Using the Census Longitudinal Studies for research on health and health inequalities

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The guide is accompanied by a recorded webinar that is freely available from the CALLS Hub website and includes presentations based on each case study led by the authors of the papers.[2]

1. Introduction

1.1. Aim of the guide

In this guide we introduce the UK census-based Longitudinal Studies (LSs)[1] and highlight their potential for research on health and health inequalities. We provide practical guidelines on how to access the data, the health information and correlates of health that are available in each LS and we explain why the LSs are such an important resource for health researchers.

The core of the guide focuses on 4 case studies that highlight the latest research on health using the longitudinal studies across the UK. These case studies cover a diverse set of substantive research themes including the effect of migration on spatial health inequalities in the UK and the impact of childhood disability on educational outcomes.

1.2. What are the Longitudinal Studies and why are they so useful for health research?

The three UK Census-based Longitudinal Studies (LSs) cover all regions of the country and comprise the Scottish Longitudinal Study (SLS), Northern Ireland Longitudinal Study (NILS) and ONS Longitudinal Study (ONS LS) covering England and Wales.

LS members are selected to be part of an LS based upon their birthdate (day and month), with each study having their own set of confidential birthdates. The ONS LS is based on four birthdates, providing a 1% representative sample of the population of England and Wales. The SLS uses the four ONS LS birthdates plus an additional 16 dates (i.e., 20 dates in total), giving an approximately 5.3% sample of the Scottish population. The NILS has the largest sampling fraction, at approximately 28% of the Northern Ireland population. The NILS selects members based on 104 dates throughout the year.

Census data form a key component of the studies and census forms are available on the CALLS Hub website. Because there is a legal requirement for every household to complete a census form every 10 years, attrition rates are very low in the LSs, with far fewer study members lost to follow-up than in most surveys and datasets. The census provides a rich resource of information on social and demographic variables including health outcomes (see section 2.1), household composition, housing tenure, ethnicity, religion, age, education, marital status, economic activity and migration. Follow-up periods in the LSs vary between 20 and 40 years: the ONS LS is the oldest of the LSs, containing census data from 1971 onwards, whilst the NILS has data from 1981-2011 and the SLS covers 1991-2011.

In addition to census data, the LSs contain information from a variety of other administrative

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[1] In fact the NILS is not 'census-based'; its members are derived initially from the Northern Ireland Health Card Registration System which are then linked to the census returns. We use the term 'census-based' here as a convenient collective term for the LSs, since the census forms a key component of all three studies.

[2] http://calls.ac.uk/guides-resources/thematic-guides-webinars/

data sources. For example, information from the registration of births and deaths are contained in all three LSs, and the SLS and NILS also include marriage registration data. The LSs in Northern Ireland and Scotland also have unique regional linkages to other data, including education data (SLS), NHS health data (SLS, NILS) and property datasets (NILS). The geographical detail of the LSs mean they can be linked to other data sources such as environmental air quality.[3]

This rich combination of data over 20-40 years of follow-up presents an excellent opportunity for long-term longitudinal research linking circumstances across all phases of the life course. The scale of the LSs in terms of population coverage (the ONS LS now has over 1 million members) means that analysis may be possible at a relatively small level of geography or for minority population subgroups, and also that more sensitive or rare events may be explored. This is particularly true for the NILS and SLS. In terms of health research this means exploration of relatively rare events, such as exploration of certain causes of death may be possible when the SLS or NILS are linked to health data. Together these factors place the LSs in a uniquely powerful position for health research.

1.3. Accessing the data

Due to the sensitive nature of the information held in the ONS LS, NILS and SLS and the potential risk of identification of an individual within the LSs, the data are not freely available to download. Instead access is given only to approved researchers in safe-setting locations with Research Support Unit staff on hand to assist with queries. Currently the safe-settings are located at:

- NISRA, Colby House, Belfast (NILS)
- Ladywell House, Edinburgh (SLS)
- ONS VML offices at London, Fareham and Newport (Wales) (ONS LS)

Information on the application process is available on the CALLS Hub website at http://calls.ac.uk/guides-resources/applying-to-use-the-lss/ It should be noted that if you would like to request linked NHS or other health data (SLS and NILS), this will require additional application steps to satisfy the relevant data-holders.

As data from the LSs can only be accessed within our safe-setting locations, this means the process can take a little longer than it might for other data resources. In order to help address this issue, the Synthetic Data Estimation for the UK Longitudinal Studies (SYLLS) project has developed synthetic longitudinal data resources [1]. Synthetic data are fake data which have been created from the real data, but which do not contain any real observations. This allows researchers to explore synthetic data at their own computer in preparation for a visit to the safe-setting.

A synthetic 'spine' dataset of core variables has been created for each of the LSs and can be downloaded from the CALLS website at http://calls.ac.uk/guides-resources/. These datasets are ideal for teaching purposes or for exploration of how LS data look and behave.

An additional development from SYLLS is the option of receiving a bespoke synthetic version of your project dataset, in order to develop syntax and models using data which closely mimic the properties of the real data. This option is now being rolled out for SLS researchers, and it is hoped that it will be available for ONS LS and NILS researchers in the near future.[4]

The CALLS Hub helpdesk can be reached by phone, email or via our website, and exists to help with all enquiries you may have about the LSs or applying to use them (contact details available at the end of this guide).

1.4. Structure of the guide

After this introduction the guide is divided into several parts. First, we discuss the practicalities of studying population health using the longitudinal studies. We describe the health information available within the LSs and associated administrative data. We also address issues of consistency across health measures over time and the challenges and opportunities of joining data from more than one LS. The following four sections are based on our case studies that use LS data to make contributions to different substantive research questions relating to health inequality. The first case study summarises research by Dr Paul Norman and Dr Fran Darlington-Pollock who used data from the ONS LS to explore the impact of health-selective migration on the stark spatial inequalities in

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[3] See, for example, http://calls.ac.uk/output-entry/place-of-work-and-residential-exposure-to-ambient-air-pollution-and-birth-outcomes-in-scotland-using-geographically-fine-pollution-climate-mapping-estimates/

[4] NOTE: Synthetic data are not real, and analyses developed using synthetic data must always be run finally on the actual LS data

health outcomes across England and Wales. In the second case study we describe research on the relationship between informal care giving and mental health in Northern Ireland in a piece of research undertaken by Dr Stefanie Doebler. The third case study is from Sebastian Franke and Prof Hill Kulu and provides the latest findings on how mortality varies according to partnership status. Finally, the fourth case study describes research led by Dr Fiona Cox on the relationship between disability in childhood and educational outcomes.

2. Studying population health using the Longitudinal Studies

2.1. Health variables in the LSs

Whilst other resources may include data about health, few can offer the longitudinal follow-up of such a large sample and the rich census and administrative data context within NILS, ONS LS and SLS. The census-based longitudinal studies are unique, allowing detailed exploration of correlates, predictors and outcomes of health and mortality across time and for fine geographical areas, minority population groups or rare conditions. The longitudinal nature of the data allows exploration of health inequalities with a life course perspective testing for both precursors and outcomes, giving indications of causality that cross-sectional or survey data cannot provide.

All three LSs contain the following health data:

- Self-reported Limiting Long-term Illness (LLTI)
- Self-reported General health
- Self-reported 'Permanently Sick/Disabled' employment status
- Death registrations

At the 2011 Census, Scotland and Northern Ireland introduced an additional question asking respondents to give a more detailed breakdown of health conditions (see section 2.3.1). These specific health conditions are explored in more detail in the case study of Fiona Cox exploring disability in childhood and educational outcomes.

A large body of work supports the validity of measures of self-assessed health (Mitchell 2005) with LLTI found to be strongly associated with mortality and other health outcomes [2-6].

In addition to the health variables listed above, all LSs are linked to vital events data on mortality (death registration data), and SLS and NILS researchers may also apply to link their LS dataset to NHS data on hospital admissions, GP prescribing data, or dental services data (NI only). The ONS LS contains cancer registration data.

2.2. Correlates of health in the LSs

A key advantage of the LSs for health research is the ability to investigate the relationship between health outcomes and a wide range of individual, household and neighbourhood factors. Table 1 gives an indication of the correlates of health available in the LSs.

2.3. Consistency over time

The LSs offer a source to monitor how health outcomes evolve over time across the UK. In this section we consider some of the methodological challenges relating to these aims.

2.3.1. Census data

The census health questions appeared at different censuses, and their wordings have changed slightly across time. This can be problematic in some instances and should be borne in mind by researchers using these questions.

General Health Questions in the Scottish Census at 2001 & 2011

7 Over the last twelve months would you say your health has on the whole been:

☐ Good?   ☐ Fairly good?

☐ Not good?

19 How is your health in general?

| Very good | Good | Fair | Bad | Very bad |
| ☐ | ☐ | ☐ | ☐ | ☐ |

Health Correlate	Source	Detail
Occupation and employment status	Census	Occupation coded to SOC categories
Economic activity	Census	Information on the economic activity of respondents including categories such as 'unemployed', 'employed', 'self-employed' and 'retired'
Social class	Census	NS-SEC socio-economic position based on census-reported occupation (only available for those who have ever worked)
Household composition	Census	Details the relationship structure of those in the household, e.g. single pensioner, all students, cohabiting family, married family, single parent family
Provision of care	Census	Hours spent each week providing informal care to others because of ill-health, disability or old age (2001, 2011 only)
Country of birth	Census	Country of birth
Date of most recent arrival in the UK/NI	Census	For those who were not born in the UK (SLS, ONS LS) or Northern Ireland (NILS)
National identity	Census	Self-reported national identity (2011 only)
Ethnic group	Census	Included since 1991 at each census, although ethnic categories change over time. See Simpson et al (2015) for detail of stability of census measures of ethnicity over time [7]
Migration	Census	Based on the difference between address one year before census and address at census night
Educational qualifications	Census (all LSs) SQA/ScotXed data (SLS)	Highest level of qualification is available from census. SLS can be linked to more detailed education data (2007-2010)
Housing tenure and type	Census	Details on tenure including indicators of renting and owner occupation
Household amenities	Census	Varies across time, but includes: central heating, bath/shower and car/van access
Household deprivation	Census	Based on education, employment, health and housing tenure indices
Area deprivation	Indices of Multiple Deprivation (SLS, NILS, ONS LS) Carstairs index (SLS, ONS LS) Townsend index (SLS)	Information on area deprivation available at different geographies over time
Area house prices	Land and Property Services Data (NILS)	Details on the valuation of properties at various geographies that can be linked to the NILS
Air pollution	DEFRA	CO, NO, O3, SO2 and particulate matter can be linked at a 1x1km grid square level
Meteorological data	Met Office	Available from January 1981 onwards. Includes: temperature, frost, sunshine, precipitation, cloud cover. Monthly data at 5x5km grid level.

Table 1: A selection of the correlates of health (individual and area) available in the LSs or may be linked to them (Note: individual level information is also available for other household members, providing further contextual data). More information at http://calls.ac.uk/variables/

LLTI in the Scottish Census at 1991, 2001 and 2011

'handicap' as opposed to a disability [8].

The census LLTI question at all three time points features a prompt to include problems that are due to old age. This is useful because it is known that the elderly are known to discount some health problems as being a result of ageing.

A question on long-term health conditions was added to the Scottish and Northern Ireland census forms in 2011, and provides a more detailed breakdown of impairments. Write-in responses have been recoded into the other categories in the SLS.

Although the response categories for the two questions do not match exactly it is possible to conduct comparative or joint research between Scotland and Northern Ireland by collapsing categories, for example to 'sensory impairments', 'learning impairments', 'developmental disorders', 'physical impairments' etc.

The general health question was introduced at 2001, and asked respondents to rate their general health. At 2001 there were three response options, but this was expanded to 5 options at 2011. Question wording was also changed, removing the timescale of "the last 12 months".

A question on limiting long-term illness and disability (LLTI) was introduced to the census in 1991. At 1991 and 2001 there were only two options, saying whether the individual did or did not have an LLTI, however at 2011 this was expanded to three options, allowing some indication of the severity of the limitation ('a little' or 'a lot'). The 1991 question used the word 'handicap' but this was changed to 'disability' at later censuses, a change that is known to complicate comparison of LLTI rates between censuses.[5] An observed lower rate of LLTI in 1991 (compared with 2001) is likely to be due to an unwillingness of respondents to classify themselves as having a

Long-term Health Condition in the Scottish and Northern Irish Census 2011

2.3.2. NHS Health data

Over time, NHS data coding and Health Board boundaries have changed slightly. Staff at the Research Support Units are able to advise on any changes that might impact your research.

2.4. Consistency between LSs

With the exception of the 2011 'health conditions' questions, census health questions have been identical across the regions of the UK. There are variations in the external NHS health data available, most notably that this is only available for Scotland and Northern Ireland. The availability of health variables from external resources will also change depending on the research question, as data linkages are approved on a project-by-project basis.

2.5. Combining LSs

It is not possible to transfer LS data between UK regions due to legal restrictions. Until recently this meant that comparative analyses between the LSs was only possible on a post-hoc basis.

However, thanks to the eDatashield methodology developed by the Longitudinal Studies Centre Scotland, it is now possible to analyse data from more than one LS as though they were part of the same dataset. To use eDatashield researchers must first apply separately to each LS. The technique requires that variables can be 'harmonised' between the LSs. Both census and NHS data may be combined in eDatashield analyses, provided comparable variables can be found or created. Further information on eDatashield is available on the CALLS website at http://calls.ac.uk/guides-resources/ or by contacting our helpdesk (see below).

3. Case study 1: Selective migration, health & deprivation: a longitudinal analysis (Dr Paul Norman)

Research supported by CeLSIUS

3.1. Research aims and key findings

The UK, like most countries, has stark spatial inequalities in health and mortality; the infamous example of the 28 year gap in life expectancy across two Glasgow neighbourhoods separated by just a few miles is regularly cited as evidence of this spatial unevenness in health outcomes [9]. Further, it is also well known that the spatial patterns of health inequality have remained remarkably persistent over time with, for example, Dorling et al demonstrating that the same spatial patterns of inequality in mortality have remained within London for the past century [10]. More recently, research has suggested that the spatial patterns in health outcomes have grown over the past two decades [11]. How can we understand such spatial changes in the geography of health across Britain in spite of a raft of initiatives that have sought to address such area based inequality?

One theory for the polarisation of health outcomes across the UK is that health-selective migration serves to exacerbate existing spatial patterns in health outcomes. For example, we might expect the relative level of population health within deprived areas to deteriorate over time if people in poor health are moving into such areas. Or alternatively if those healthy individuals in deprived areas move away from such areas.

In order to fully understand why the spatial patterns of poor health in the UK are so persistent, and perhaps strengthening, we require a data source that follows individuals over time with detail of their health, residence and migration history. The Longitudinal Studies are some of the few data sources that allow such analysis.

Norman et al explore the extent to which such health-selective migration contributes to the progression of spatial health inequalities in England and Wales between 1971 and 1991 using data from the ONS Longitudinal Study (ONS LS) [12]. The key contribution of the paper is to rigorously explore changes in health status across small geographical locations and the extent to which such health changes in local areas can be attributed to inter-relationships between evolving area-based patterns of deprivation and health-selective migration. The ONS LS is used to describe the gradient of inequality in levels of self-reported limiting long-term illness across deprivation quintiles (Carstairs index) in 1971 and 1991 isolating the impact of health selective migration.

The main finding of the research is that inequalities in health across space are significantly exacerbated by the migration process. Norman and colleagues argue that had there be no migration between 1971 and 1991,

the extent of inequality in health across small areas in England and Wales would be smaller than observed in the 1991 census. They contend that migration, rather than changes in the deprivation of the area that non-migrants live in, accounts for the large majority of change in health observed over the period. This is an important finding; it suggests that an important aspect of the stark inequalities in health across the UK is a reflection of other social processes that divert people in, or most prone to, poor health towards deprived areas.

3.2. Why was the ONS LS needed?

The ONS LS is one of the few UK data sources that allow an evaluation of the contribution of health selective migration to the observed spatial health inequalities. Crucially it has a longitudinal design, contains a sample present over a long period and has the necessary detail on the health and residence of participants. Finally, the very large sample of the ONS LS sample compared to most other longitudinal sample surveys is critical to ensure sufficient sample sizes for robust analysis of migration that distinguish flows between areas of differing deprivation levels. Although surveys and cohort studies contain rich detail on health and circumstances including

migration, none have the sample size to support the aims of this analysis.

3.3. Analysis

The ONS LS data extracted for this study is a closed sample of the population present in the 1971, 1981 and 1991 censuses. International migrants and those in poor health in 1971/81 are excluded leaving a sample of 315,684 individuals who are relatively healthy in the sense that they did not define their economic activity status as being 'permanently sick or disabled' at the start of the period (1971) and all survive until 1991. Crucially, the paper exploits the rich detail on residence, health and migration to explore the patterns of health selective migration between 1971 and 1991. The results show a strong flow of healthy migrants into the most affluent areas and away from the most deprived areas. In other words, net counts of people within the ONS Longitudinal Study who move between differently deprived areas drive a large accumulation of healthy and surviving people in least deprived areas with a net loss from the most deprived areas. Thus, migration, rather than changes in the deprivation of the area that non-migrants live in, accounts for the large majority

of the widening spatial inequality in health observed between 1971 and 1991.

The main analysis examines standardised mortality ratios (1991-1999) and self-reported illness in 1991 according to the area deprivation quintiles observed in 1971 and 1991 both with and without the influence of migration. Crucially, the extent of inequality in limiting long-term illness (LLTI)/mortality is larger across 1991 deprivation categories than if the 1991 LS sample were put back to the deprivation patterns observed in 1971.

The widening of the gradient in mortality/LLTI across area deprivation quintiles may be due to health-selective migration or changes that occur when areas change their deprivation characteristics whilst non-migrants remain in-situ. However, the analyses show that health selective migration offers the key driver of widening spatial health inequality between 1971 and 1991. We see that migration of people with no LLTI from the least deprived quintile and of people with an LLTI to the most deprived areas are the main components that increase counts of LLTI in the most deprived areas and decrease counts of LLTI in the least deprived areas. Thus the growing gap in spatial inequalities in health outcomes is driven predominantly by migration.

3.4. Potential policy impact

A recommendation to policymakers that flows from this research is that strategies to address the growing extent of spatial inequality in health in the UK might focus not only on improving conditions and the circumstances of individuals in the most deprived areas, but also to consider carefully the health selective migration that exacerbates the spatial patterns observed.

3.5. Extensions to this work

The 2011 Census offers an excellent opportunity to update this research and compare whether similar processes operated between 2001 and 2011. Fran Darlington-Pollock discusses such research in the CALLS Hub webinar that accompanies this guide.[6]

4. Case study 2: Informal caregiving & mental ill health in Northern Ireland (Dr Stefanie Doebler)

*Research supported by NILS-RSU*

4.1. Research aims and key findings

This study uses data from the Northern Ireland Longitudinal Study (NILS) to explore the complex relationship between caregiving and mental health, and how this is affected by other factors such as the number of hours spent caregiving, gender, age and proximity to services. The proportion of the population at the older ages is expected to increase over the coming decades driving a likely rise in levels of informal caregiving reflecting the higher demand for care in later life. In this context an understanding of the impact of caring on the health and wellbeing of caregivers is essential. This research was presented at the WISERD/CALLS Hub/ADRC Wales event 'Big Data or Big Rubbish? The Contribution of Data Linkage to Social Science' in Cardiff, July 2016. A new journal paper by Doebler et al gives further detail on the analyses [13].

Whilst many previous studies have explored the relationship between informal caregiving and mental health, they have provided conflicting results. Most research has demonstrated a significant link between caregiving and poor mental health [14, 15]. However, some studies have reported that caregiving may be positive for mental health [16, 17] and might actually lower mortality and suicide rates [18]. Other studies have been less conclusive in their findings.

There are several drawbacks to these studies which may explain the differing results: for example, most studies employed cross-sectional designs, with samples that were not representative of the full population, and many relied solely on subjective measures of mental health. Methodologically, studies using cross-sectional data are not equipped to adequately control for selection effects into the caregiving role; it may be that caregivers are predisposed to poorer health as a result of their own circumstances rather than as a result of the care they provide.
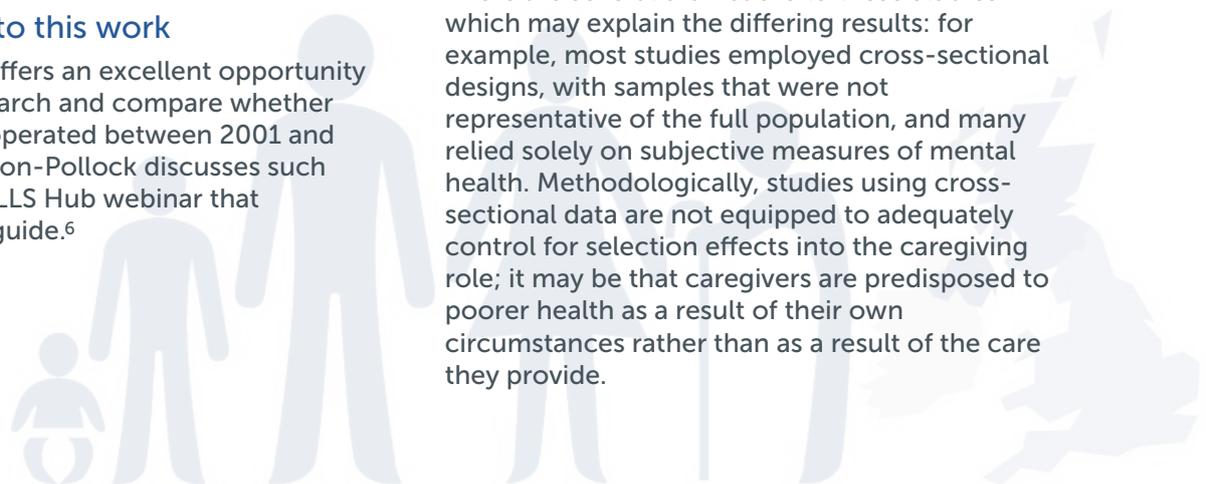
Doebler et al exploit the longitudinal aspect of the Northern Ireland Longitudinal Study and its rich detail on level of care provision to demonstrate that it is not caring per se which is linked to mental ill-health, but rather that the relationship is much more complicated, being moderated by several factors. The number of hours spent supplying informal care each week plays a large role in mental health outcomes, with those caring for more than 20 hours per week much more likely to be prescribed anti-depressants. Proximity to services is also shown to be an important factor in poor mental health for caregivers, particularly for those caring for 50 or more hours per week, since having easy access to services such as GP practices and shops becomes increasingly important with a higher caregiver workload. The mental health of younger caregivers is particularly affected by the care task, possibly due to the additional burden of caring for children as well as a sick adult. Finally, Doebler et al's analyses reveal that women show a stronger relationship between caregiving and mental ill-health than do men.

4.2. Why was the NILS needed?

The Northern Ireland Longitudinal Study (NILS) is well-suited to exploration of the complex relationship between caregiving and mental health. The dataset has a large and representative sample (c28% of the Northern Ireland population) allowing detailed analysis of the determinants of poor mental health across a range of correlates (including extent of care giving).

Detail on other household members provided by the NILS enabled exploration of the relationship between mental health and caregiving for multiple adults, and with having an additional childcare burden. Linkage to the NI Enhanced Prescribing Database provides an objective measure of mental wellbeing to contrast with the subjective measure in the census, whilst the link to NISRA'S Proximity to Services Index enabled stratification by accessibility of services. Finally, the longitudinal aspect of the study allows testing of the interactions between caregiving and employment transitions, offering a stronger case for a causal link between

caring and mental health than cross-sectional data could have provided.

4.3. Data and methods

The study uses data from the 2001 and 2011 censuses for NILS members and their households, with linked prescribing data for anti-depressants and anxiolytics, and data on proximity to health services. A series of binary logistic multilevel models were carried out with either subjective or objective measures of mental health as the dependent variable. The richness of the NILS allows control for various key individual-, household- and area-level factors, such as socio-economic status, gender, education, area deprivation, household composition and housing tenure. The longitudinal aspect of the study enables changes in caring circumstances to be linked to mental health outcomes.

4.4. Potential policy impact

This research clearly identifies the particular sub-populations of caregivers who are at the highest risk of mental ill-health as a result of informal caregiving. These comprise those providing high levels of care, women, caregivers in remote areas with poor access to services, those in part-time or no employment, and younger caregivers especially those with additional childcare responsibilities. This evidence might inform policy to target limited resources more effectively in order to reduce the high levels of depression suffered by informal caregivers in the
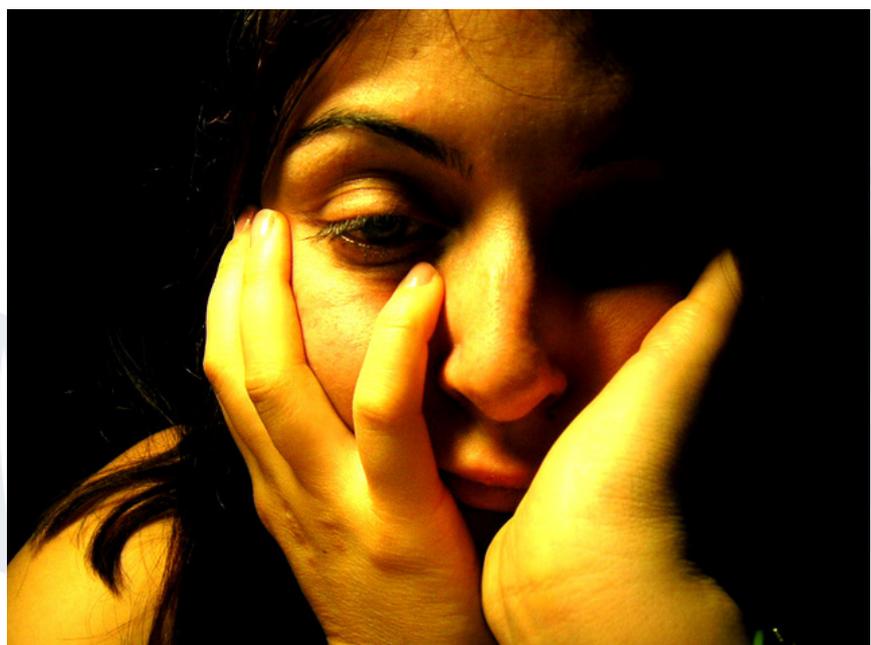
context of an increase in numbers of caregivers expected over the coming decades.

4.5. Extensions to this work

This work could be extended to the wider context of rural areas in other UK regions, potentially using data from the Scottish Longitudinal Study and the ONS Longitudinal Study for England and Wales. Future work plans also include in-depth qualitative interviews to further explore the needs of male and female carers across age-groups.

5. Case study 3: Overall & cause-specific mortality differences by partnership status in 21st century England and Wales (Sebastian Franke & Dr Hill Kulu)

Research supported by CeLSIUS

5.1. Research aims and key findings

Research has shown that there appears to be a protective effect of marriage, with married people – and men in particular – having lower mortality rates than their non-married counterparts. Over the last few decades there has been an important social trend in the UK, and many other developed countries of a rise in the complexity of family formations, with lower marriage rates, increased rates of cohabitation, increased life expectancy and a general change in values and opinions towards new types of household. This research paper, led by Sebastian Franke at the University of Liverpool, considers whether the mortality differences favouring married individuals seen in earlier research still exists given recent changes in cultural context. Further, the research explores whether the protective effect of marriage exists only for one cause or across different causes of mortality.

The main findings are that the marital advantage for mortality risks still exists, with the exception of death caused by (all) cancer. The results show evidence of greater cultural acceptance of cohabitation, as shown by a similar protective effect for married and cohabiting individuals. This important analysis demonstrates how research that ignores cohabitants and only compares married vs non-married individuals may underestimate mortality differences.

5.2. Why was the ONS LS needed?

The ONS LS provides the detailed household composition data in combination with data from death registrations which were required for the analyses. The sample size allows investigation of a range of mortality causes across different age groups.

5.3. Data and methods

The study uses ONS LS data from the 2001 and 2011 censuses, plus yearly death data throughout that period. The sample was aged 30-85 years at 2001, and consists of approximately 330,000 individuals.

The key variable of interest is partnership status, and unlike previous studies, Franke et al separately consider those who are single, divorced or widowed but are cohabiting. This led to the creation of the following categories of non-married individuals:
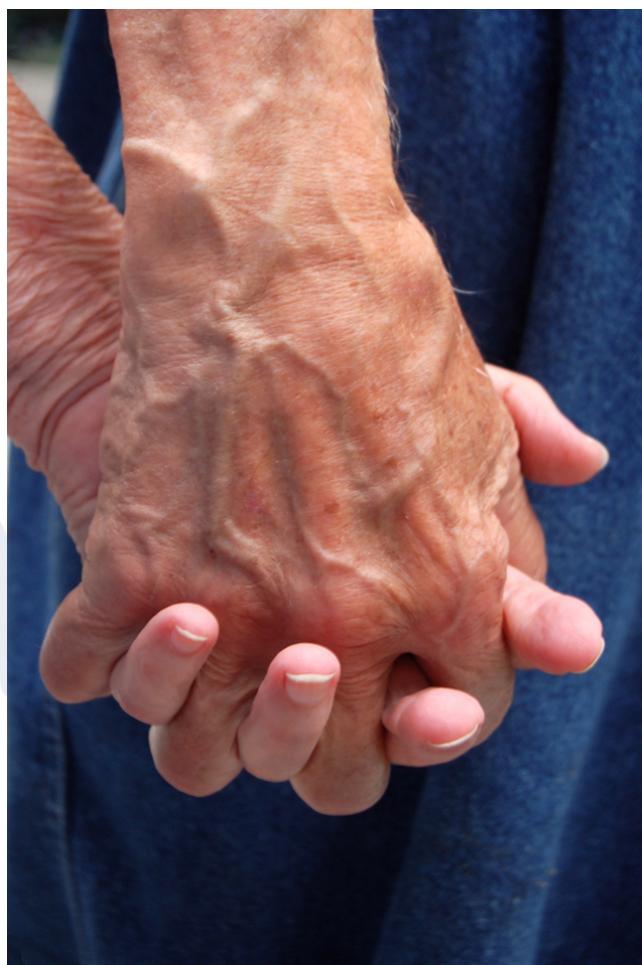
- Single (never married; not cohabiting)
- Single (never married; pre-marital cohabiting)
- Divorced (not cohabiting)
- Widowed (not cohabiting)
- Divorced or widowed (post-marital cohabiting)

Control variables include country of birth, ethnicity, household size, number of children, educational level and socio-economic status (NS-SEC2001).

Survival analysis was conducted for overall mortality differences using a Cox Proportional Hazard Model. Partnership status was considered separately for men and for women, across three age groups: 30-49 years, 50-64 years and 65-85 years. Comparing Married vs Non-married individuals, those who were married have a lower risk of mortality regardless of age group or gender. Once the more detailed 5 categories of partnership are used, for men there is a protective effect of cohabiting as well as of marriage. For men who are divorced or widowed, cohabiting individuals have a lower mortality risk than those who remain single. For the youngest age group of men (30-49 years), pre-marital cohabitants have a similar mortality risk to those who are married. For women, the differences between partnership categories are smaller than for men.

A second cause-specific survival analysis was carried out using a Competing Risk Approach [19]. It was possible to explore 7 mortality causes: circulatory disease, cancer, respiratory disease, digestive system disease, mental illness, accidental death, alcohol-related mortality and 'other causes'. For the youngest group of men, married men have a higher risk of cancer than other groups, but a lower risk of mental illness, accidental death, alcohol-related death and 'other' causes. In general a protective effect of marriage is seen for all mortality causes except cancer.

5.4. Extensions to this work

Possible extensions to the research include linking back in time to cover the period from 1991, 1981 or even back to 1971 Censuses in order to cover the lifespan in greater detail. Another option would be exploring shifting cultural attitudes by comparing the trends from 2001 to 2011 with those from 1991 to 2001 or earlier inter-censal periods.

6. Case study 4: An exploration of educational outcomes for children with disabilities (Dr Fiona Cox)

Research supported by SLS-DSU

6.1. Research aims and key findings

Academic success is a key factor in providing opportunities in employment and further education. However, reports suggest that children with disabilities are not performing as well as their non-disabled peers in terms of school qualifications. For example, the Department for Work and Pensions reported that 58% of non-disabled 19 year olds had an A-level, compared to only 47% of their disabled peers [20]. The Equality and Human Rights Commission reported that just 17% of children with Special Educational Needs (sometimes used as a proxy for disability) achieved 5 GCSEs, whereas 61% of children with no SEN did [21]. Whilst there is some evidence that the gap is narrowing it remains an important barrier for children with disabilities [20].

To date the evidence on educational outcomes for children with disabilities has come primarily from cross-sectional surveys and official statistical releases, with little or no research evidence available from a longitudinal perspective. However, such research is vital in order to provide information on causality, the factors which may be moderating the effect, and to tease out whether it is disability at an early age or later in childhood which has most effect on educational outcomes. Both the World Health Organisation and DWP have called for more longitudinal research on the issue [22,20].

In order to shed clearer light on the relationship between disability and educational outcomes, Cox makes use of the Scottish Longitudinal Study (SLS). The sample of 23,700 children was aged 3-11 years at the 2001 Census. This age group was selected in order to capture as many children as possible who were in their senior years of schooling or had recently left school at the time of the 2011 Census. The analyses controlled for a variety of possible confounding factors, such as having a parent with a Limiting Long-Term Illness (LLTI, a proxy for disability), area deprivation, gender, ethnicity and type of impairment.

The results show that children with Mental Health problems (at 2011) were significantly more likely than other children to leave school early. Children with a disability at 2011 were less likely to attempt Higher Grade exams and were less likely to achieve 3 A-C passes in their Highers. Exploring these outcomes by impairment type reveals that children with learning difficulties are particularly disadvantaged, both in terms of the likelihood of sitting any Highers and of achieving 3 good Higher qualifications.

6.2. Why was the SLS needed?

In addition to allowing a longitudinal perspective on the issue, the Scottish Longitudinal Study provides full information on family and household context, allowing control for many possible confounding factors in the analyses. For this research these control variables include gender, area deprivation (at both time points), family structure in early childhood, parental disability, ethnicity and type of impairment.

The SLS offers two additional benefits: linked educational data, and a new census question on health conditions. Education data in the SLS is supplied by ScotXed, and includes information on absences, exclusions, school census data and SQA qualifications data (for more information see

SLS Technical Working Paper 6 [23]). These additional education data provide much greater detail than census alone, which only gives a broad indication of the highest level of qualification attained.

A new health conditions question was added to the Scottish (and Northern Ireland) Census in 2011 (see section 2.3.1), and for the first time allows researchers to narrow down which types of health conditions and disabilities individuals have, rather than relying on the more global proxy of LLTI.

Finally, the scale of the SLS provides a much larger and more representative sample than any other datasets or surveys are able to.

6.3. Data and methods

Dummy variables were created for 'disability' and 'early leavers'. Children were counted as having a disability if they had at least one health condition at 2011 and also reported that their daily activities were limited by it (either 'a little' or 'a lot'). The official definition of an 'early leaver' is a child who leaves full-time education before they complete the legally required amount of education, which in Scotland is related to the 16th birthday [24]. However, Cox felt that for this study it was also important to capture those who

left school as soon as they were legally allowed, as this might indicate disengagement or feelings of disenfranchisement with the educational system. To this end, a variable was created which captured all children under 16 at the 2011 Census who were not in full-time education, as well as those aged 16 or over who did not appear in the school census for what would be their 5th year at secondary school – the first non-compulsory year of FTE in Scotland – and were not in FTE at the 2011 Census.

Two measures of educational attainment were tested: being registered to sit at least one Higher; and achieving at least 3 'good' Higher pass marks (grades A-C).

Logistic regressions were carried out controlling for multiple factors as described above. The independent variables of key interest were LLTI at 2001 (age 3-11), 'disability' at 2011 (age 13-21) and in additional models the type of impairment at 2011 was explored. Dependent variables were: the likelihood of being an 'early leaver'; being registered to sit at least one Higher; and achieving at least 3 good Higher passes.

6.4. Potential policy impact

Following presentation of the preliminary results at the BSPS conference in September 2016, there has already been interest in the research from the Scottish Government's Demographics and ScotXed Education Data teams. There are plans for an invited presentation to ScotXed team and it is hoped that through this the results can then feed into future Scottish Government reports and into educational policy.

The Equality and Human Rights Commission have also expressed a keen interest in using the research as part of the evidence base for their reports on health inequalities in the UK.

6.5. Extensions to this work

The next phase of this project will examine socioeconomic outcomes after leaving school, such as the likelihood of progressing into Higher Education, the risk of becoming NEET (not in education, employment or training) and labour market outcomes. As with educational outcomes for children with disabilities, this is an area which has previously only been explored on a snapshot basis or through administrative data releases, and so once again the SLS will be invaluable in providing wider context and a longitudinal aspect for a much larger sample.

7. Future research directions and developments

As the body of research using LS data to investigate health inequalities continues to grow new questions and research directions inevitably emerge. And as new linkages are made between the LSs and various administrative data sources it becomes possible to advance knowledge on health inequalities and their determinants in new directions.

The longitudinal studies also enable researchers to explore the effects of important societal events on health outcomes. For example, Prof Sarah Curtis is currently working with colleagues at Durham University and at the Centre for Research on Environment, Society and Health (CRESH) at the University of Edinburgh to examine how health outcomes for Members of the Scottish Longitudinal Study relate to local economic conditions during the latest economic recession starting in 2006. Since SLS data is linked to data on NHS service use and prescription records, the study will allow them to explore possible links between local impacts of recession and health outcomes impacting on need and demand for health care as well as reported illness and mortality.

In other research, members of the CRESH team at Edinburgh are currently using the SLS to explore a number of questions relating to how local environments influence various health outcomes. Work in this area includes using a sibling study design to examine how the change in maternal exposure to different types of green space (total natural space, total accessible (public) natural space, parks, woodlands and open water) is related to birth weight in urban Scotland. In other work, the team are also examining the changing provision of forestry across Scotland and examining the influence on physical and mental health outcomes using novel individual-level measures derived from GP and prescription records.

FURTHER INFORMATION

You can find the recording of an accompanying webinar at:
http://calls.ac.uk/guides-resources/thematic-guides-webinars/

For further information about CALLS Hub and the Longitudinal Studies:

- www.calls.ac.uk
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- NILS-RSU: www.qub.ac.uk/research-centres/NILSResearchSupportUnit/
- SLS-DSU: www.lscs.ac.uk/sls/

The CALLS Hub website contains a range of information and resources for anyone considering using the LSs or who would like to explore previous LS-based research outcomes, including:

- Census forms
- Searchable database of research outputs
- Searchable data dictionary for all 3 LSs with features to save and download your own lists of variables
- Research briefs
- Impact case studies
- Thematic guides

Explore these features and more at calls.ac.uk

ACKNOWLEDGEMENTS

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