factors in their respective models, yet the associations were consistent; this consistency shows that the associations of HHS are robust findings. In McCann et al. (2011)'s models, they controlled for age, general health and the presence of a limiting long-term illness. In this study, more factors were controlled for, including: age, deprivation, long-term illness, housing tenure, urban/rural classification, recent employment, population density and house type. Thus, despite controlling for many more socio-demographic, geography and housing factors, the associations of HHS remained consistent – the associations were not attenuated by these factors. This provides evidence that the effects that both studies are observing and interpreting as associations with HHS, are being correctly attributed to some aspects or mechanisms involving HHS.

#### *GENERAL IMPLICATIONS*

More generally, the implications of this research suggests that married women have greater chances of being in care homes at follow-up than married men. This gender imbalance is proposed to be due to women providing, but not receiving, informal care from their partner (McCann et al., 2011; McCann, Donnelly, et al., 2012). This is evidenced in this analysis by the smaller effect sizes for women in riskier HHSs compared to men, which shows living with a partner is riskier to begin with for women than men. But this raises the question, whether the caring responsibilities that women living with partners take on are detrimental to their own independence and longevity, especially since gender roles mean that women are more likely to provide more unpaid care, as this is seen as “women’s work” (Neno, 2004). The next chapter will aim to explore whether providing informal care for household members is associated with care outcomes for older people. However, due to the limitations of the available data, this will not fully explore

this remaining question, so this is something future research could also pursue in greater detail.

In terms of recommendations for policy and practice – these results suggest that women carers might benefit from enhanced support. In Scotland, this could look like adjusting care needs assessments for partners of women, so women are expected to contribute less informal care. It is possible the care needs of older men with women as partners might appear lower than they are in reality, due to the informal caregiver role of their spouses hiding some care needs. So perhaps greater formal support provision should be provided where informal carers are women, as women are probably already providing more unpaid care than they report (Neno, 2004). This would benefit the carer with the aim of alleviating their care burden. While gendered policies like this sound unjust, this is one way to target systemic gender inequity which seems to be behind this excess attributable risk for women.

## CONCLUSION

In conclusion, these analyses demonstrated similar patterns of association for different HHS types with being in a care home at follow-up for older people in Scotland, as were demonstrated in Northern Ireland by McCann et al. (2011). Living alone was associated with greater odds, although when split by sex/gender, these associations were generally larger for men. The odds were also increased for older people living with a sibling, and again this association was larger for men, when the sample was split by sex/gender. This pattern indicates that instead of men being at greater risk than women when living alone or with siblings, married women who lived with their partner (the reference category in the analysis) might have greater odds of being in a care home at follow-up than men in the same position. Accordingly, policy and practice recommendations suggest greater support might be given to women who are providing informal care for a partner, as this burden could be detrimental to their own independence. Ultimately, the pattern seems to be explained by a complex mix of sex and gender issues, since this persisted in

the more recent cohort of older people, this demonstrates that this trend is likely to continue.

Additionally, this study observed the same pattern as McCann et al. (2011), where living with a sibling seemed riskier than living with a partner. This seems odd given a sibling and a partner would have similar demographics – they would be of a similar age, social status and are close relations, arguably the sibling is closer as they are a blood relative. McCann et al. (2011) offered some possible explanations and these were discussed and critiqued. An alternative explanation was proposed, suggesting that the circumstances leading siblings to cohabit might be negative – such as bereavement, mental health problems, loneliness, financial difficulties or remaining unmarried due to systematic discrimination – subsequently, it might be these influences driving the excess risk associated with this HHS.

Methodologically the study was not as robust as McCann et al. (2011)'s study due to the unavailable data on care home outcomes. However the corroboration between the studies, suggests the methodology used in this study is appropriate and valid given the data limitations. Moreover, given that the McCann et al. (2011) study and this research all cover different time periods, yet the HHS associations were replicated; this suggests the associations of HHS are stable over time, even if demography is changing. So while a greater number of people live in single households in more contemporary cohorts, the association of HHS with care use in old age remains constant. Ultimately, like McCann et al. (2011), this analysis concludes that HHS is important for independence in old age, and not all living arrangements seem equal in terms of risk of being in a care home at follow-up for older people.

## CHAPTER 8 – ANALYSIS 4: RECEIVING AND PROVIDING INFORMAL CARE

### CHAPTER SUMMARY

This chapter made use of new information which was available from the 2001 census onwards, so for the later 2001-2011 sample. The analyses presented here investigate whether being a carer/providing informal care (measured via the proxy of reporting providing unpaid care in the census), or receiving informal care (measured via the proxy of household members reporting providing informal care), were associated with older people being in a care home at follow-up ten years later.

Both providing and receiving informal care were associated with care outcome at follow-up. Receiving informal care was associated with increased odds of being in a care home at follow-up. Then providing informal care was associated with reduced odds of being in a care home at follow-up, however this association should be interpreted with caution because of issues with the measure used. The possible explanations for these associations, strengths and limitations, directions for future research, and policy recommendations based on these findings are discussed.

### AIMS AND OBJECTIVES

The aim of the analyses presented in this chapter was to explore the associations of informal/unpaid care with subsequent care home use. This information was only available for SLS members from 2001 onwards because in 2001, Scotland's Census included new questions asking people whether they were carers, and the number of hours of informal/unpaid care they provided. Based on answers from the SLS member, and their household members, this allowed two new factors to be derived:

1. *Being a carer* - reporting providing informal/unpaid care for others
2. *Receiving* informal/unpaid care from household members

Note: Here “being a carer” means providing informal care (based on reported provision of informal care in the 2001 census) and ‘informal care’ means receiving informal/unpaid care from someone else in your household (based on older people’s household cohabitant’s reported provision of informal care in 2001). For further details of how these factors were derived, see the Methods in Chapter 3.

Therefore, this chapter investigated these two new factors in the 2001-2011 cohort of older people in Scotland (Sample 2). It was expected that reporting being a carer would be associated with increased odds of being in a care home at follow-up (10 years later). This was based on the results in Chapter 4 which indicated that married women had higher odds of being in care homes at follow-up, and this could be due to their caregiving roles for their spouses. Moreover, evidence suggests that caregiving has a negative impact on older people’s own self-reported health, particularly when caregivers are under stress (Spillman & Long, 2009). Poorer physical health, in turn, is a known predictor of care home use, which has been evidenced both in this thesis (see Chapter 4 and Chapter 5) and in the existing literature (Gibbons et al., 2014; Ornstein et al., 2019; Reiss-Sherwood et al., 2002).

It was expected that receiving informal care would also be associated with being in a care home or not at follow-up. However, while some current evidence suggests that receiving informal care might be protective against entry to care homes for older people (Fernández-Carro & Evandrou, 2014; Jette et al., 1995); receiving informal care may also be an indicator of poorer health or increasing dependency. Therefore, it was not possible to predict the direction of the association this factor might have in the analysis.

#### *RESEARCH QUESTIONS*

1. Is reporting providing informal care associated with care use?
2. Is receiving informal care from household members associated with care use?



## RESULTS

### DESCRIPTIVE STATISTICS

As reported in earlier chapters, for the 2001-2011 sample, 6.53% of the sample of older people in Scotland were in a care home at follow-up 10 years later. Table 24 also shows that just over 12% of this sample reported being carers (older people who reported providing informal care). Then nearly 10% of the sample were possible recipients of informal care (older people whose fellow household occupants reported providing informal care). Table 24 also shows the number and proportion of older people who are carers or received informal care, who were subsequently in a care home themselves at follow-up. This showed that compared to non-carers, a smaller proportion of carers were in care homes themselves at follow-up. Then compared to those not receiving informal care, a greater proportion of the older people receiving informal care were in a care home at follow-up.

Table 24.

*Table of Descriptive Statistics for Informal Carers and Informal Care Recipients*

*Table showing the number and percentage of older people in each level of the factors: carer – providing informal care (based on reported provision of informal care in the 2001 census) and informal care – receiving informal care from someone else in your household (based on older people's household cohabitant's reported provision of informal care in 2001). Additionally, the number and percentage of the older people who had entered care by follow-up in 2011 is also presented for all levels of both informal care factors. These frequencies and percentages are for the 2001-2011 cohort, which consisted of a representative sample of people aged 65 and older and still living at home in Scotland at the 2001 census date, who were then successfully traced in the 2011 census. Source: SLS.*

2001 Factor	Total sample		In a care home in 2011	
	N	%	n	%
<b>Carer</b>				
No	12619	87.86%	866	6.86%
Yes	1743	12.14%	72	4.13%
<b>Informal Care</b>				
No	12997	90.50%	829	6.38%
Yes	1365	9.50%	109	7.99%
<b>Total</b>	14362	100.00%	938	6.53%

Table 25 is similar to Table 1, but stratified by sex/gender. This shows roughly equal proportions of men and women in the sample reported providing informal care (~13% of men and almost 12% of women), but a greater proportion of the men were in the group who possibly received informal care (just over 12% of men and nearly 8% of women).

It also shows that, consistent with the patterns reported earlier for men and women, a greater proportion of the women were in a care home at follow-up and this applied within the informal care factors. For both carers and non-carers, and informal care recipients and non-recipients, a greater percentage of the women were in a care home at follow-up.

*Table 25.  
Table of Descriptive Statistics for Informal Carers and Informal Care Recipients Stratified by Sex/Gender*

*Table showing the frequency and percentage of older people in each level of the factors: carer – providing informal care (based on reported provision of informal care in the 2001 census) and informal care – receiving informal care from someone else in your household (based on older people’s household cohabitant’s reported provision of informal care in 2001) – but split by sex/gender. Additionally, the number and percentage of the older men and women who had entered care by follow-up in 2011 is also presented for all levels of both informal care factors. These frequencies and percentages are for the 2001-2011 cohort, which consisted of a representative sample of people aged 65 and older and still living at home in Scotland at the 2001 census date, who were then successfully traced in the 2011 census. Source: SLS.*

2001 Factor	Men				Women			
	Total sample		In a care home in 2011		Total sample		In a care home in 2011	
	N	%	n	%	N	%	n	%
<b>Carer</b>								
No	5069	87.01%	211	4.16%	7550	88.45%	655	8.68%
Yes	757	12.99%	19	2.51%	986	11.55%	53	5.38%
<b>Informal Care</b>								
No	5118	87.85%	201	3.93%	7879	92.30%	628	7.97%
Yes	708	12.15%	29	4.10%	657	7.70%	80	12.18%
<b>Total</b>	<b>5826</b>	<b>100.00%</b>	<b>230</b>	<b>3.95%</b>	<b>8536</b>	<b>100.00%</b>	<b>708</b>	<b>8.29%</b>

## ANALYSIS

For this analysis, the new most parsimonious model for the 2001-2011 sample was used as a base model – here it will be called Model 1. This model included the variables which predicted care outcome in Chapter 5, including: age, sex, marital status, sex:maritalstatus, long-term illness, housing tenure, recent work and house type. The model results for Model 1 are presented in each of the tables for this section of the results, for comparison. Model 1 shows that increased age, being a woman, being single or divorced, having a long-term condition and living in a flat are associated with increased odds of using care at follow-up; while recently working and being a homeowner are associated with reduced odds (see Tables 26, Table 27 or Table 28 for full model results of Model 1).

### **Carer**

Model 2 included all the predictors from Model 1 plus the new factor – being a carer (reporting providing informal care). It shows that while the point-estimate suggests carers had nearly 20% lower odds of using care at follow-up, the interval estimate crosses the null value, so there was insufficient evidence that carers and non-carers had different odds of using care at follow-up. The other predictors remained stable in strength and direction of association, so showed no evidence of confounding, with the exception of marital status. For marital status, attenuation was only slight (differences of 0.03-0.07 in Odds Ratios (ORs)); this is probably due to married people being more likely to care for their partner. There was only a marginal change in the model fit statistics from including the factor ‘carer’ in this model. For full model results see Table 26.

Table 26.

**Table of Model Summaries of for Analysis 4 - Model 1 and Model 2**

Model summary table for Model 1 and Model 2 which were run on the 2001-2011 sample of older Scottish people. The results presented show the odds ratios (ORs) (where the null value is 1), 95% confidence intervals (CIs) and the significance level for all factors in the models when regressed against the outcome of being in a care home at follow-up ten years later. The models presented here both included the socio-demographic, self-rated health and geographical factors: age, sex, marital status, sex:maritalstatus, long-term illness, housing tenure, recent work and house type; and then Model 2 also included the new factor carer – whether older people reported providing informal care or not. The model fit statistics McFadden's pseudo-R square ( $R^2McF$ ) and Akaike Information Criterion (AIC) are also presented for both models. Source: SLS.

2001 Factor	Model 1		Model 2	
	OR (95% CI)	Sig.	OR (95% CI)	Sig.
<b>Age</b>				
65-69	1.00	***	1.00	***
70-74	2.39 (1.90, 3.02)		2.39 (1.90, 3.02)	
75-79	2.85 (1.72, 4.93)		2.83 (1.73, 4.97)	
80+	6.29 (3.80, 11.00)		6.34 (3.83, 11.09)	
<b>Sex</b>				
Male	1.00	***	1.00	***
Female	1.79 (1.42, 2.25)		1.79 (1.43, 2.26)	
<b>Marital Status</b>				
Married	1.00	***	1.00	***
Single	4.76 (3.16, 7.04)		4.69 (3.11, 6.94)	
Divorced	2.84 (1.59, 4.77)		2.79 (1.57, 4.70)	
Widowed	1.41 (0.97, 2.01)		1.38 (0.95, 1.97)	
<b>Sex:Marital Status</b>				
Male Married	1.00	***	1.00	***
Female Single	0.36 (0.23, 0.59)		0.36 (0.22, 0.59)	
Female Divorced	0.34 (0.17, 0.70)		0.34 (0.17, 0.70)	
Female Widowed	0.89 (0.60, 1.34)		0.89 (0.60, 1.34)	
<b>Long-term Illness</b>				
No Long-term Condition Reported	1.00	***	1.00	***
Long-term Condition	1.60 (1.39, 1.84)		1.61 (1.40, 1.85)	
<b>Housing Tenure</b>				
Rent	1.00	*	1.00	*
Own	0.84 (0.72, 0.98)		0.84 (0.72, 0.99)	
<b>Recent Work</b>				
No Recent Work	1.00	*	1.00	*
Recent Work	0.53 (0.33, 0.90)		0.53 (0.33, 0.91)	
<b>House Type</b>				
Other	1.00	**	1.00	**
Flat	1.30 (1.11, 1.51)		1.30 (1.11, 1.52)	
<b>Carer</b>				
No	-	-	1.00	0.105
Yes	-	-	0.81 (0.62, 1.04)	
<b>AIC</b>	5957.4		5956.7	
<b>R<sup>2</sup>McF</b>	0.1450		0.1453	

Note: Significance - \*\*\* <0.001, \*\* <0.01, \* <0.05, for >0.05 value will be given.

**Informal Care**

Model 3 included all the predictors from Model 1 plus the new factor – receiving informal care from a household member. It shows that those receiving informal care from a household member have 1.6 times the odds of

using care at follow-up, compared with those who do not receive informal care from a household member. The other predictors remain stable in magnitude and direction of association, so show no evidence of confounding, with the exception of marital status and long-term conditions. For both, the change in ORs is likely due to married people being more likely to receive care from their partner, and people with long-term conditions being more likely to receive informal care. Including the informal care factor in Model 3 resulted in a small increase in  $R^2$ McF and a small reduction in AIC signalling a small improvement in model fit. For full model results see Table 27.

Table 27.

**Table of Model Summaries for Analysis 4 - Model 1 and Model 3**

Model summary table for Model 1 and Model 3 which were run on the 2001-2011 sample of older Scottish people. The results presented show the odds ratios (ORs) (where the null value is 1), 95% confidence intervals (CIs) and the significance level for all factors in the models when regressed against the outcome of being in a care home at follow-up ten years later. The models presented here both included the socio-demographic, self-rated health and geographical factors: age, sex, marital status, sex:maritalstatus, long-term illness, housing tenure, recent work and house type; and then Model 3 also included the new factor informal care – whether the older people's household cohabitants reported providing informal care or not. The model fit statistics McFadden's pseudo-R square ( $R^2$ McF) and Akaike Information Criterion (AIC) are also presented for both models. Source: SLS.

2001 Factor	Model 1		Model 3	
	OR (95% CI)	Sig.	OR (95% CI)	Sig.
<b>Age</b>				
65-69	1.00	***	1.00	***
70-74	2.39 (1.90, 3.02)		2.40 (1.91, 3.03)	
75-79	2.85 (1.72, 4.93)		2.85 (1.73, 4.97)	
80+	6.29 (3.80, 11.00)		6.33 (3.82, 11.09)	
<b>Sex</b>				
Male	1.00	***	1.00	***
Female	1.79 (1.42, 2.25)		1.78 (1.42, 2.25)	
<b>Marital Status</b>				
Married	1.00	***	1.00	***
Single	4.76 (3.16, 7.04)		5.01 (3.32, 7.42)	
Divorced	2.84 (1.59, 4.77)		3.02 (1.70, 5.08)	
Widowed	1.41 (0.97, 2.01)		1.49 (1.02, 2.12)	
<b>Sex:Marital Status</b>				
Male Married	1.00	***	1.00	***
Female Single	0.36 (0.23, 0.59)		0.37 (0.23, 0.60)	
Female Divorced	0.34 (0.17, 0.70)		0.34 (0.17, 0.69)	
Female Widowed	0.89 (0.60, 1.34)		0.89 (0.60, 1.35)	
<b>Long-term Illness</b>				
No Long-term Condition Reported	1.00	***	1.00	***
Long-term Condition	1.60 (1.39, 1.84)		1.52 (1.32, 1.75)	
<b>Housing Tenure</b>				
Rent	1.00	*	1.00	*
Own	0.84 (0.72, 0.98)		0.83 (0.71, 0.97)	
<b>Recent Work</b>				
No Recent Work	1.00	*	1.00	*
Recent Work	0.53 (0.33, 0.90)		0.53 (0.33, 0.91)	
<b>House Type</b>				
Other	1.00	**	1.00	***
Flat	1.30 (1.11, 1.51)		1.31 (1.12, 1.53)	
<b>Informal Care</b>				
No	-	-	1.00	***
Yes	-	-	1.66 (1.31, 2.08)	
<b>AIC</b>	5957.4		5942	
<b>R<sup>2</sup>McF</b>	0.1450		0.1475	

Note: Significance - \*\*\* <0.001, \*\* <0.01, \* <0.05, for >0.05 value will be given.

**Sensitivity Analysis**

Sensitivity analyses compared levels of informal care, with lesser and greater confidence in the informal care being for the SLS member/older person in that household. Informal care provision in the household an SLS member

was living in was measured based on household cohabitant's reports of providing of informal care in 2001. There is no established way to know if this informal care was for the SLS member, another household member or someone external to the household. So those determined to be receiving informal care were split into two groups:

1. 'Possible Informal Care' - where other household members reported limiting long-term illness (possible care needs), so these household members could be receiving the informal care in that household rather than the SLS member.
2. 'Probable Informal Care' - where no other household member reported limiting long-term illness (possible care needs), so nobody else in the household had any measurable competing care needs, meaning the SLS member was more likely to be the recipient of the informal care in that household.

However, sensitivity analyses showed no evidence of a difference between these two groups. Both possible and probable informal care were associated with increased odds of being in a care home at follow-up, and the ORs were similar and the confidence intervals overlapped. Thus, there was no evidence that having household members with competing care needs affected the association for receiving informal care.

### **Fully-adjusted Model**

Model 4 included all the predictors from Model 1 plus both new factors – being a carer and possibly receiving informal care from a household member. It shows that compared to people who do not report providing unpaid care for another person, unpaid carers have 30% reduced odds of using a care/nursing home themselves at follow-up. Then compared to people not receiving informal care from a household member, informal care recipients have 1.8 times the odds of using a care/nursing home at follow-up. The other predictors remain relatively stable in magnitude and direction of association. There is a small increase in the ORs for the oldest age group (who are less

likely to be carers) and marital status – single, widowed and divorced (married people are more likely to give and receive informal care) and a small decrease in ORs for having a long-term condition (people with long-term conditions are more likely to receive informal care). The model fit statistics show that including both these factors has increased the variance explained by the model. For full model results see Table 28.



Table 28.

*Table of Model Summaries for Analysis 4 - Model 1 and Model 2*

Model summary table for Model 1 and Model 4 which were run on the 2001-2011 sample of older Scottish people. The results presented show the odds ratios (ORs) (where the null value is 1), 95% confidence intervals (CIs) and the significance level for all factors in the models when regressed against the outcome of being in a care home at follow-up ten years later. The models presented here both included the socio-demographic, self-rated health and geographical factors: age, sex, marital status, sex:maritalstatus, long-term illness, housing tenure, recent work and house type; and then Model 4 also included both of the new factors: carer – whether older people reported providing informal care or not, and informal care – whether the older people's household cohabitants reported providing informal care or not. The model fit statistics McFadden's pseudo-R square ( $R^2$ McF) and Akaike Information Criterion (AIC) are also presented for both models. Source: SLS.

2001 Factor	Model 1		Model 4	
	OR (95% CI)	Sig.	OR (95% CI)	Sig.
<b>Age</b>				
65-69	1.00	***	1.00	***
70-74	2.39 (1.90, 3.02)		2.39 (1.90, 3.02)	
75-79	2.85 (1.72, 4.93)		2.89 (1.75, 5.04)	
80+	6.29 (3.80, 11.00)		6.41 (3.87, 11.24)	
<b>Sex</b>				
Male	1.00	***	1.00	***
Female	1.79 (1.42, 2.25)		1.79 (1.43, 2.26)	
<b>Marital Status</b>				
Married	1.00	***	1.00	***
Single	4.76 (3.16, 7.04)		4.93 (3.26, 7.30)	
Divorced	2.84 (1.59, 4.77)		2.96 (1.66, 4.98)	
Widowed	1.41 (0.97, 2.01)		1.44 (0.99, 2.06)	
<b>Sex:Marital Status</b>				
Male Married	1.00	***	1.00	***
Female Single	0.36 (0.23, 0.59)		0.36 (0.23, 0.59)	
Female Divorced	0.34 (0.17, 0.70)		0.33 (0.17, 0.68)	
Female Widowed	0.89 (0.60, 1.34)		0.89 (0.60, 1.34)	
<b>Long-term Illness</b>				
No Long-term Condition Reported	1.00	***	1.00	***
Long-term Condition	1.60 (1.39, 1.84)		1.51 (1.31, 1.75)	
<b>Housing Tenure</b>				
Rent	1.00	*	1.00	*
Own	0.84 (0.72, 0.98)		0.83 (0.71, 0.97)	
<b>Recent Work</b>				
No Recent Work	1.00	*	1.00	*
Recent Work	0.53 (0.33, 0.90)		0.54 (0.33, 0.93)	
<b>House Type</b>				
Other	1.00	**	1.00	***
Flat	1.30 (1.11, 1.51)		1.32 (1.13, 1.54)	
<b>Carer</b>				
No	-	-	1.00	**
Yes	-	-	0.70 (0.53, 0.91)	
<b>Informal Care</b>				
No	-	-	1.00	***
Yes	-	-	1.81 (1.42, 2.29)	
<b>AIC</b>	5957.4		5936.6	
<b>R<sup>2</sup>McF</b>	0.1450		0.1485	

Note: Significance - \*\*\* <0.001, \*\* <0.01, \* <0.05, for >0.05 value will be given.

## DISCUSSION

The findings of this chapter showed that both newly measurable factors, being a carer and possibly receiving informal care from a household member, were associated with being in a care home at follow-up ten years later for older Scottish people in the 2001-2011 sample. Being an unpaid carer was associated with 30% reduced odds of being in care at follow-up, meanwhile, possibly receiving informal care was associated with 80% increased odds of being in care at follow-up.

Possibly receiving informal care from household members was significantly associated with care outcome when modelled in the base model, and also when modelled in the full model with the carer factor. But for reporting being a carer, initially when modelled in the base model, there was insufficient evidence to conclude that this factor was associated with care outcome at follow-up. But when both factors were modelled against the outcome of being in a care home at follow-up in the full model, they were both significantly predictive of care use at follow-up; which suggests there was evidence of some confounding between the two factors.

The possible interpretations of these findings for the bigger picture of social care in Scotland are discussed below, providing informal care first, followed by receiving formal care. Then the strengths and limitations of these analyses are discussed, followed by the implications for future research and the policy implications arising from these findings. Then finally, a conclusion of the chapter is presented.

### *INTERPRETATION OF FINDINGS*

#### **Providing Informal Care**

Reporting providing unpaid care for another person was associated with decreased odds of using care at follow-up. This association was not in the direction hypothesised, however there are several possible reasons that providing informal care might be linked to care outcomes in the way observed by this research. First, reporting providing informal care for another person might have indicated that the older person's own health and physical abilities

were good. Providing unpaid care can be physically and mentally demanding, so the ability to provide care suggests good or better health. Consistent with this, McCann et al. (2004) investigated the factors associated with commencing informal caring for older American adults (65+ years), and reported that physically healthier older people were more likely to take on a caregiver role. O'Reilly et al. (2008) also reported that caregivers in a Northern Irish sample were less likely to report a limiting long-term illness in the census and also that caregivers have lower mortality compared with non-caregivers. This suggests there might be a healthy carer selection effect (O'Reilly et al., 2008; Vlachantoni et al., 2013). Therefore, it might be carers' better health which explains the findings of this chapter, where caregivers have reduced chances of being in a care home at follow-up.

Second, Neno (2004) suggests that many women do not report being unpaid carers, even when they provide care; often this is because they view it as part of their duty as women or within a marriage. People who feel duty-bound to provide care might be less likely to seek help, as they may feel this is a personal failing on their part. Conversely, the people aware they are "carers" and thus reporting it in the census, may have greater awareness of the support available for unpaid carers, and be consequently more likely to seek assistance with their roles. Having good boundaries and self-advocacy in the caregiver role might be protective against the negative health impacts of caregiving, as outlined in the literature review in Chapter 2 (e.g. Gibbons et al. (2014); Ornstein et al. (2019); Reiss-Sherwood et al. (2002)). This self-preservation may explain why this group have reduced chances of using institutional care at follow-up, despite the negative health consequences associated with being a caregiver.

Ultimately, the association could be a mixture of both of these suggested explanations, or there may also be other explanations that have not been considered here. However, it should be noted that the percentage of men and women reporting providing care was fairly even with a slightly higher proportion of men than women reporting providing unpaid care in this sample

(13% of men and 11.6% of women). However, the majority of unpaid care is generally provided by women, both throughout the world and in Scotland (Criado Perez, 2019; One Scotland - Scottish Government, 2019). This suggests a lot of unpaid caring may be unmeasured in this sample, and/or that the measure of caregiving used in this analysis might be biased. As mentioned above, Neno (2004) suggests gender roles in society mean that despite providing unpaid care, many women do not report this when asked. This might explain why far fewer women than expected reported providing informal care in the samples used in this piece of research. Therefore, this finding should be reported and interpreted with caution, and the role of caregiving on the caregivers' own care outcomes warrants further investigation.

### **Receiving Informal Care**

Despite evidence in the literature which suggested receiving informal care was protective against care/nursing home admission (Bonsang, 2009; Gannon & Davin, 2010; Gaugler et al., 2007; Jette et al., 1995; Lo Sasso & Johnson, 2002; Van Houtven & Norton, 2004), this analysis found that receiving informal care from a household member was associated with greater likelihood of using a care home at follow-up. The most likely explanation for this is that people who receive informal care from a household member have greater care needs. Therefore informal care here may be indicative of care needs, which will logically predict care/nursing home use.

Furthermore, a lot of the literature looks at informal care provided by children, who are less likely to live with the older person they provide care for. Whereas here the analysis uses a measure of co-resident carers, who are more likely to be a partner and also old themselves. Moreover, for those not receiving this informal care from a spouse, then having a co-resident carer might be more likely for older people with increased disability or greater care needs. Accordingly, Bonsang (2009) reported that the protective effect of informal care diminishes with increasing levels of disability. Therefore,

informal care being associated with increased chances of using a care/nursing home may be because informal care in this analysis is limited to informal care provided by a co-resident caregiver. So the carer might be older themselves, such as a partner; or the carer may be another relative who has either moved in with the older person, or relocated the older person into their home – which signals higher levels of disability and/or more significant care needs.

Additionally, the follow-up period for this study is ten years, which is longer than some in the literature. So, while receiving informal care could in the short-term delay entry to a care home, this analysis suggests that receiving informal care is still a predictor of using formal care in the longer term. Furthermore, informal care here might be indicative of “needing support to manage”, which signals dependency. Dependency in turn may eventually lead to requiring care in a care home. Therefore, there are several possible explanations why despite previous literature suggesting receiving informal care is protective against entry to care, that this study might have observed the opposite, with informal care signalling increased likelihood of being in a care home ten years later at follow-up.

#### *STRENGTHS AND LIMITATIONS*

A strength of this research is that it makes use of secondary data from a representative Scottish sample to explore factors which might be associated with increased or reduced risk of being in a care home at follow-up. It also considers the implications of providing care on caregivers’ own care outcomes in later life; while the literature predominantly considers physical and mental health outcomes.

A limitation of this piece of research is that the census variable for receiving informal care is a proxy variable and with proxy measures for constructs/variables, there is the question of the validity of the proxy for measuring the desired construct/variable (McCoach et al., 2020). This method of using proxy measures could be particularly error prone; for

informal care, household members reported providing informal care and this is used as a proxy for the older person receiving informal care, but there is nothing that indicated who is the recipient of this care, and whether it was the “SLS member” (older person in our sample). However, for older people, if household members report providing unpaid care, given the household structures which were predominant for older people living in Scotland in the last chapter, Chapter 7, these unpaid carers would primarily be spouses or children of the older person, and thus the care being for them is fairly likely. Plus, sensitivity analyses showed no evidence of any difference if other household members with possible competing care needs were accounted for. Thus, the level of confidence in the informal care being for the older person in the sample, did not seem to affect the results.

Another limitation is that for providing care, the gender split of older people reporting providing care in the Scottish samples used here does not match with statistics from elsewhere on caregiver gender in Scotland (One Scotland - Scottish Government, 2019). This suggests that the measure of caregiving used might be biased, and so the findings here must be interpreted with caution.

A further limitation of this research is that the available data means that the care outcome is measured at one time point. More robust analyses would be possible if time-to-event data for admission to a care home could have been used instead. However these data were not available for this project, due to time limitations of the studentship and interruptions from the COVID-19 pandemic. Therefore, while this is a limitation, the analyses still present valuable research using the data available. Moreover, in the previous analysis presented in Chapter 7, almost identical results were generated by this thesis using this logistic regression method, compared with a previous study which had used Cox proportional hazards regression (McCann et al., 2011). Based on this evidence that both methodologies generated almost identical findings, this limitation should not affect the reliability and validity of the findings of this analysis.

### *IMPLICATIONS FOR FURTHER RESEARCH*

The research in this chapter attempted to explore the associations of providing and receiving informal/unpaid care with whether older people in Scotland were in a care home at follow-up, ten years later. These are important aspects of many older people's lives which warrant further research. Providing unpaid care is undertaken by more women than men (Criado Perez, 2019; One Scotland - Scottish Government, 2019), but this was not picked up by the census measure used in this research. Moreover, the effects of caregiving are difficult to quantify, as caregivers appear to be healthier in the first place, so any negative impact may have been hidden in previous research including this study (McCann et al., 2004). Additionally, women are consistently at higher risk of using care homes in old age – possible explanations have been proposed and explored in previous chapters, surrounding traditions within heterosexual marriage where men marry younger women, so women do not have as much opportunity to receive informal care from their older partners, who are more likely to be ill or deceased themselves when women need care (McCann, Donnelly, et al., 2012). However, there may be alternative implications for women's risk of using care homes in old age arising from their roles as caregivers, especially since measuring the true burden of caregiving women bear has traditionally been difficult and under-reported (Neno, 2004). Therefore, further research to try and understand the implications of providing unpaid care are warranted.

### *IMPLICATIONS FOR POLICY AND PRACTICE*

Despite the findings suggesting that caregiving is associated with reduced chances of being in a care home at follow-up, this measure of caregivers does not appear to capture all carers in this Scottish sample. Older women in Scotland are more likely to provide unpaid care (One Scotland - Scottish Government, 2019), yet for this measure of providing unpaid care, a greater proportion of the men than the women reported providing unpaid care in this sample of older Scottish people.

Neno (2004) suggests that caregiving is under-reported by women because they view it as part of their duty as women or role within a marriage. So this relates to the influence of gender roles in society on women's reporting of the hours of unpaid care they provide. Particularly for women who have been homemakers, the boundary between unpaid care and their usual role within their home may be unclear. Moreover, feeling this is part of their role/duty as a wife may mean older women might be less likely to seek help and support in their caregiving roles.

Therefore, the policy recommendations would be to support caregivers in these roles, by relieving some of the burden of care. Especially for women, who due to societal gender norms, experience a greater burden of caregiving and responsibility, yet may not realise they are unpaid carers, and may not try to access the support that already exists. Greater effort may need to be taken to extend support to women who provide care in old age, as due to the under-reporting of this caregiving evidenced in this chapter, they may not realise they are "carers", or that they are able to seek support. Moreover, the descriptive statistics presented here show older women make up the majority of the population of older Scottish adults, thus targeting social care policies towards the needs of women is warranted – especially as women have experienced systematic inequality in society (Criado Perez, 2019). This recommendation aligns with the commitment of the Scottish Government to the United Nations Sustainable Development Goals (SDGs) – the 10<sup>th</sup> SDG is to reduce inequalities (Scottish Government, 2020).

## CONCLUSION

In conclusion, the analyses in this chapter have made use of information available from the 2001 census onwards to explore the association of providing or receiving informal (unpaid) care in old age, with whether older people were in a care home at follow-up. Both providing informal care and receiving informal care from a household member were associated with care outcome at follow-up. Being a carer was associated with 30% reduced odds of using care, this may be because people who report providing care are



aware that their role counts as being a carer and are aware of the services available to support them, or these individuals are healthier to begin with and this is why they take on caregiving roles. However, it could also be due to women under-reporting their roles as carers, thus this finding should be interpreted with caution. Receiving informal care was associated with over 80% increased odds, and the suggested explanation for this was that receiving informal care may be indicative of the older person having care needs, and thus more likely to require care in a care home at follow-up.

The implications of these findings for future research and policy were discussed. This centred on the roles of caregivers and how this disproportionately affected older women. However, the census measure used in this research did not demonstrate this pattern – so possible explanations for the mismatch between other caregiving statistics for Scotland (One Scotland - Scottish Government, 2019), and those reported in this study were discussed. This chapter concluded further research was needed here. It also concluded that more generally, better supporting groups known to experience systematic disadvantage such as women, would align with Scottish Government's commitment to the United Nations' Sustainable Development Goals for reducing inequalities here (Scottish Government, 2020).

## CHAPTER 9 – DISCUSSION

### CHAPTER SUMMARY

This chapter presents a discussion and summary of the findings and implications of the research contained within this thesis. The findings of each chapter are presented below in order. There are four broad themes to these pieces of research, which all investigate how various factors under these four themes are associated with older people (aged 65 and older) in Scotland being in a care home at follow-up, ten years later. The four themes include: 1) socio-demographic, self-rated health and geographical factors; 2) Sex/gender differences; 3) Household structure (who older people live with in their home); and 4) Providing informal care and receiving informal care from a household member. Then, a more general discussion of the research in this thesis is presented, including the broader strengths, limitations, implications for future research and policy recommendations.

Note: This thesis used two samples of older people in Scotland throughout these analyses; first a sample of people aged 65 and older in 1991, followed-up in 2001 (the 1991-2001 sample), and second a sample of people aged 65 and older in 2001, followed-up in 2011 (the 2001-2011 sample).

### SOCIO-DEMOGRAPHIC, SELF-RATED HEALTH AND GEOGRAPHICAL FACTORS

#### *CHAPTER 4*

The Chapter 4 analyses identified several key aspects of socio-demographics, self-reported health and geography which are important in predicting care home use in Scotland for the 1991-2001 sample of older people. Within the UK, previous published studies had been carried out in England, Wales and Northern Ireland on equivalent longitudinal study datasets (the ONS and NILS respectively); the analyses presented in this

thesis provide a Scottish study of these factors and their association with older people being in a care home at follow-up, ten years later. It successfully replicated many of the effects found in other populations, using Scottish data; which supported the generalisability of these findings from other UK populations, and previous literature from other populations, to Scotland.

Also, this chapter evidenced that three lesser researched factors were also associated with being in a care home at follow-up for older people in Scotland. Low population density, and living in a flat were associated with increased odds of being in a care home at follow-up, while recently working (in the last ten years) was associated with reduced odds. Some explanations for how these associations might be driven were suggested and discussed. Caution interpreting recent work was also advised, based on this variable likely also being linked to older people's health status and age, and thus their *ability to work*, rather than the recent work itself.

Additionally, Chapter 4 investigated the seemingly paradoxical associations of two measures of geography – Urban Rural Classification and Population Density, which I had previously found in my Masters project. This further exploration in this thesis found that the way geography is associated with care home use in Scotland appears to be more complex than has been found elsewhere. Notably, instead of all city/urban areas having a higher attributable risk of older people being in a care home at follow-up, this was limited to low population density parts of these urban and city areas. It is still unknown whether this applies only to Scotland, or might apply to other populations too. It is feasible that since research elsewhere primarily uses urban rural classification as a measure of geography, and not also population density, that this interaction between urban rural classification and population density could be relevant in these other populations.

## *CHAPTER 5*

In Chapter 5, the same factors as were investigated as those in Chapter 4 but this time in the later sample, 2001-2011. This showed differences in the factors which were associated with being in a care home at follow-up in old age, between the two Scottish cohorts. However, factors like age, sex/gender, marital status, having long-term conditions, housing tenure, house type, recent employment and HHS have remained consistently associated with care use across both Scottish cohorts. Therefore, the associations of these factors with being in a care home at follow-up do not seem to be influenced by period and cohort differences in Scotland over time.

For the novel association of urban rural classification and population density reported in Chapter 4, this chapter showed that this association did not successfully replicate in this later sample of older people in Scotland. However, for all three area-level factors – urban rural classification, population density and deprivation – associations were no longer observed with care outcome (being in a care home at follow-up). A suggested explanation was the more uniform care provision in Scotland due to the enactment of the new social care policy, The Community Care and Health (Scotland) Act (Community Care and Health (Scotland) Act, 2002), in 2002; meaning that access to social care no longer depended on where people lived. However, further research is needed to assess the feasibility of this explanation, especially as some existing research raises questions about the real difference that this policy made to social care in Scotland. Instead this may be due to more general changes rather than the specific policy, as this period shortly after devolution of the governments in the UK meant several big changes across the health and social care landscape.

## *SUMMARY*

Overall, the research presented here has made a valuable contribution to the understanding of the socio-demographic, health and geographical factors associated with care home use in Scotland. It has evidenced that while some of these factors remain consistent over different time periods, other

associations are not consistent. Additionally, it has expanded the number of known factors associated with care use and demonstrated a notable more nuanced spatial association.

## SEX/GENDER DIFFERENCES – CHAPTER 6

Chapter 6 explored sex/gender differences in more detail. First, it corroborated previous research by demonstrating that the association of marital status is different for men and women. This also supported the explanation proposed by McCann, Donnelly, et al. (2012), that the excess risk for women is due to the differing availability of informal care from a spouse for men and women. However, this chapter also discussed further possible interpretations and developed this explanation in light of more contemporary awareness of the effects of gender roles on caring behaviours.

Second, this chapter demonstrated that some socio-demographic, self-rated health and geographical factors are equally important in explaining the variance in care home status at follow-up for men and women. However, for some other factors, there is evidence of sex/gender differences. Possible explanations for why these sex/gender differences might exist for these factors were proposed and discussed – these included a mixture of sex differences (e.g. differences in health and life expectancy) and gender roles in society (e.g. traditions of age gaps in heterosexual marriages and differences in occupations).

Ultimately, while previous research has looked at sex differences in marital status, the key contribution of this analysis is that it has expanded upon this to investigate sex/gender differences in other factors associated with being in a care home in old age. Highlighting these patterns, differences and inequalities is an important contribution to the understanding care home use in old age. The findings of this chapter also gave further support to policy recommendations for gendered policies to address inequalities in social care, such as gendered social care support packages.

## HOUSEHOLD STRUCTURE – CHAPTER 7

Chapter 7 investigated the association of living with other people, and older peoples' relationship with these other people, on care outcomes at follow-up. This was a replication study of previous research carried out using equivalent Northern Irish Longitudinal Study data, by McCann et al. (2011). The analyses presented here found that in both of the Scottish cohorts (1991-2001 and 2001-2011), household structure is similarly associated with being in a care home at follow-up for older people, and this also corroborated the original findings of the Northern Irish study by McCann et al. (2011).

The results showed that living alone was associated with greater odds of being in a care home at follow-up compared to living with a partner, as was living with siblings. When the analyses were split by sex/gender, these associations were generally larger for men. This pattern could indicate that instead of men being at greater risk than women when living alone or with siblings; married women who lived with their partner (the reference category in the analysis) might have greater odds of being in a care home at follow-up than men in the same position. This could suggest greater support might be needed for women who are providing informal care for a partner, as this burden could be detrimental to their own independence. Ultimately, similar to the sex/gender differences discussed elsewhere in the thesis, this pattern also seems likely to be explained by a complex mix of sex and gender issues. Moreover, the persistence of this pattern in both cohorts demonstrated that this trend is likely to continue.

Additionally, this study observed the same pattern as McCann et al. (2011), where living with a sibling seemed riskier, in terms of being in a care home at follow-up, than living with a partner. This seems odd given a sibling and a partner would have similar demographics – they would be of a similar age, social status and are both close relations - arguably the sibling is a closer relative, as they are a blood relative. This odd association was termed “the sibling paradox”. McCann et al. (2011) offered some possible explanations and these were discussed and critiqued. An alternative explanation was

proposed, suggesting that the circumstances leading siblings to cohabit might be negative – such as bereavement, mental health problems, loneliness, financial difficulties or remaining unmarried due to systematic discrimination – subsequently, it might be these influences driving the excess risk associated with this household structure.

Methodologically the study was not as robust as McCann et al. (2011)'s study. This was due to the availability of data on care home outcomes within the timeframe of the PhD thesis, which meant that the suitable methodology for these data was comparatively less robust than that used in the original study. However, the striking corroboration between the studies provides evidence that the methodology used in this study is appropriate and valid given the data limitations. Moreover, given that the McCann et al. (2011) study and this research cover different time periods, yet the household structure effects replicated; this suggests the effects of household structure are stable over time, even if demography is changing. So while a greater number of people live in single households in more contemporary cohorts, the association of household structure with care use in old age remains constant. Plus, in this thesis, more covariates were controlled for and the associations for the different household structures were still consistent – suggesting the variance attributed to household structure was not due to confounding with any of these additional covariates. Ultimately, like McCann et al. (2011), this analysis concludes that household structure is important for independence in old age, and not all living arrangements seem equal in terms of risk of being in a care home at follow-up for older people.

The key contributions of this chapter were replicating effects found elsewhere on these Scottish data, this justifies this effect being generalised outside of Northern Ireland, and supports the credibility of the original findings. A further key contribution is the exploration of further explanations for the sibling paradox, following critique of the explanations offered by McCann et al. (2011). This thesis took a contemporary view of the problem, offering explanations considering the important role of time period on the behaviour of

women and LGBTQ+ individuals. This is an important contribution, because interpretations of the patterns in data are also subject to the biases held by those interpreting them (Olteanu et al., 2019). In academia, particularly in science fields, white, cis-gendered, heterosexual, able-bodied men are the most well-represented group (Cech, 2022), and this lack of diversity may have implications for the interpretation of the data we see. So this chapter explored possibilities considering the different experiences of people not predominantly focused on in history, such as women and other marginalised groups.

#### PROVIDING AND RECEIVING INFORMAL CARE – CHAPTER 8

In Chapter 8, additional variables available from 2001 were utilised to attempt to explore the association of providing or receiving informal (unpaid) care in old age, with the outcome of being in a care home at follow-up or not.

Because these were only available from 2001, they could only be explored in the later sample – 2001-2011. Also due to the way the census questions these variables were derived from were asked, this had implications for what type of informal care could be measured, and how certain I could be that the care I was measuring was provided to the SLS members whose care outcomes I was modelling. But it offered the opportunity to explore the associations of providing and receiving informal care with older people's own likelihood of using a care home in old age.

Both providing informal care and receiving informal care from a household member were associated with care outcome at follow-up. Receiving informal care (in this case from a household member) was associated with over 80% increased odds of being in a care home at follow-up 10 years later. The suggested explanation for this was that receiving informal care likely indicates that the older person has care needs, and thus is more likely to require care in a care home at follow-up.

Then, being a carer was associated with 30% reduced odds of being in a care home at follow-up ten years later. This may be for a number of reasons,



first, because people who report providing care are aware that their role counts as being a carer and are aware of the services available to support them, so seek the help and support they require to prevent negative effects such as burnout. Second, individuals who choose to or are able to provide informal care might be healthier to begin with, and this is why they take on caregiving roles. The nuances of reporting providing care and the impact of gender roles on who reports being a carer were also discussed, as the gender split for those reporting being caregivers did not match with other Scottish estimates. In this sample, fewer women than expected reported being caregivers, and this had implications for the reliability and generalisability of this finding.

## GENERAL DISCUSSION

This section presents more general discussion of the thesis, starting with the overall contributions to knowledge, followed by a discussion of the more general strengths and limitations of this project of research. Then, overall recommendations for future research such as remaining unanswered questions are presented, followed by the policy and practice recommendations. Lastly, a final conclusion to the thesis is presented.

## *CONTRIBUTION TO KNOWLEDGE*

This thesis has addressed several key research questions around the use of care/nursing homes in Scotland – which has contributed to knowledge about the characteristics of older people that might have important implications for their use of formal institutional care in old age. These findings are relevant to the field of social care in old age and policy and practice in Scotland/the UK. In addition to the key contributions of each chapter, highlighted above, this section presents some more general contributions of the thesis.

First, every piece of research presented in this thesis used a representative sample of people living in Scotland. This was achievable through the use of administrative data, as many groups who are often excluded from volunteer or survey samples (a popular source of data for previous studies), are

included in administrative data (Harron et al., 2017). Second, this representative sample also means that the findings presented here can comment on the generalisability of other studies to Scotland. Previous research on the risk factors for using a care/nursing homes in old age included mainly global northern populations around the world. Then within the UK, before the start of this project, similar research had primarily been conducted in England, Wales and Northern Ireland. So this thesis has provided comparative and representative research in Scotland.

Then finally, two samples of administrative data were used for this thesis research, each from a different time point (1991-2001 and 2001-2011). This means that for all but one piece of research, the results were either replicated between the samples, or the differences in the findings between the samples were identified and discussed. This provides evidence of which characteristics of older people continued to be associated with care outcomes for older people in Scotland in the later sample, and which associations did not persist. For example, geographical measures which had been associated with care outcomes in the earlier sample (1991-2001) were no longer associated with care outcomes in the more recent sample (2001-2011) – suggesting that spatial inequalities in care provision could have been reduced. This is important for understanding which inequalities may be pervasive and thus still relevant to policy, and which inequalities may be less relevant in the current period. Where inequalities were not present in the later sample, they may have been successfully mediated by policy, practice and structural changes in how social care is provided in Scotland. While this requires extensive further research, the research presented here has contributed to current knowledge by highlighting this difference between the samples over time.

#### *STRENGTHS AND LIMITATIONS*

The strengths and limitations of this research have been discussed in detail throughout this thesis, however some are applicable more broadly to the thesis as a whole, so these are presented below.

First, a possible limitation of this research is that the outcome measure used throughout this thesis – a census derived snap-shot measure of whether a person is in a care/nursing home on the census date - is not the best available measure within the existing Scottish administrative datasets. However, there are several reasons why this was both an appropriate, practical and valid outcome measure to use. Firstly, my studentship funding period was time-limited and there was disruption to normal data access procedures from the unfolding COVID-19 Coronavirus Pandemic. The care outcome measure used provided a feasible way to complete this research within the studentship, as the permissions for access to the variables used to derive the outcome, were secured prior to the pandemic. Secondly, the validity of this outcome measure was evidenced in this thesis, by the similarity between the results of the analyses presented in Chapter 7 and an original study that these analyses replicated. The study that these analyses replicated was by McCann et al. (2011), who used an alternative outcome measure, relying on health card address changes and care inspectorate data from care homes. This gave care home admission dates over a follow-up period, which allowed for different, arguably a more robust, statistical methods to be used. However, the strong corroboration between the results of this thesis and the original study supports the validity of the methods and measure of social care outcomes used throughout this thesis.

However, a strength of this research, in terms of ethics, is that the measure of care outcomes used by this thesis did not require additional linkages to alternative data sources. All of the datasets used by this thesis were from the Scottish Longitudinal Study (SLS), and no additional linkages to datasets outside the SLS were used. Additional linkages are considered riskier in terms of disclosure risk, due to the extra information about each individual which is then available (Desai et al., 2016). Despite the stringent measures taken to reduce disclosure risks, it is still a recommendation that researchers conduct their research with the minimum variables and linkages possible; this falls under the “five safes” guidance for ensuring data safety (UKRI Medical

Research Council, 2020). Therefore, by conducting the research using this outcome variable, which was derived from the existing SLS datasets, it was more ethically conscious – as it used the minimum data necessary to conduct the research.

A further strength of the research presented in this thesis, is the balanced perspective of care use. In much of the previous literature, using or entering a social care facility has been discussed in a predominantly negative light. While older people generally would prefer not to use care/nursing homes (Social Care Institute of Excellence, 2017), care homes have their place in providing services to older people who require this type of support. So entering a care home is not necessarily a negative outcome. Therefore, this thesis has taken the view that associations with care use can have two interpretations: first, factors associated with increased care use might indicate further intervention or support is needed to prevent this excess risk of losing independence in old age. Then second, so called “protective associations” could also indicate that care needs are not being met or care/nursing homes are not accessible. By taking a more neutral view of care, it means both possibilities have been considered in explaining the patterns of care observed in this thesis.

Another limitation of the research presented in this thesis is that there are unmeasured variables. For example, while this thesis explored a measure of long-term conditions, there may be specific conditions where older people are more or less likely to require care home admission. For example, having a diagnosis of dementia is itself associated with requiring care in a care home (Harrison, Walesby, et al., 2017), plus dementia is more common in women than men (Cao et al., 2020). Therefore, unmeasured variables, such as diagnoses of specific conditions may be important in understanding more nuanced patterns of older people using care homes, such as for women, or women with long-term conditions.

Finally, an additional limitation of the research in this thesis is the applicability of the findings to LGBTQ+ identifying older people. While a representative sample of Scotland was used to conduct this research, it will not realistically represent LGBTQ+ people today. Due to the laws against homosexuality, lack of human rights protections for LGBTQ+ people, lack of questions about LGBTQ+ identities in censuses, consequences of the HIV AIDS pandemic and mistreatment of LGBTQ+ individuals throughout history (as discussed in Chapter 1), there will be a lack of representation of LGBTQ+ people living their lives authentically within these datasets (Guyan, 2022). For example, individuals who may today identify as LGBTQ+, are unlikely to have done so in the samples used throughout this thesis. This means that where people maybe would have in today's society changed gender, or married same-sex partners, they may have instead remained living as the gender they were assigned at birth, remained single, or married heteronormatively. This means that as society becomes more progressive, and more people are afforded the freedom to live authentically – marry a same-sex partner, identify as non-binary, transition etc. - we cannot say what this will mean for their care outcomes, as they are not represented *this way* in the datasets used throughout this thesis. Therefore, the findings of this thesis may not be generalisable to older people who identify as LGBTQ+ living in present-day Scotland.

#### *REMAINING QUESTIONS: RECOMMENDATIONS FOR FUTURE RESEARCH*

This thesis, while answering some of the questions about social care use in Scotland, has also raised several more. Some remaining questions are finding-specific, while others are more general. So directly below, these finding-specific suggestions are presented, and then below this some further more general suggested directions.

Some examples of specific findings, where future research could develop upon them further to understand what might be driving the associations include:

- Living in a flat - this was consistently associated with increased odds of being in a care home at follow-up. Suggested explanations included that flats with entry via stairs may pose accessibility issues for some older people e.g. those with physical disability, age-related decline or frailty. So future research could investigate the appropriateness of this explanation by considering the floor level of the flats that older people live in.
- Marital status - this was also consistently associated with care outcomes, however it was always measured at the census prior to the care outcome. Future research could also measure change of marital status between the initial census and follow-up census using Scottish data, as some older people may experience a change of marital status between the initial measurement and the outcome measurement, and this might have implications for their odds of being in a care home at follow-up. Additionally, effects for changing marital status, such as widowhood, have been observed for mortality outcomes, such as in the work by Boyle et al. (2019), where excess mortality was observed for those who were widowed in a Scottish sample; while this mortality risk was highest in the first six months after the death of a spouse, increased risk continued in the ten years following. Schneider and Atherton (2018, 2018a) observed that between 2001 and 2011 between 78-80% of people who died in Scotland had care needs in the year preceding their deaths. Therefore, given that 1) there is an association between widowhood and mortality (Boyle et al., 2019), and 2) care need precedes mortality in Scotland (Schneider & Atherton, 2018, Schneider & Atherton, 2018a); then there may be an effect of recent widowhood on care outcomes which was not measured in this research.
- Informal care provision - while this thesis explored whether caregiving had implications for caregivers' own care outcomes in later-life in Chapter 8, the findings of this piece of research should be interpreted

with caution. The demographics of the people reporting providing informal (unpaid) care in this sample were not what was expected based on previous reports of caregiving trends in Scotland (One Scotland - Scottish Government, 2019), with fewer women reporting caregiving than was expected. Thus the finding here, that caregivers were less likely to be in a care home at follow-up than non-caregivers, may not be representative of caregivers in Scotland more generally. So further research, using a different data source with a more representative measure of who provides informal care, should be undertaken to investigate caregiving and its implications for older people's own care outcomes.

Other chapter-specific remaining questions raised by each analysis have been discussed throughout this thesis, chapter by chapter. So the broader recommendations for future research, based on the more general findings of this thesis, are discussed below.

First, this thesis examined samples from two time periods (1991-2001 and 2001-2011) and evidenced both similarities and differences in which characteristics may have implications for older people's care outcomes in old age. Some of these differences showed that inequalities persisted, while others showed inequalities were no longer present in the more contemporary sample. Where inequalities in care outcomes no longer persist in the later sample, understanding how this was achieved and what needs to be done to continue this trend would be of interest to Scottish Government. Scottish Government have committed to reducing inequalities, as part of the Sustainable Development Goals set by United Nations (Scottish Government, 2020); so developing on the findings of this thesis could have potentially policy relevant findings.

Second, the evidence of differences in the factors which were associated with being in a care home at follow-up between the two samples used for this research, suggests that in even more recent samples there may also be

differences. Soon the equivalent sample for 2011-2022 will be available, when the 2022 census is digitalised for SLS members (Note: Scotland deferred its census by a year due to the impact of the COVID-19 Coronavirus Pandemic). If changes have occurred between 2001 and 2011 in which factors were associated with care use, then with a further decade of progression in policies, general trends and population health, the predictors of care outcomes could be different again. However, it will be important to consider that this sample may also be affected by the impact of the COVID-19 pandemic. During the pandemic, COVID-positive patients were discharged to care homes, which resulted in the virus spreading to care home residents and ultimately a high number of fatalities in this already vulnerable population (the exact death figures are still believed to be an underestimate at the time of writing) (O'Dowd, 2021; Oliver, 2020). The pandemic affected older people's willingness access and use care services, including care homes (Bottery, 2020), and this pattern may continue. It could have had implications for future formal social care use and older people's preferences around social care modalities. Therefore, this will be an important consideration for Scottish Government when planning and making policy around institutional care in the future. So investigating which factors remain important in a more contemporary sample, when the 2022 census data become available, would better inform future policies and care provision.

Finally, in the limitations discussed above, a critique of this research was that the findings may not be generalisable to people who identify as members of the LGBTQ+ community. This is a gap in the research literature on social care, and many other areas too (Russell et al., 2020) (for further information about the benefits and challenges of identifying LGBTQ+ individuals in administrative data see Russell et al. (2020)). Accordingly, initiatives such as INCLUDE have been set up to try and include "under-served" groups in research such as clinical trials (National Institute for Health Research, 2020). So in terms of social care outcomes, future research should aim to ascertain whether the care needs and the factors associated with care home use are



different for people in these marginalised groups within Scotland, such as LGBTQ+ identifying individuals. As society becomes more progressive, allowing people to live authentically, this means that future social care services and policies will need to cater for a population with an increasingly diverse range of sexualities and genders. Recent years have seen a rise in LGBTQ+ care homes, retirement villages and care services (Powys Maurice, 2020; Wood, 2021) – this is an area of care provision Scotland too will need to consider. Therefore, research into the differing needs of these groups will be essential in providing adequate social care for everyone in Scotland.

#### *RECOMMENDATIONS FOR POLICY AND PRACTICE*

There have been several policy recommendations made by this thesis in response to the findings of each analysis in the chapters, the majority of which come from identifying inequalities in who uses care homes or who might have access to care homes in old age. Inequalities are pervasive, and accordingly a focus of Scottish Government strategy is to reduce inequalities (Scottish Government, 2016, 2018a, 2018b). This is also underpinned by Scottish Government's commitment to the United Nation's Sustainable Development Goals, where reducing inequalities is one of the goals (Scottish Government, 2020). Thus, the inequalities identified by this thesis research are relevant to Scottish Government's strategies and policies. Below some of the key policy relevant findings are summarised.

First, living in a flat was identified consistently throughout this research as a factor associated with increased likelihood of being in a care home at follow-up. This is likely due to the accessibility issues with stairs to access flats, particularly the tenements common in Scotland. Scottish Government's Age, Home and Communities Strategy aimed to support older people with their housing, to help them remain at home for longer; as such they worked with Age Scotland to create a guide for housing options in old age, and assigned priority in social housing allocations to older people who need to move house due to care needs (Age Scotland, 2020; Scottish Government, 2018a). However, developments could include a policy to give similar priorities to

older people with care needs in private lets. Within the cities in Scotland, the private renting market can be very competitive, so this would make finding an accessible property even harder. Moreover, both renting a home and living in a flat were risk factors for using care, so policies like this could help older people in both these groups.

Additionally, with an increasing number of older people in Scotland, ensuring future social housing provides properties suitable for the needs of older people will be essential (Age Scotland, 2022). One further possibility is to develop social housing retirement villages. This would both increase the social housing stock, and increase the number of suitable properties for older people. This could be one method to reduce the waiting times for older people to move into more suitable properties; which was mentioned by Age Scotland as a challenge for older people (Age Scotland, 2020).

Second, women consistently had greater risk of using care, and this may be due to inequalities faced by women due in part to their gender. Part of the Scottish Government's Fairer Scotland strategy is to focus on making Scotland a fairer place with equal opportunities for all, with a particular focus on a "thriving third age" – i.e., improving the experiences of older people (Scottish Government, 2016). However, based on the pervasive inequalities observed by this research for older women, it is recommended that more focus is put on securing this for women. A key conclusion over several chapters of this thesis has been that policies should focus on the needs of women in old age, based on older women making up the majority of the old age population in Scotland, especially in the older age groups (National Records of Scotland, 2020b).

Specifically, Local Authorities could seek to offer care needs assessments to older people at certain age thresholds (similar to health screening appointments), and these thresholds could be from younger ages or more frequent for older people with characteristics associated with care outcome inequalities, such as women, those living in deprived areas, people living in

rented housing or flats. This could remove some inequality in who seeks care assessments and spot unmet care need. Informal care from a spouse is something which has been argued by both this thesis and previous research (e.g. McCann, Donnelly et al. (2012)), as something women in a couple are less likely to receive, and therefore a likely reason for their increased risk of using care homes in old age. Where informal care from a spouse has up until now been meeting some care need for men, for women, assessing for care needs might identify unmet care need and provide in-home social care. Therefore, this could reduce inequalities in in-home care (something which can delay or buffer against eventual care home use) and resultantly reduce this inequality for women in their risk of using care homes in old age.

Additionally, funding for accompanying Scottish Government campaigns and advertising around raising awareness that support is available (similar to the Scottish debt advice campaigns on social media and television from 2021 onwards (Scottish Government, 2023)) could also encourage older people that their types of care need qualify as requiring assistance, e.g. demonstrating that support is designed for those experiencing struggles to complete daily activities. To make this address inequalities faced by women, these advertisements and campaigns could be targeted towards older women.

Furthermore, an additional recommendation would be expanding the types of social care services provided under the free personal and nursing care policy in Scotland to include what was termed “mopping and shopping” (tasks such as laundry, shopping, cleaning, and household tasks that older people may struggle with) by McLeod & Mair (2015) when they recommended the same in their 2015 report following research on older people’s own perspectives on the 2002 free personal and nursing care policy. Since the majority of household labour is undertaken by women (Criado Perez, 2019), this policy change would relieve this extra burden for older women.

Third, this thesis also recommended further improvement to the support offered to informal carers. Again, this disproportionately affects women, who provide the majority of unpaid care (Neno, 2004; One Scotland - Scottish Government, 2019). Certain housing situations were associated with reduced chances of being in care at follow-up, particularly for men, and this was attributed to informal care provision provided by their partners who were women (given the generation, heteronormative partnerships were assumed). Society views women as more capable in a caregiver role and there is an expectation on women to provide unpaid care (Gibbons et al., 2014; Neno, 2004); and this bias may mean that women feel duty bound to provide informal care, and may be unaware that they are able to seek support in their roles. Expectations due to gender roles should not mean women are less supported in their caregiving, as this is unfair.

Therefore, it is a recommendation that more support be provided for informal carers, particularly when those carers are older women, who may not advocate for themselves due to the legacy of gender roles in society. This could work alongside the regular scheduled care needs assessments suggested above, with assessments including a partners' assessment to specifically target old age carers. All partners in relationships/couples/families could be assessed together for care and support needs to form a joint social care support plan.

Additionally, including "mopping and shopping" social care services (as suggested by McLeod & Mare (2015)) would alleviate some of the burden particularly for older women in caring roles. As Criado Perez (2019) states, women perform the majority of household domestic tasks and labour, while also providing the majority of unpaid care; so these two policy recommendations in combination could better support older women in Scotland to maintain their independence longer.

A final point on policy recommendations is that many inequalities are not experienced in isolation, most are compounded by other inequalities. So in

reality older people facing one source of inequality will likely be facing others too – often termed ‘intersectionality’ in policy-making and academic contexts (Scottish Government, 2022a). Therefore, policies aiming to reduce inequalities need to cover all sources, especially when these intersect. For example, this might include considering the different needs of people who identify as LGBTQ+, are women, are BIPOC (Black, Indigenous, and People of Colour) and/or part of other marginalised groups in society. Thus, it is also a recommendation that future policies for social care should consider how diversity may impact the needs of older people living in Scotland.

## CONCLUSION

In conclusion, this thesis has contributed to the field of research on social care, especially the knowledge about social care specific to Scotland. It has attempted to address gaps in the literature, particularly with regard to the risk factors for using institutional social care in Scotland. It has made novel contributions – such as finding more nuanced associations for different geographies. It has expanded on the existing research – by looking at the sex/gender differences in a greater number of factors, and exploring lesser researched factors like living in a flat, recent work, population density and providing informal care. Then it has replicated other work and found support for the original findings in a different population, and replicated all but one analysis by carrying out these analyses on two samples, each from different time points. This thesis has also demonstrated evidence that some inequalities in who uses care home in old age have disappeared in the more recent Scottish sample, while other inequalities have remained pervasive across both samples.

Several of the findings have implications for social care in Scotland, and the resulting policy recommendations have been presented. However, it has also identified numerous areas where this research could be expanded to further increase the understanding of care use in Scotland. It has also identified contemporary issues, such as the lack of representation of LGBTQ+ individuals – identifying this as an area where research needs to be

expanded to better inform social care for the future. Ultimately, while further work can always be done, the research presented here for this PhD thesis is original, useful and informative both to the research field and to those charged with making policy decisions for social care in Scotland in the future.

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# APPENDIX

## APPENDIX A

*Figure 2.*

*School of Philosophy Psychology and Language Sciences Ethics Review Application*  
*Ethics application following amendments submitted to the School of Philosophy Psychology and*  
*Language Sciences Ethics Board.*

s1683369 [profile](#) [logout](#)**PPLS Research Ethics — Submissions**[Help](#)[New Application](#)[Existing Applications](#)[List & Access](#)[View Form](#)[Co-applicant  
Messages](#)[Uploads](#)[Compare Previous](#)[Edit Submission](#)**Project: What factors are associated with entry to formal social care and/or receipt of informal social care for people aged 65 and over in Scotland?**

Pre-submission created on 28 Nov 2018 11:11 AM by Helen Corby Ref No: 103-1718/9

Submitted for approval on 03 Dec 2018 09:56 AM

Approval: Granted on 11 Dec 2018

## 1.1 Title of Study

What factors are associated with entry to formal social care and/or receipt of informal social care for people aged 65 and over in Scotland?

## 1.2 Type of Project

PhD thesis

## 1.2.1 If the student is in LEL, has the student completed the online Ethics Training Module

## 1.2.2 If training has been completed, what was the completion date for the ethics training

## 1.3a Applicant Details

Name	UUN	Email	Role
Helen Corby			PhD student

## 1.3b Name of all University of Edinburgh collaborators and their roles on this project

Name	UUN	Email	Role
Chris Dibben			Staff
Ian Deary			Staff
John Starr			Staff (lead)
Matthew Iveson			Staff

## 1.4 If applicable, give the names, email addresses, and institution of any collaborator(s) outwith the University of Edinburgh and their research roles on this project

Name	Email	Institution	Role
------	-------	-------------	------

## 1.5 What subject area / group best matches your project

Psychology - Human Cognitive Neuroscience/Visual Cognition/Perception

## 1.6 Is another ethics committee outside of PPLS reviewing this project

No

## 1.6.1a Describe the status of the application at each other institution or ethics committee

## 1.6.1b Give the details of the current status of that application if not yet approved

## 1.6.2a Does this research involve NHS patients/service users or their carers: access to data, organs or other materials from past or present NHS patients; foetal or IVF material from NHS patients; recently dead NHS patients

- 1.6.2b Does this research Involve, take place in, or use facilities of the NHS
- 1.6.2c Does this research Involve clinical trials
- 1.6.3 Have you consulted the Universities Research Governance and NHS R&D Office to get appropriate approvals and costs
- 1.7 Is there a funding body for the project Yes
- If there is a funder, who is the funder? Does the funder require formal prior ethical review? If yes, by what date is a response for the prior review required  
 CCACE and ADRC-S funded studentship PhD project,  
 No request for formal ethical review has been made.
- 1.8a Project Start date  
 03-12-2018
- 1.8b Anticipated end date of data collection or project completion  
 31-12-2020
- 1.9a Does this research project involve human or other live participants No
- 1.9b Does this research project make use of any ethically sensitive pre-existing data Yes
- 1.9bi If using pre-existing material, what is the source of your pre-existing material  
 Other or some combination of the above
- 
- 1.9c Does this research project concern groups that may be construed as terrorist or extremist in any way No
- 1.9d I hereby declare that I am familiar with the usage guidelines of my data source, or will familiarise myself with the guidelines prior to beginning my project Yes
- 2.1C.1 Please describe the source of your pre-existing data  
 Scottish Longitudinal Survey/ Scottish Government - linked census data. (Permissions via an SLS application)  
 CHI flag, death data and prescription data (only data on medication prescribed for dementia to determine if SLS members are likely to have dementia) from ISD Scotland/NHS. (Permissions via a Public Benefit and Privacy Panel (PBPP) application and an eDRIS application)  
 Care provision in Local Authorities - yearly figure for the number of care home places within each local authority/local health board area. (Data gathered via a freedom of information act, but permission to link to SLS data will be gained via SLS Application).
- 2.1C.2 What are the usage guidelines of your data source, if known  
<http://sls.lscs.ac.uk/wp-content/uploads/Scottish-Longitudinal-Study-Disclosure-Control-Protocol-2015.pdf>  
<https://sls.lscs.ac.uk/about/what-about-data-confidentiality/>
- 2.1C.3 What are the main objectives of your study  
 Answering the questions:  
 Which socio-demographic and geographic variables are associated with entering formal social care (residential/nursing home) for 65+s in Scotland?  
 Does receiving informal care from household members associated with entering formal social care for 65+s in Scotland?  
 Which socio-demographic and geographic variables are associated with receipt of informal social care (provided freely by friends/relatives) for 65+s in Scotland.  
 Is household composition (relationships of people residing in a household) associated with receipt of informal social care?  
 Are the profiles of those who enter care prior to death and those who die without entering care different? What socio-demographic, geographic and health factors are associated with each?  
 Did the introduction of the 2002 Policy for free personal and nursing care alter the factors associated with entering formal care? Are certain groups more or less likely to enter formal care after 2002 versus before 2002?
- 2.1C.4 Is there any potential for the confidentiality of the contributors to your pre-existing data to be compromised  
 Confidentiality maintenance measures:  
 SLS Data will be de-identified and analysed in a safe-haven at SLS only by approved researchers



(received training), all outputs will be disclosure checked by SLS and cell counts will be >10. NHS, CHI and SLS data linkage will be performed by the SLS and then de-identified before the researcher(s) have access to it. Access will be as per SLS guidelines, in a safe-haven by approved and trained researchers and all outputs will be disclosure checked by SLS and cell counts will be >10.

2.1C.5 How feasible is it to obtain consent from the contributors to your pre-existing data, and will you be obtaining their consent

The large sample size and mortality status of some participants means gathering informed consent is not feasible. This will also could mean study inclusion is biased and the sample then would not be representative of the Scottish population. No consent will be gathered.

2.1C.6 If any information is likely to be passed on to external companies or organisations in the course of the research, please describe. If the project is a funded collaboration with an external company, please give that information here

NA

2.1C.7 Does your research involve a conflict of interest or any situation which could be construed as a conflict of interest

NA

2.1C.8 Could any aspect of the proposed research bring the University into disrepute

NA

3.1.1 State which professional organisation guidelines you are using

Other

3.1.1b Other organisation Name

University of Edinburgh

3.1.1c Other organisation URL

<https://www.ed.ac.uk/files/atoms/files/researchdataprotection.pdf>

3.1.2 Will your study make use of subjects from the Volunteer Panel

No

3.1.3 Are drugs, placebos or other substances to be administered to study participants, or will blood or tissue (e.g. saliva) samples be obtained from participants

No

#### Submission Signatories

Forename/Initials	Surname	E-mail	Date	Auth. User
Helen	Corby		28 Nov 2018	
John	Starr		28 Nov 2018	
Ian	Deary		28 Nov 2018	
Matthew	Iveson		28 Nov 2018	
Chris	Dibben		03 Dec 2018	



## APPENDIX B

### SLS MEMBERS

Table 4.

*Table of the Scottish Longitudinal Study (SLS) Variables Requested for 1991-2001 Sample*  
*SLS variables requested in first SLS application for Sample 1 (1991-2001), for SLS members' data.*  
 Source SLS.

<b>Table name</b>	<b>Variable name</b>	<b>Short description</b>	<b>Restriction Level</b>
A01	HISCEN0	Census history for 2001	N
A01	HISCEN9	Census history for 1991	N
A01	TRACEIN	Tracing indicator defines how the SLS member entered the SLS project and whether traced at NHSCR	N
A01	TRACEOUT	Tracing indicator defines how the SLS member exited the SLS project	N
C10	AGETEN9	Age of person (SLS recoded). 1991.	N
C10	COB9	Country of birth code. 1991.	N
C10	DEPNAPT9	Dependent persons. 1991.	N
C10	EAIND9	Economic activity indicator (SLS recoded). 1991.	N
C10	ECONPOT9	Economic Position (SLS recoded). 1991.	N
C10	ETHNIC9	Ethnic Group. 1991.	N
C10	HRSWRKD9	Hours worked (SLS recoded). 1991.	N
C10	LTILL9	Long term illness. 1991.	N
C10	MSTAT9	Legal marital status (SLS recoded). 1991.	N

C10	NSSECAC9	NSSEC using 2001 standard. Analytical Class. Reduced method. 1991.	N
C10	QMLVHQT9	Level of highest qualification (SLS recoded).	N
C10	RECTYPE9	Record type. 1991.	N
C10	SEXTEN9	Sex (SLS recoded). 1991.	N
C10	SOC20009	Occupation coded to SOC2000. 1991.	N
C12	BLDTYPE9	Building type. 1991.	N
C12	TENURE9	Tenure of household. 1991.	N
C20	AGEP0	Age. 2001.	N
C20	COBP0	Country of birth. 2001.	N
C20	CTYDIS0	Council area code. 2001.	N
C20	ECOPO	Economic activity. 2001.	N
C20	HBACD0	Health board area code. 2001.	N
C20	HEAP0	Health. 2001.	N
C20	HELPO	Carer. 2001.	N
C20	ILLPO	Long term illness indicator. 2001.	N
C20	MSTPO	Marital status. 2001.	N
C20	NSSECAC0	NSSEC using 2001 standard. Analytical Class. Reduced method. 2001.	N
C20	PERTYP0	Person type. 2001.	N

C20	SEX0	Sex. 2001.	N
C20	SOC20000	Occupation coded to SOC2000 (SLS version). 2001.	N
C20	SOCNSSP0	National Socio-economic classification, NSSEC, based on SOC20000). 2001.	N
C22	ACCH0	Type of accommodation. 2001.	N
C22	CRSH0	Number of carers in Household. 2001.	N
C22	TENH0	Household tenure. 2001.	N
C22	TENH0	Household tenure. 2001.	N
C23	CECLT10	Client type - physical disability. 2001.	N
C23	CECLT110	Client type - prisoners/offenders. 2001.	N
C23	CECLT150	Client type - other. 2001.	N
C23	CECLT160	Client type - no usual residents (NOT SCOTLAND). 2001.	N
C23	CECLT20	Client type - learning disability. 2001.	N
C23	CECLT30	Client type - mental health problems. 2001.	N
C23	CECLT40	Client type - convalescent/post-op care. 2001.	N
C23	CECLT60	Client type - terminal illness/respite care. 2001.	N

C23	CECLT70	Client type - chronic illness care. 2001.	N
C23	CECLT80	Client type - acute illness care. 2001.	N
C23	CECLT90	Client type - elderly. 2001.	N
C23	CEMYPE0	Management type. 2001.	N
C23	CETC0	Establishment type. 2001.	N
E02	ageyrs	Deceased age	N
G01	CARDECO	Carstairs deprivation score decile. 2001.	N
G01	CARDEC9	Carstairs deprivation score decile. 1991.	N
G01	CARSCO0	Carstairs deprivation score. 2001.	3
G01	CARSCO9	Carstairs deprivation score. 1991.	3
G01	DENSITY9	Population density. 1991.	3
G01	PCARDECO	Population weighted Carstairs deprivation score decile. 2001.	N
G01	PCARDEC9	Population weighted Carstairs deprivation score decile. 1991.	N
G01	URSHS60	Urban and rural classification, Scottish Household Survey, 8-fold. 1991 and 2001, linked at output area level.	N

## SLS NON-MEMBERS

Table 5.

*Table of the Scottish Longitudinal Study (SLS) Variables Requested for 1991-2001 Sample*  
*SLS variables requested in first SLS application for Sample 1 (1991-2011), for SLS non-members'*  
*data. Source SLS.*

<b>Table name</b>	<b>Variable name</b>	<b>Short description</b>	<b>Restriction Level</b>
C11	AGTEN9	Age of person (SLS recoded). 1991.	N
C11	DEPNAPT9	Dependent persons. 1991.	N
C11	EAIN9	Economic activity indicator (SLS recoded). 1991.	N
C11	ECONPOT9	Economic Position (SLS recoded). 1991.	N
C11	HRSWRKD9	Hours worked (SLS recoded). 1991.	N
C11	MSTAT9	Legal marital status (SLS recoded). 1991.	N
C11	NSSECR9	National Socio Economic Classification, NSSEC, using 2001 standard (ONS 1-40 Range, Reduced Method). 1991.	N
C11	SEXTEN9	Sex (SLS recoded). 1991.	N
C11	SOC20009	Occupation coded to SOC2000. 1991.	N
C15	LSRELAT9	Relationship to SLS member. 1991.	N
C21	AGEP0	Age. 2001.	N
C21	ECOP0	Economic activity. 2001.	N
C21	HELPO	Carer. 2001.	N
C21	HOUP0	Hours worked. 2001.	N
C21	ILLPO	Long term illness indicator. 2001.	N

C21	NSSECRO	National Socio Economic Classification using 2001 standard (ONS 1 - 40 Range, Reduced Method). 2001.	N
C21	SEX0	Sex. 2001.	N
C21	SOC20000	Occupation coded to SOC2000 (SLS version). 2001.	N
C21	SOCNSSPO	National Socio-economic classification, NSSEC, based on SOC20000). 2001.	N
C25	LSRELAT0	Relationship to SLS member. 2001.	N

## APPENDIX C

### *SLS MEMBERS*

Table 6.

*Table of the Scottish Longitudinal Study (SLS) Variables Requested for 2001-2011 Sample SLS variables requested in second SLS application for Sample 2 (2001-2011), for SLS members' data. Note: This sample included 1991, 2001 and 2011, but was used as detailed in the thesis. Source SLS.*

<b>Table name</b>	<b>Variable Name</b>	<b>Short Description</b>	<b>Restriction Level</b>
A01	HISCEN0	Census History for 2001	N
A01	HISCEN1	Census History for 2011	N
A01	HISCEN9	Census History for 1991	N
A01	TRACEIN	Tracing indicator defines how the SLS member entered the SLS project and whether traced at NHSCR	N
A01	TRACEOUT	Tracing indicator defines how the SLS member exited the SLS project	N

C10	AGETEN9	Age of person (SLS recoded). 1991.	N
C10	COB9	Country of birth code. 1991.	N
C10	CTYDIS9	Council area code. 1991.	N
C10	ECONPOT9	Economic Position (SLS recoded). 1991.	N
C10	HBACD9	Health board area code. 1991.	N
C10	HRSWRKD9	Hours worked (SLS recoded). 1991.	N
C10	LTILL9	Long term illness. 1991.	N
C10	MSTAT9	Legal marital status (SLS recoded). 1991.	N
C10	QMLVHQT9	Level of highest qualification (SLS recoded). 1991.	N
C10	RECTYPE9	Record type. 1991.	N
C10	SCLAS9	Social Class based on occupation. 1991.	N
C10	SEXTEN9	Sex (SLS recoded). 1991.	N
C12	BLDTYPE9	Building type. 1991.	N
C12	TENURE9	Tenure of household. 1991.	N
C13	ESTABTY9	Type of communal establishment. 1991.	N
C20	AGEP0	Age. 2001.	N
C20	COBP0	Country of Birth. 2001.	N
C20	CTYDIS0	Council area code. 2001.	N
C20	ECOP0	Economic Position. 2001.	N
C20	HBACD0	Health board area code. 2001.	N
C20	HEAP0	Health. 2001.	N
C20	HELPO	Carer. 2001.	N

C20	HLQP0	Highest qualification. 2001.	N
C20	HOUP0	Hours worked. 2001.	N
C20	ILLP0	Long term illness indicator. 2001.	N
C20	MSTP0	Marital Status. 2001.	N
C20	PERTY0	Person Type. 2001.	N
C20	SCLAS90	Social class based on occupation (employment status derived using 1991 method). 2001.	N
C20	SEX0	Sex. 2001.	N
C22	ACCH0	Type of accommodation. 2001.	N
C22	CRSH0	Number of carers in Household. 2001.	N
C22	TENH0	Household Tenure. 2001.	N
C23	CETC0	Establishment type. 2001.	N
C23	CECLT10	Client type - physical disability. 2001.	N
C23	CECLT100	Client type - students. 2001.	N
C23	CECLT110	Client type - prisoners/offenders. 2001.	N
C23	CECLT120	Client type - nurses. 2001.	N
C23	CECLT130	Client type - armed forces personnel. 2001.	N
C23	CECLT140	Client type - homeless. 2001.	N
C23	CECLT150	Client type - other. 2001.	N
C23	CECLT160	Client type - no usual residents (NOT SCOTLAND). 2001.	N



C23	CECLT20	Client type - learning disability. 2001.	N
C23	CECLT30	Client type - mental health problems. 2001.	N
C23	CECLT40	Client type - convalescent/post-op care. 2001.	N
C23	CECLT50	Client type - drug/alcohol problems. 2001.	N
C23	CECLT60	Client type - terminal illness/respice care. 2001.	N
C23	CECLT70	Client type - chronic illness care. 2001.	N
C23	CECLT80	Client type - acute illness care. 2001.	N
C23	CECLT90	Client type - elderly. 2001.	N
C30	AGEP1	Age. 2011.	N
C30	AGEP1_IMP	Age - Imputation Flag. 2011.	N
C30	COBP1	Country of birth. 2011.	N
C30	CTYDIS1	Council area code 2011.	N
C30	ECOP1	Economic Activity. 2011.	N
C30	HBACD061	Health board area code. (2006 onwards). 2011.	N
C30	HEAP1	Health. 2011.	N
C30	HELP1	Provision of unpaid care. 2011.	N
C30	HLQP1	Highest Qualification. 2011.	N
C30	HOUP1	Hours worked by week. 2011	N

C30	ILLP1	Long-term illness, health problem or disability. 2011.	N
C30	MSTP1	Marital and civil partnership status. 2011.	N
C30	NATCON_B1	Nature of Health Condition: blind or partially vision impaired. 2011.	N
C30	NATCON_D1	Nature of Health Condition: deaf of partially hearing impaired. 2011.	N
C30	NATCON_DD1	Nature of Health Condition: developmental disorder. 2011.	N
C30	NATCON_LD1	Nature of Health Condition: learning difficulty. 2011.	N
C30	NATCON_LDS1	Nature of Health Condition: learning disability. 2011.	N
C30	NATCON_LTI1	Nature of Health Condition: long-term illness, disease or condition. 2011.	N
C30	NATCON_MHC1	Nature of Health Condition: mental health condition. 2011.	N
C30	NATCON_OC1	Nature of Health Condition: other condition. 2011.	N
C30	NATCON_PD1	Nature of Health Condition: physical disability. 2011.	N
C30	RESIDENCE_TYPE1	Residence Type. 2011.	N
C30	SEX1	Sex. 2011.	N
C32	ACCH1	Accommodation type. 2011.	N

C32	CRSH1	Number of unpaid carers in household. 2011.	N
C32	TENH1	Household tenure. 2011.	N
C33	CLIENTS011	Client Group: Physical Disability. 2011.	N
C33	CLIENTS021	Client Group: Learning Disability. 2011.	N
C33	CLIENTS031	Client Group: Mental Illness. 2011.	N
C33	CLIENTS051	Client Group: Substance Misuse. 2011.	N
C33	CLIENTS061	Client Group: End of Life Care. 2011.	N
C33	CLIENTS071	Client Group: Respite. 2011.	N
C33	CLIENTS081	Client Group: Chronic Illness Care. 2011.	N
C33	CLIENTS091	Client Group: Acute Illness Care. 2011.	N
C33	CLIENTS101	Client Group: Older People. 2011.	N
C33	CLIENTS111	Client Group: School Children. 2011.	N
C33	CLIENTS121	Client Group: Uni/College Students. 2011.	N
C33	CLIENTS131	Client Group: Armed Forces Personnel. 2011.	N
C33	CLIENTS141	Client Group: Prisoners/Offenders. 2011.	N
C33	CLIENTS151	Client Group: Asylum Seekers. 2011.	N
C33	CLIENTS161	Client Group: Paying Guests. 2011.	N
C33	CLIENTS171	Client Group: Homeless. 2011.	N
C33	CLIENTS181	Client Group: Nurses/Doctors. 2011.	N
C33	CLIENTS191	Client Group: Staff. 2011.	N

C33	CLIENTS201	Client Group: Seasonal/Temporary Workers. 2011.	N
C33	CLIENTS211	Client Group: Other. 2011.	N
C33	ESTNATURES1	Type of establishment. 2011.	N
E02	DODMT	Month of death of SLS member	N
E02	DODYR	Year of death of SLS member	N
E08	ENTER_NHS_M	Flag indicating whether the posting relates to an entry into the Scottish NHS system.	N
E08	ENTER_SCO_M	Flag indicating whether the posting relates to an exit from Scotland.	N
E08	EXIT_NHS_M	Flag indicating whether the posting relates to an exit from the Scottish NHS system.	N
E08	EXIT_SCO_M	Flag indicating whether the posting relates to an entry into Scotland.	N
E09	DEATH_IND_ND	Indicates whether the death is recorded by the SLS as well as NHSCR or NHSCR only.	N
E09	DOD_DISCREP_IND_ND	Indicates whether there is a discrepancy between the date of death as recorded by the SLS and the date of death as recorded by NHSCR.	N
E09	DOD_ND	Date of Death of SLS member, as held by NHSCR.	N

E09	LOCATION_N D	Location of Death of SLS member, as held by NHSCR.	N
E09	SLS_DOB_IND _ND	Indicates whether the date of birth as recorded by NHSCR is an SLS date of birth.	N
G01	CARDECO	Carstairs deprivation score decile. 2001.	N
G01	CARDEC1	Carstairs deprivation score decile. 2011.	N
G01	CARDEC9	Carstairs deprivation score decile. 1991.	N
G01	CARSCO0	Carstairs deprivation score. 2001.	3
G01	CARSCO1	Carstairs deprivation score. 2011.	3
G01	CARSCO9	Carstairs deprivation score. 1991.	3
G01	DENSITY0	Population Density. 2001.	3
G01	DENSITY1	Population Density. 2011.	3?
G01	DENSITY9	Population Density. 1991.	3
G01	PCARDECO	Population weighted Carstairs deprivation score decile. 2001.	N
G01	PCARDEC1	Population weighted Carstairs deprivation score decile. 2011.	N
G01	PCARDEC9	Population weighted Carstairs deprivation score decile. 1991.	N
G01	PDENSITY0	Population Density (weighted). 2001.	3
G01	PDENSITY1	Population Density (weighted). 2011.	3
G01	PDENSITY9	Population Density (weighted). 1991.	3

G01	SIMDQUIN4	Scottish Index of Multiple Deprivation - QUINTILE. 2004.	N
G01	URSG131461	Urban and rural classification, Scottish Government, 6-fold, for the period 2013-2014. 2011.	N
G01	URSHS60	Urban and rural classification, Scottish Household Survey, 6-fold. 1991, linked at output area level.	N
Information on spouse			
E02	DODMT	Month of death of SLS member's spouse	N
E02	DODYR	Year of death of SLS member's spouse	N

### **SLS NON-MEMBERS**

*Table 7.*

*Table of the Scottish Longitudinal Study (SLS) Variables Requested for 2001-2011 Sample SLS variables requested in second SLS application for Sample 2 (2001-2011), for SLS non-members' data. Note: This sample included 1991, 2001 and 2011, but was used as detailed in the thesis. Source SLS.*

Table name	Variable Name	Short Description	Restriction Level
C11	AGETEN9	Age of person (SLS recoded). 1991.	N
C11	ECONPOT9	Economic Position (SLS recoded). 1991.	N
C11	HRSWRKD9	Hours worked (SLS recoded). 1991.	N
C11	LTILL9	Long term illness. 1991.	N
C11	MSTAT9	Legal marital status (SLS recoded). 1991.	N

C11	SCLASS9	Social Class based on occupation. 1991.	N
C11	SEXTEN9	Sex (SLS recoded). 1991.	N
C15	LSRELAT9	Relationship to SLS member. 1991.	N
C21	AGEP0	Age. 2001.	N
C21	ECOPO	Economic activity. 2001.	N
C21	HEAPO	Health. 2001.	N
C21	HELPO	Carer. 2001.	N
C21	HELP1	Provision of unpaid care. 2011.	N
C21	HOUP0	Hours worked. 2001.	N
C21	ILLPO	Long term illness indicator. 2001.	N
C21	MSTPO	Marital Status. 2001.	N
C21	SCLASS90	Social class based on occupation (employment status derived using 1991 method). 2001.	N
C21	SEX0	Sex. 2001.	N
C25	LSRELAT0	Relationship to SLS member. 2001.	N
C31	AGEP1	Age. 2011.	N
C31	AGEP1_IMP	Age - Imputation Flag. 2011.	N
C31	ECOP1	Economic Activity. 2011.	N
C31	HEAP1	Health. 2011.	N
C31	HOUP1	Hours worked. 2011.	N
C31	ILLP1	Long term illness indicator. 2011.	N

C31	MSTP1	Marital and Civil Partnership Status. 2011.	N
C31	NATCON_B1	Nature of Health Condition: blind or partially vision impaired. 2011.	N
C31	NATCON_D1	Nature of Health Condition: deaf of partially hearing impaired. 2011.	N
C31	NATCON_DD1	Nature of Health Condition: developmental disorder. 2011.	N
C31	NATCON_LD1	Nature of Health Condition: learning difficulty. 2011.	N
C31	NATCON_LDS1	Nature of Health Condition: learning disability. 2011.	N
C31	NATCON_LTI1	Nature of Health Condition: long-term illness, disease or condition. 2011.	N
C31	NATCON_MHC1	Nature of Health Condition: mental health condition. 2011.	N
C31	NATCON_OC1	Nature of Health Condition: other condition. 2011.	N
C31	NATCON_PD1	Nature of Health Condition: physical disability. 2011.	N
C31	SEX1	SEX. 2011.	N
C35	LSRELAT1	Relationship to SLS member. 2011.	N



## APPENDIX D

Figure 3.

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