HAGIS
Healthy Ageing In Scotland

Healthy Ageing in Scotland: the pilot survey

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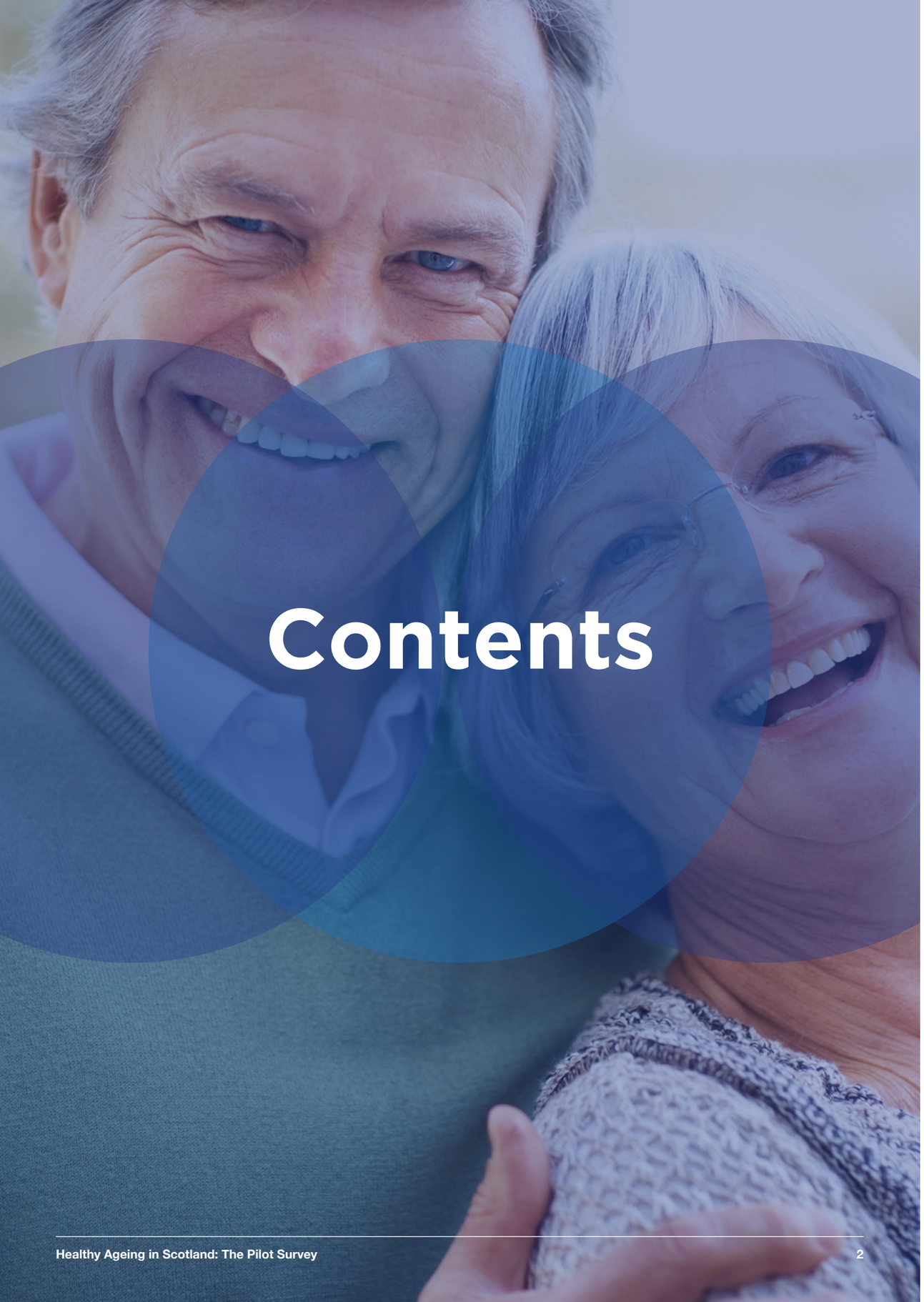

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Acknowledgments

Thanks to all the respondents across Scotland without whose help HAGIS could not have been made a reality.

Thanks to the National Institute of Aging for its financial support and particularly Richard Suzmann and John Haaga for their help.

Thanks to the Nuffield Foundation for its financial support and particularly Sharon Witherspoon, Teresa Williams, Alex Beer and Alison Rees for their help.

Prof Jim Smith, RAND for his continuing help throughout the project.

To the team at FACTS International for their success in delivering a challenging contract: Gemma Stephenson, Emily Kettle, Crispin Beale, Claire Muchmore, Adam Wyles and Amy Russell. And to the interviewers whom they recruited.

Ian Deary and Chloe Fawns-Ritchie from the Centre for Cognitive Ageing and Cognitive Epidemiology, University of Edinburgh.

Our many colleagues at the University of Stirling including Alasdair Rutherford, Elizabeth Lemmon, Carol Johnstone, Feifei Bu, Alison Bowes, Emma Reynish, Judith Phillips, Joy Taylor, Colin Elliot, Rona McNicol, Sharon Bolton, Maria Massaro, Alannaha Young.

Staff attached to the Administrative Data Research Network in Edinburgh - Anthea Springbett, Brian Murray, Suhail Iqbal, Ashley Gray for their support in the process of data linkage.

And with thanks to other longitudinal researchers for their help:

- From HRS: David Weir, Arie Kapteyn and Ken Langa
- From ELSA: James Banks, Andrew Steptoe, Nina Rogers, Gemma Tetlow, Rowena Crawford, Zoe Oldfield
- From Understanding Society: Michaela Benzeval and Nick Buck
- From TILDA: Rose Anne Kenny, Anne Nolan and Christine McGarrigle
- From NICOLA: Frank Kee, Frances Burns and Declan French
- From CLOSER: Alison Park
- From the Gateway to Global Ageing at the University of Southern California: Jinkook Lee

Acknowledgments

Other supporters:

- Jane Falkingham at the ESRC Centre for Population Change, University of Southampton
- David Ulph at the Scottish Institute for Research in Economics
- And in no particular order Simon Anderson, Paul Boyle, John Frank, Vernon Gayle, Lord Sutherland, Robert Wright, Brian Sloan, Marcello Massaro and Jon Minton.

The Nuffield Foundation is an endowed charitable trust that aims to improve social well-being in the widest sense. It funds research and innovation in education and social policy and also works to build capacity in education, science and social science research. The Nuffield Foundation has funded this project, but the views expressed are those of the authors and not necessarily those of the Foundation. More information is available at www.nuffieldfoundation.org

Research reported in this publication was supported by National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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With thanks to all who contributed to this report.

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He is past President of the UK Society for Behavioural Medicine. He served on the UK National Institute of Clinical Excellence (NICE) organ transplantation clinical guideline development group (2010, 2013, 2016). He was then appointed as an Expert Adviser for the NICE Centre for Guidelines (2017-2020). He was a member of UK National Institute of Health Research (NIHR) Health Services & Delivery Research Grants Board (2010-2017) and the UK NIHR Programme Grants Board for Applied Research (2011-2014). In 2017 he was appointed to the NIHR Policy Research Unit Commissioning Panel.

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Alasdair is part of the Scottish Administrative Data Research Centre; the Centre for Population Change; the Scottish Civil Society Data Partnership. He also sits on the Scottish Third Sector Research Forum; is a member of the Scottish Informatics and Linkage Collaboration Strategic Management Board; and is a board member of Age Scotland.

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Executive Summary

Chapter 1

The Development of HAGIS

- The Scottish Government controls most policies that affect older people in Scotland and it is therefore able to follow a different strategic direction for older people's policy than that in other parts of the UK. The distinct policy environments suggest the need for a different evidence base for older people in Scotland
- Healthy Ageing in Scotland (HAGIS) is the pilot study for Scotland's comprehensive longitudinal study of its ageing population
- The pilot study of HAGIS has been funded by the National Institute of Aging and the Nuffield Foundation
- The study has taken advantage of its access to administrative data linkage to develop an innovative sampling frame and to link consenting respondent's surveys to health, social care, and education data
- Fieldwork was conducted by FACTS International and project managed by the HAGIS team
- HAGIS is of international importance as a member of the Health and Retirement Study (HRS) family of longitudinal surveys of ageing. Harmonised data from HAGIS will permit quantitative comparisons of ageing processes between Scotland and the other members of the HRS family, which now cover more than 50% of the world's population aged 50+

Chapter 2

Socio-Demographic Characteristics of the HAGIS pilot sample

- The weighted HAGIS sample is representative of Scotland's population at mainland Health Board level, with most respondents living in urban areas
- Almost all respondents were born in the UK (96%) and 84% identified themselves as equally or more Scottish than British
- Most older people are currently married (62%), approximately 10% of older people have never been married
- A substantial fraction of older people live alone, with women more likely to live in a single household than men (30% men, 44% women). 14% of respondents live with children
- Most of the respondents have a secondary education (60%), and men are more likely to hold a degree (26% men, 18% women)

Chapter 3

Help and Unpaid Care

- There is diversity in the demographics and landscape of help and care in Scotland
- Compared to other surveys there is continuity with women as the predominant care givers, recipients of care and sandwich carers
- 11% of respondents spent over 50 hours a week providing care
- 10% of carers were sandwich carers caring for both an adult and a child
- Those in most deprived communities are more likely to provide long hours of care than those in less deprived communities. People with high level of deprivation are more likely to receive help with Activities of Daily Living (ADL) activities; whereas people from the medium deprivation group are those who are mostly likely to receive help with Instrumental Activities of Daily Living (IADL) activities

Chapter 4

Disability Benefits

- The HAGIS questionnaire includes validated measures of physical activity
- Levels of physical activity varies considerably across Scotland's older population
- Physical activity declines with age
- The relationship between physical activity and area deprivation is complex
- Females are less active than males, which is perhaps a reflection of frailty among older women
- Among those that might be classed as disabled due to their inability to carry out low level physical tasks, some, but by no means are all in receipt of disability-related welfare benefits

Chapter 5

Volunteering In Older Age in Scotland

- The patterns of volunteering participation amongst HAGIS respondents are in line with other similar social surveys containing volunteering questions. The descriptive analysis shows the importance of the transition between employment and retirement as a key time for volunteering participation
- We also show the association between volunteering participation and wellbeing. Volunteers have more positive expectations of their life expectancies than non-volunteers, and also rate themselves with higher subjective wellbeing
- We show that there are associations between prosocial motivations (using volunteering as a proxy) and engagement with HAGIS. Volunteers were more likely to be enthusiastic about participating in HAGIS, and were also more likely to consent to administrative data linkage. This suggests a role for altruistic motivation in encouraging survey participation, and further work could consider the implications for how respondents should be asked for consent to data linkage

Chapter 6

Online Shopping and Service Use in an Older Population in Scotland

- 76% of Scotland's older population use the internet. Internet usage by older people in Scotland is higher than the average across OECD countries
- The most common internet activities for older people are using email (67%), finding information about goods and services (66%) and online shopping (54%)
- Internet usage is less frequent as age increases. 56% of people aged 80 or over report that they never use the internet
- Amongst internet users there is no age difference in the proportion using email. Older internet users are less likely to use the internet to find information or shop online

Chapter 7

Older Workers and Retirement

- Economic activity rates for older people in Scotland have increased over the past decade
- 68% of men and 55% of women aged 50-64 in the HAGIS study are working, around 20% are retired, with the remainder unemployed, unable to work through illness or disability, caring or looking after the family home
- 26% of degree-educated individuals have already retired by age 65
- Only 18% of individuals who identify themselves as being in poor health are in work
- Hours of work decline gradually from age 50 onwards as individuals cut their working hours as they approach retirement. Women are more likely to be in part-time employment prior to retirement than men
- Almost 40% of older people expect to retire before the State Pension Age (SPA), 30% plan to retire when they become eligible for the state pension, and 30% after they have passed the eligibility criterion.
- 42% of HAGIS respondents do not have any pension arrangements in addition to state provision. 49% are enrolled into an occupation pension scheme. 23% have a private pension. 14% have both an occupational and a private pension
- There is some evidence to support the finding that those in the middle of the income distribution are likely to remain in work longer than the relatively poor and the relatively rich

Chapter 8

Time and Risk Preferences in Older Persons in Scotland

- Understanding attitudes towards time and risk is important as we age as many decisions older people face involve uncertainty
- In general women are more present orientated and less willing to take risks than men
- University graduates tend to be more future orientated
- Older individuals are more risk averse

Chapter 9

Financial Literacy

- Financial literacy of older people in Scotland is quite low in an international context
- Financial literacy is higher for men than for women, with evidence of decreasing financial literacy with age for both genders
- There is no difference in financial literacy between older people in retirement and those who are working. For individuals in other employment status financial literacy levels are lower
- Individuals with higher educational attainment have a higher degree of financial literacy
- Older people who live alone tend to have lower levels of financial literacy than cohabitating individuals.
- Confidence in financial literacy is higher for men than women, and in those with higher levels of education and living in areas with lower deprivation
- Financial literacy and confidence was associated with poorer subjective mental health

Chapter 10

Cognitive Function & Personality

- Inspection of the psychometric properties of the cognitive tests and the personality measure in HAGIS showed that the test characteristics, distributions, and associations with other tests and demographic variables are as expected
- A general measure of cognitive ability was created by entering five of the HAGIS cognitive tests into a principal component analysis. This general measure of cognitive ability was associated with performance on health literacy and financial literacy
- The personality disposition of higher intellect had a small association with higher health literacy, and agreeableness with financial literacy, when controlling for cognitive ability

Chapter 11

Physical Activity and Health Behaviours in an Ageing Scottish Population

- Physical activity frequency declines with age across all intensities
- Physical activity frequency is higher in the less deprived SIMD quartiles (Q2, Q3 and Q4) than in Q1 (most deprived)
- Physical activity frequency is highest in Q3, and different from all other SIMD quartiles when examining moderate and vigorous activities
- Physical activity frequency for light activity (walking >10mins) is highest in least deprived SIMD quartile
- Physical activity frequency is higher at all intensities in males than females
- Age effects are not strongly evident in reported sitting time, but the most sitting time occurred in the 85-89 age band
- Sitting time is highest in the most deprived SIMD quartile (Q1) and lowest in Q3
- Females report sitting less than males
- Perception of activity guidelines for a healthy lifestyle are much higher than the current minimum recommendations
- Reported number of days on which vigorous activity was performed did not associate with other health behaviours such as smoking, or fruit and vegetable consumption, but showed a moderate positive association with alcohol consumption in the last 7 days
- Odds ratios reveal that active respondents have significantly higher odds of several other positive health behaviours such as cancer screening, and report fewer self-reported health problems, than inactive respondents

Chapter 12

Physical Activity and Health Status in Older Scots

- Physical activity is substantially lower in those who live in the most deprived quartile of neighbourhoods
- The observed decline in physical activity around the age of retirement is unlikely to be associated solely with increasing age
- The impact of physical activity on the maintenance of the ability to move easily is particularly marked
- While movement is a form of physical activity the absence of a linear relationships between the two variables, and sharp drops in physical activity in those who indicated mild and moderate problems with movement indicates that mobility is measuring something that differs from physical activity
- These findings underline the importance of physical activity in improving the health of older Scots

Chapter 13

Subjective Life Expectancy in HAGIS

- After correcting for individual characteristics such as gender, area of multiple deprivation and health, SLE and objective life expectancy grow at almost identical rates
- Males tend to be over optimistic. Objectively, they are likely to live 4 years less than women, but the gap in SLE in our more extensive model is only 1.5 years
- The gap in SLE between those living in deprived areas and those living in affluent areas is much less than that in observed life expectancy. The objective difference in life expectancies between the most and least deprived quartiles is around 12 years, but the SLE estimates are only 2.4 years
- Having poor health and having smoked at any time tend to reduce individuals' expectations of longevity. The difference in SLE between those in "excellent" health and those in "poor" health is 7.2 years, while having smoked reduces it by a further year

Chapter 14

Bowel Cancer Screening Uptake in a Scottish Population

- HAGIS asked respondents whether they participate in one of Scotland's major public health interventions – Scottish Bowel Screening Programme for those aged 50+
- Participation in bowel screening is lower than that for other forms of screening such as breast and cervical cancer
- The HAGIS data suggest that single males are significantly less likely to participate in bowel screening tests. There are no significant differences in participation rates between men living with a partner and women living either alone or with a partner
- Increasing the participation rate of single males to the Scottish average would save around 3.2 lives per year, based on Scottish Government estimates of the effectiveness of the screening programme
- Uptake is also lower in deprived communities. Raising participation rates in the most deprived quartile of Scottish households to the average for Scotland as a whole would save around the same number of lives as raising the participation rates of single men
- Whether those eligible for screening live in cities or rural areas does not seem to affect response rates. This is not surprising given that bowel screening is conducted by post. Screening that requires attendance at NHS premises may be less attractive to rural dwellers

Chapter 15

Psychological Factors and Cancer Screening Uptake in Scotland

- Those who are slightly more agreeable may not uptake bowel and breast cancer screening but this effect size was small for bowel and medium for breast cancer screening
- Those who did not participate in breast cancer screening reported being slightly more conscientiousness and emotional stability, with a higher overall quality of life, less happiness, and more anxiety
- Results may provide insight to individuals who may be targeted for future campaigns to increase cancer screening

Chapter 16

Wellbeing

- HAGIS collects a number of measures of individual well-being in its self-report questionnaire. These cover life satisfaction, whether individuals feel their life is worthwhile, their happiness and their level of anxiety
- The distributions derived from the HAGIS data are quite similar to the distribution of well-being among older Scots drawn from other sources
- The different measures of well-being are positively correlated, though not always that highly, implying that they capture different aspects of individuals' feelings of latent well-being
- Typically, life satisfaction increases with age and is higher for those living as a couple than those living alone
- Health has a very significant impact on well-being: compared with someone in excellent health, poor health reduces life satisfaction by 2.5 points on a 10 point scale
- There are no clear patterns in well-being that depend on the type of area in which HAGIS respondents reside. Thus, there are no significant differences in life satisfaction between those living in the most deprived 25% of Scotland's data zones and those living in the most affluent 25% of Scotland's data zones
- Using life satisfaction questions that have been validated in other surveys enables comparisons with other datasets. The ONS Annual Population Survey (APS) asks the same life satisfaction question as HAGIS. Estimating the same model of life satisfaction in HAGIS and APS shows that individual characteristics typically influence life satisfaction in the same direction. However, the much larger APS sample means that estimates from the APS model are likely to be much more precise

Chapter 17

Methodology

- HAGIS used an innovative sample frame designed to produce a random sample of eligible households across mainland Scotland
- The HAGIS pilot main questionnaire was administered as part of a household interview
- All participants who responded to the main interview were asked to complete a self-completion questionnaire
- A total of 1,057 main interviews were completed in the pilot wave and 67% of respondents completed a self-completion questionnaire
- 88% of all respondents agreed to link their survey to at least one source of administrative data

1. The Development of HAGIS

Like most developed countries, Scotland has an ageing population. Currently, around 40% of its residents, some 2 million people, are aged 50+. Scotland will face many policy challenges associated with ageing over the next few decades, including how to meet the increasing demand for health and social care services, how to adapt to an elderly population with increasingly diverse social and economic characteristics and how to provide income support for those outside the labour market.

A necessary condition for effective policy response to these challenges is a clear understanding of the economic, social and health-related conditions faced by older people in Scotland. The UK is a world-l eading centre for the development longitudinal and cohort studies. These have had a substantial influence on policy development in recent decades. However, Scotland has no longitudinal study that focuses on its ageing population. This report describes the development and results of the pilot survey for such a longitudinal study. The study is known as Healthy AGeing In Scotland (HAGIS).

Background to HAGIS

Anderson, Boyle and Sharp (2008) carried out an initial scoping study into the possibility of developing a Scottish longitudinal study of ageing. This study was funded by the Scottish Government. Their analysis highlighted longitudinal studies of ageing that had already been established across the developed world. These included the Health and Retirement Study (HRS) in the USA, the English Longitudinal Study of Ageing (ELSA), the Survey of Health and Retirement in Europe (SHARE) and The Irish Longitudinal Study of Ageing (TILDA). They argued that a hybrid study with some elements of ELSA and some of SHARE would be the best approach for Scotland. Further, a sample size of at least 8000 would be needed for compatibility with other studies from the British Isles. The study should also have a project lifespan of at least 10 years, implying a minimum of four waves of data collection. Their main conclusion, following a wide consultation with a range of stakeholders, was that there was:

"a clear interest from both the policy and academic communities in the richer source of data that could be provided by a longitudinal study in this area." (Anderson, Boyle and Sharp 2008 p5)

Publication of this scoping study closely followed the publication of a strategy document by the Scottish Government entitled "Planning for a Scotland with an Ageing Population" (Scottish Government 2007) which laid out policy priorities for Scotland in the field of ageing. These priorities included increasing healthy life expectancy, extending working lives, providing opportunities for volunteering and learning etc.

The evidence collected by a longitudinal survey of ageing could clearly be linked to such issues. However, although the Scottish Government did initiate a longitudinal study of children known as Growing up in Scotland (GUS) in 2005, it did not establish a longitudinal survey of ageing. As longitudinal studies of ageing studies have expanded in both developed and less developed countries, and now cover more than half the world's population aged 50+, the lack of any such study in Scotland became increasingly puzzling to external observers. The Scottish Government controls most policies that affect older people in Scotland and it is therefore able to follow a different strategic direction for older people's policy than that in England. The distinct policy environments suggest the need for a different evidence base for older people's policy north of the border.

After 2008, further small scale studies of the feasibility of establishing a longitudinal survey of ageing in Scotland were supported by the Economic and Social Research Council, the Scottish Institute for Research in Economics, and the ESRC Centre for Population Change. These involved Prof David Bell and Dr Alistair Rutherford from the University of Stirling and Prof Robert Wright from the University of Strathclyde. Each study argued that there was considerable scientific potential in the establishment of a longitudinal study of ageing in Scotland. Funding for the establishment of a pilot study was therefore sought. Coincidentally, Richard Suzman, Director of the Division of Behavioural and Social Research in the US National Institute of Aging (NIA) was, at this time, interested in extending the range of countries encompassed within the Health and Retirement Study (HRS) family of longitudinal studies of ageing. He encouraged an application from Scotland to the NIA to support a pilot study. Principal reasons for his interest in Scotland were that its relatively poor health outcomes for older people and health inequalities were similar to the experience of the US. These inequalities are stark: male life expectancy in Scotland's areas of greatest deprivation (those in the lowest decile of the Scottish Index of Multiple Deprivation) was 70.08 in 2014. In contrast, in the most affluent decile, it was 82.3. The minority ethnic population in Scotland comprises only 4% of the population. Therefore, these differences in life expectancy across Scotland cannot be explained by race. Their source must lie in the variation in social and economic conditions experienced by different groups within Scotland's population. This is the kind of information that a longitudinal study of ageing is ideally placed to collect.

Scotland also has great potential to link data collected from a household survey with administrative data from individual health records. This carried the potential benefit of providing objective health data linked to individual's social and economic circumstances at much lower cost than carrying out a medical examination as well as an interviewer-based survey.

NIA funding was intended to support a "proof of concept" project, with a sample size of around 400. This application ultimately proved successful, having been significantly enhanced by support from members of the HRS team, notably Prof Jim Smith of the RAND Corporation and Dr David Weir, Director of the Health and Retirement Study.

The Nuffield Foundation, in conjunction with the NIA, had been instrumental in the establishment of the English Longitudinal Survey of Ageing. It has also had a continuing interest in ageing studies. An application to the Nuffield Foundation to extend the sample size in the Scottish pilot study to 1000 was also successful. The case for the extension was that an increase in the sample size would provide sufficient statistical power to generate useful, and statistically significant, research findings from the pilot study. Particular interest was focused on findings relating to financial literacy and to cognitive ageing, topics which were to be given particular attention in the HAGIS pilot. These aspects of the study were made possible through the financial support of the Nuffield Foundation. Initially this support came from Dr Sharon Witherspoon and subsequently from Teresa Williams.

With funding of around £500,000 in place, the HAGIS team at the University of Stirling set about the process of making the pilot study happen. This proved to be challenging and took much longer than expected. First, staff had to be hired: Alasdair Rutherford initially, and subsequently Elizabeth Lemmon, were hired on temporary contracts to initiate the study. Elizabeth was replaced by Dr Elaine Douglas, who became the de facto manager of the project. She was involved in the questionnaire design, the tendering process that led to the selection of a survey company, the ethics approvals and the interaction with the many stakeholders involved in the project.

Ethical approval for the project design was involved and took the best part of a year. There were two main issues that had to be resolved:

The Sample Frame

The target population for the HAGIS pilot was individuals resident in private households on mainland Scotland aged 50+ (and other adults living in households where one resident has been identified as being aged 50+). Deriving a random sample from this population required knowledge of the age of at least one person at the target address. While it is relatively easy to draw a random sample from all private households anywhere in the UK, including Scotland, using the postcode address file (PAF), the PAF does not include ages of those resident at an address. To ensure that at least one person at an address was aged 50+ was only possible if the addresses could be screened against NHS health records. The National Records of Scotland (NRS) holds information collected from General Practitioner (GP) data on addresses and the ages of those resident at that address. However, this process had never been attempted before and the screening process required consent from the Public Benefit and Privacy Panel (PBPP) (for further details see Methodology chapter). This became a long and involved dialogue between the research team at Stirling and the PBPP. Once approval had been received, the NRS team were able to draw an initial set of addresses that could be used for the survey interviews.

Consents

The second issue concerned linkage of the survey results to a range of administrative data held by the UK and Scottish governments. Clearly such linkage requires informed consent from survey respondents. Establishing consent for health data linkage also required PBPP approval, which again took a considerable time. The linkage with respondent's survey data that was granted permission comprises:

- SMR01 - all hospitalisation events
- SMR04 - all mental health events
- Accident and emergency records
- Prescription records

We are able to compare health records for those respondents who have completed the survey and given their consent for health record linkage with the sample as originally drawn (which has no identifying information). This enables us to determine whether those who have responded to the HAGIS pilot and given health-record linkage consent are representative of the Scottish population as a whole. The sample originally drawn is a random selection from the entire mainland Scottish population. This comparison is explained in the Linkage chapter.

We have also received permission to link respondents' data with social care records. Scotland holds an annual census of social care provision which each local authority is required to complete. This is a record of all clients that are being supported by local authorities during a particular week. It includes details of the type of support being provided. We understand that social care linkage is relatively novel. It will provide interesting insights into economic and social aspects of social care as well as the interaction between health and social care, which is currently a key policy issue in each of the U.K.'s constituent nations. However, the sample in the HAGIS pilot is relatively small and only around 2.5% of the population aged 50+ are in receipt of local authority provided social care. Therefore it will not be possible to carry out a statistical analysis with this linkage until a full wave of HAGIS becomes available.

Other forms of linkage, such as those arranged with the Scottish Qualification Authority for educational records were less exacting in their ethical requirements. Many respondents gave consent to link to these records, which primarily consist of school qualification records held by the National Records of Scotland. Access to these data has been sought and granted. However, there has been a delay of several months in arranging access so it has not been possible to include information from this source in the report on the pilot study. In cooperation with the Department of Dental Public Health at the University of Glasgow, we have also sought to link respondent data to NHS dental records. This has required a further application to the Public Benefit and Privacy Panel, with whom we are currently in negotiation, following an initial rejection of our application.

Linkage to benefit and tax records is of particular significance in Scotland at present, given that the Scottish government has taken control over a number of welfare benefits as well as income tax, following the 2014 independence referendum. Linkage to these datasets is likely to take some time and we are taking advice from the Institute for Fiscal Studies, who have had some success in establishing comparable linkages with ELSA.

Fieldwork

Fieldwork commenced in October 2016. This involved close cooperation with the survey company, Facts International, in finalising the main and self-report questionnaires. Dr Douglas spent some time training the interviewers, many of whom were not familiar with such an extensive questionnaire. Chloe Fawns-Ritchie, a PhD student with Professor Ian Deary at the Centre for Cognitive Ageing and Cognitive Epidemiology, University of Edinburgh, helped train the interviewers with the specially designed battery of questions relating to cognitive ageing.

Initial progress with the interviews was quite slow and slowed up further as Christmas 2016 approached. The logistics of some interviews were challenging, particularly those in Scotland's more remote areas. Some of the addresses turned out not have anyone aged 50+, which may have been due to changes of address or inaccurate recording of addresses by the NHS. Other householders were not contactable, while others refused to participate. Interviewers were expected to return on three occasions to establish contact: if no contact had been made after the third attempt, it was decided to permit interviewers to approach next-door neighbours to determine whether they were eligible and willing to participate. This change, along with changes to the incentives offered to interviewers, speeded up the completion rate, though the final interviews were not completed until May 2017. Though this was a somewhat arduous process, it was greatly facilitated by the close cooperation between the team at Facts International and the project manager, Dr Douglas. Facts International were given the 2017 Interviewer Excellence award by the Interviewer Quality Control Scheme (ICQS), specifically for the work that one of their interviewers, Vicky Powell, had done for HAGIS.

Data preparation commenced immediately after the completion of the fieldwork. Variables were checked and named. Ambiguities in the data were resolved. All personal identifiers were removed. The data were weighted both with probability and with frequency weights (the size of Scotland's 50+ population is just over 2 million people). Datasets were made available in SPSS and Stata to contributors to the HAGIS pilot report.

Analysis

The report on the HAGIS pilot survey, of which this Introduction forms a part, is intended to provide an initial overview of the data that has been collected over the last year. In designing the report, our strategy was to invite a number of researchers with interests in particular aspects of the study to provide a largely descriptive analysis of their area of interest. It is hoped that these initial explorations of the data will lead to more considered articles that will be submitted to academic journals. The first such publication from HAGIS, entitled "Pilot study protocol to inform a future longitudinal study of ageing using linked administrative data: Healthy AGeing In Scotland (HAGIS)" has been accepted for publication in the British Medical Journal (BMJ) Open.

The data from HAGIS will be made available to other researchers from two sources: the UK Data Service and the Gateway to Global Aging. Contact has been made with both organisations to bring this about. Both have expressed an interest in holding a deposit of the HAGIS data. We are preparing the metadata for these deposits.

Once the data is available, we intend to focus on comparative analysis using the Gateway to Global Aging. This will provide opportunities not only for established researchers, but also postgraduates that have an interest in international aspects of ageing. We hope to work with the Scottish Graduate School in Social Sciences to ensure that there is a stream of quantitatively trained PhD students that are capable of developing such analyses.

However, the linkage to administrative data will not be generally available. For example, at present, access to the health data linked to HAGIS is only possible at the Administrative Data Research Centre which is part of the University of Edinburgh. Access to the Care Census is also restricted, though not limited to a single location. Researchers wishing to access these data will have to demonstrate their capacity to handle confidential data observing all relevant privacy safeguards. Nevertheless, working with these administrative data will provide a range of new research opportunities, both methodological and applied. For example, analysis of the survey data linked with health records poses very significant statistical challenges both in terms of the amount and complexity of the data.

Wider Significance of HAGIS

HAGIS is of international importance as a member of the HRS-family of longitudinal surveys of ageing. Harmonised data from HAGIS will permit quantitative comparisons of ageing processes between Scotland and the other members of the HRS family, which now cover more than 50% of the world's population aged 50+

HAGIS is the first in the family of HRS-related longitudinal studies of ageing which has drawn its sampling frame based on administrative health records. This means that the health characteristics of individuals who consent to health record linkage can be compared with those of the population aged 50+ resident in private households. One criticism of existing longitudinal studies of ageing is that their samples are biased with respect to the health characteristics of their respective populations. HAGIS is able to test whether this is the case using objective administrative data on individual health.

The completion of the HAGIS pilot coincides with the Scottish Government taking control over the design and delivery of several welfare benefits. These benefits largely relate to disability and are disproportionately allocated to older people. HAGIS will provide a more detailed analysis of the social and economic circumstances of older people receiving such benefits than is possible with existing large-scale surveys. The same arguments apply in relation to taxation. Scotland has recently taken control over the bands and rates of income tax. Around 67% of income tax in Scotland is paid by those aged 45+. HAGIS will provide a wider understanding of the labour market for older workers and in particular how labour supply (changing hours, moving to part-time work, retirement) may be influenced by tax policy. These are areas where labour supply response is likely to be quite elastic and therefore could have a significant effect on tax revenues should Scotland adopt significantly higher rates of income tax than the rest of the UK.

The Future

Building on the work already done in the HAGIS pilot, we hope to take the study forward to its first full wave. An application to gain ESRC support for the first full wave through the 2016 Large Grants scheme was unsuccessful, but was shortlisted for an award even though the fieldwork had only just commenced and no analysis using the data was therefore available.

As well as working on the pilot study, we have been working to establish contacts with other longitudinal studies. This helps establish relationships which might support joint working in the future, whether that be in relation to data collection and/or research. Already, we have a close relationship with the other longitudinal ageing studies in the British Isles and strong contacts with the other studies, particularly the Health and Retirement Study in the USA.

Through CLOSER, we have also been keeping abreast of developments in longitudinal survey analysis. One of the major challenges for survey work is declining response rates. Alternative methods for data collection other than face-to-face interviews are being explored around the world. It is essential that we are aware of these developments, both on the grounds of cost and of data quality. Obviously the area of alternative methods of data collection in which we have most experience is with administrative data.

We intend to continue research in this area, and have applied to the ESRC through the Centre for Population Change at the University of Southampton for funding to compare access to, and usage of, linked administrative data by the HRS-related longitudinal studies. We have also explored other potential linkages: for example, we have been discussing the possibility of linking dental health records to HAGIS with the Department of Dental Public Health at the University of Glasgow. Oral health among older people is an important, though much neglected issue.

It is also important that we establish the policy relevance of the information that has been collected in the pilot. The most immediate client for such information is the Scottish Government. Nevertheless, there are also important opportunities for comparative study. For example, though Scotland and England share many institutional, social and economic characteristics, their health and social care policies are subtly different. Given the huge pressures on these services in both countries, information which may help improve efficiency or equity has obvious merit. And where the underlying socio-economic structures are quite different, it can still be very useful to compare the experience of older people and explore how the drivers of well-being differ across jurisdictions. The Gateway to Global Aging provides an exciting "laboratory" to explore these issues. It also provides an opportunity to showcase Scotland's strength in administrative data linkage.

1. The Development of HAGIS

Our mission therefore, over the next two years, is to assemble a consortium of funding organisations that are willing to support the further development of HAGIS. We have identified a number of such bodies to whom we will be actively promoting the merits of HAGIS in the near future. In turn this will lead to applications for funding in response to research calls that are relevant to the effects of population ageing in Scotland.

2. Socio-Demographic Characteristics of the HAGIS pilot sample

2. Socio-Demographic Characteristics of the HAGIS pilot sample

Mirko Moro, Tanya Wilson, University of Stirling

- The weighted HAGIS sample is representative of Scotland's population at mainland Health Board level, with most respondents living in urban areas.
- Almost all respondents were born in the UK (96%) and 84% identified themselves as equally or more Scottish than British.
- Most older people are currently married (62%), approximately 10% of older people have never been married.
- A substantial fraction of older people live alone, with women more likely to live in a single household than men (30% men, 44% women). 14% of respondents live with children.
- Most of the respondents have a secondary education (60%), and men are more likely to hold a degree (26% men, 18% women)

Introduction

In this chapter we provide an overview of the socio-demographic characteristics of respondents in the HAGIS pilot study. As discussed in the methodology chapter, a sample size of 1,000 respondents was targeted, with a final achieved sample of 1,057 respondents. We compare the socio-demographic characteristics of the HAGIS data with official sources where possible in order to demonstrate the representativeness of the HAGIS pilot sample.

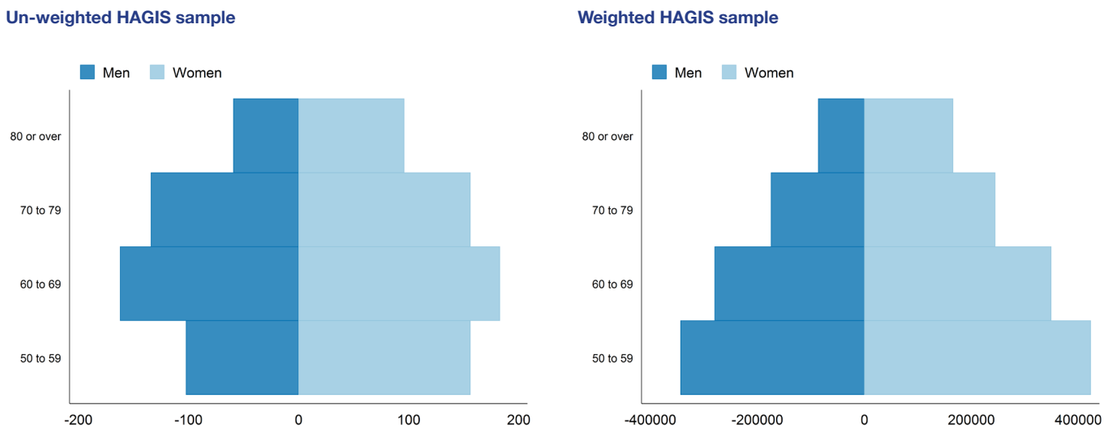
We present findings regarding age and gender composition, area of residence, nationality, legal marital status, living arrangements, number of children and education.

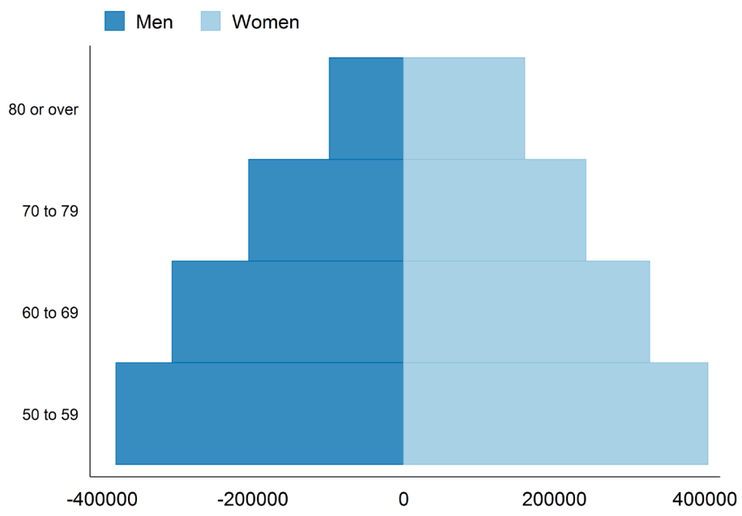
Age and Gender Composition

The HAGIS pilot study contains information on 1,057 individuals, of whom 56% are women and 44% are men. The age and gender composition of the HAGIS sample are illustrated by Figure 1, which compares population pyramids from the weighted and un-weighted HAGIS sample to the population pyramid reported by the National Records of Scotland (NRS)[1]. The use of survey weights renders the HAGIS sample representative. As expected, the first two age groups represent the largest cohorts, 37.10% of the weighted sample is aged between 50 and 59. This figure compares favourably with the NRS data, where 36.94% of individuals aged above 50 are in the 50-59 age group.

[1]Population Pyramids of Scotland (2017). www.nrsscotland.gov.uk. [Date Accessed 31/10/17]

Figure 1: Population pyramids using the weighted and un-weighted HAGIS sample vs National Records of Scotland data

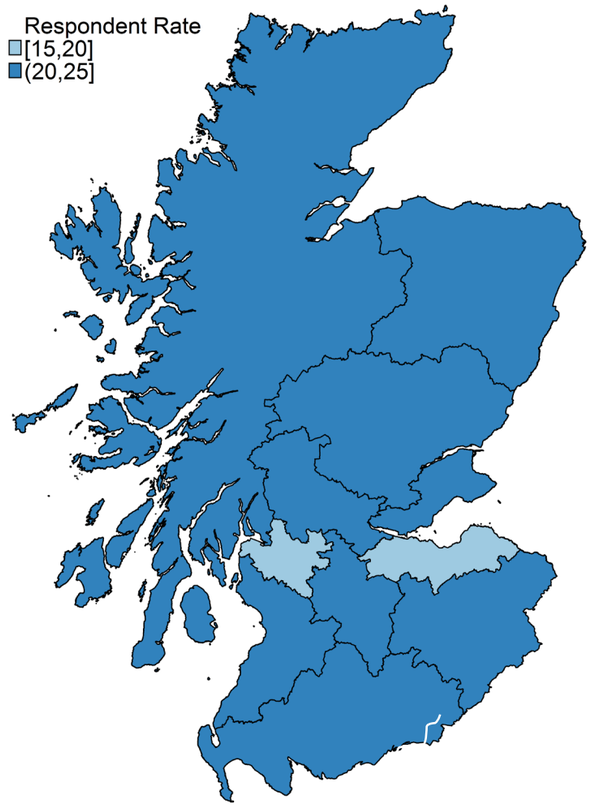




Area of Residence

The HAGIS sampling strategy was designed to be representative at mainland Health Board level. Figure 2 illustrates that achieved response rates in the final sample were approximately equal across health boards, and ranged from 17 to 24 per 100,000 population. Although more respondents were interviewed in the Lothian and Greater Glasgow and Clyde Health Boards, due to higher population numbers these have slightly lower respondent rates per 100,000 population.

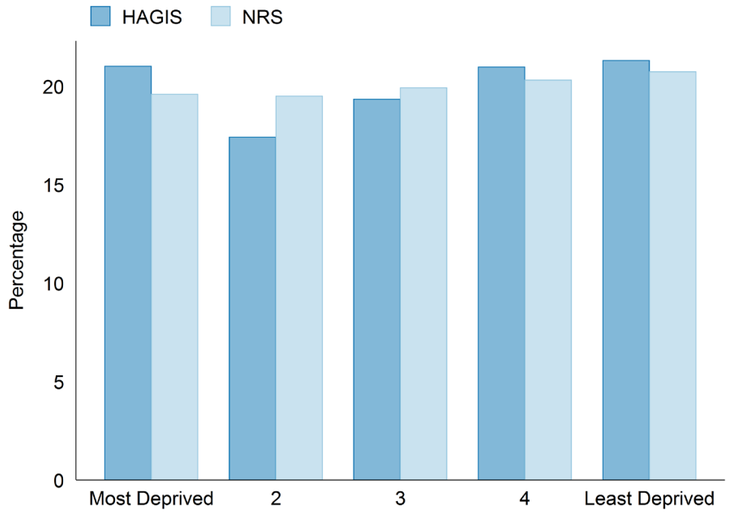
Figure 2: HAGIS respondent rates by area of residence (Health Board)



Health Board	Number Respondents	Rate per 100,000 population
Ayrshire and Arran	91	23
Borders	26	24
Dumfries and Galloway	35	24
Fife	75	21
Forth Valley	57	20
Grampian	107	20
Greater Glasgow & Clyde	208	17
Highland	75	23
Lanarkshire	148	23
Lothian	145	18
Tayside	91	23

Although not part of the sampling strategy, Figure 3 indicates that the HAGIS sample is broadly representative across Scottish Index of Multiple Deprivation 2016 quintiles (SIMD16[2]) as well as urban and rural areas. Most Deprived areas and Remote Small Towns[3] are slightly over-represented.

Figure 3: HAGIS respondent rates by area of residence



Urban/Rural classification	Respondent rate (per 100,000)
Large Urban Areas	16
Other Urban Areas	18
Accessible Small Towns	23
Remote Small Towns	43
Accessible Rural	19
Remote Rural	28

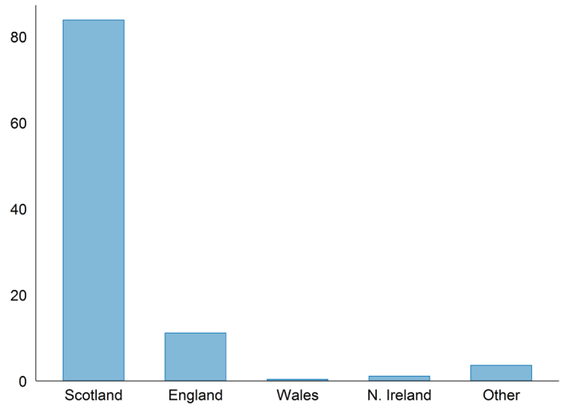
[2]Population Estimates by the Scottish Index of Multiple Deprivation (SIMD) 2016. www.nrscotland.gov.uk. [Data Accessed 31/10/17]

[3]The Scottish Government 6 fold Urban Rural Classification defines Large Urban Areas as settlements of 125,000 or more people; Other Urban areas are settlements between 10,000 and 124,999 people; Accessible Small Towns are settlements between 3,000 and 9,999 people within 30 minutes of a settlement of 10,000 or more; Remote Small Towns are also settlements between 3,000 and 9,999 people but over 30 minutes from a settlement of 10,000 or more; Accessible Rural are areas with a population of less than 3,000 people within 30 minutes of a settlement of 10,000 or more; Remote Rural are areas with a population of less than 3,000 people and over 30 minutes from a settlement of 10,000 or more.

National Identity

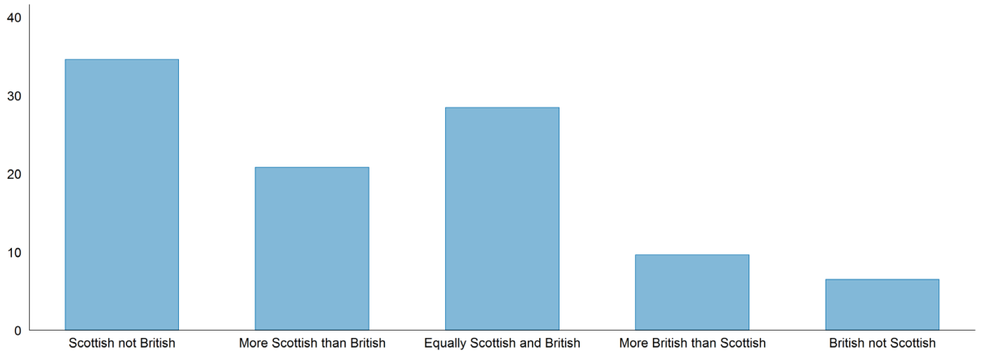
Nearly all (96.38%) HAGIS members were born in the UK, with 83.80% born in Scotland (see Figure 4). These figures compare favourably to the population enumerated in the 2011 census[4], which showed that although 93% of people resident in Scotland are UK born, in the over-50s age group 96.1% of the population were born in the UK.

Figure 4: Country of Birth



HAGIS members were asked to describe their British-Scottish national identity, i.e. the degree to which they identify themselves as Scottish as compared to British. Figure 5 shows that 34.58% identified themselves as Scottish rather than British, 20.84% felt they are more Scottish than British, 28.45% feel that they are equally Scottish and British. In contrast, 9.65% identified themselves as more British than Scottish with 6.48% saying that they are British rather than Scottish. In total, 83.87% of the HAGIS respondents said that they identified themselves equally or more Scottish than British. The comparable figure from the 2015 Scottish Attitudes Survey for individuals aged 50 or over is 88.27%.

Figure 5: British-Scottish national identity

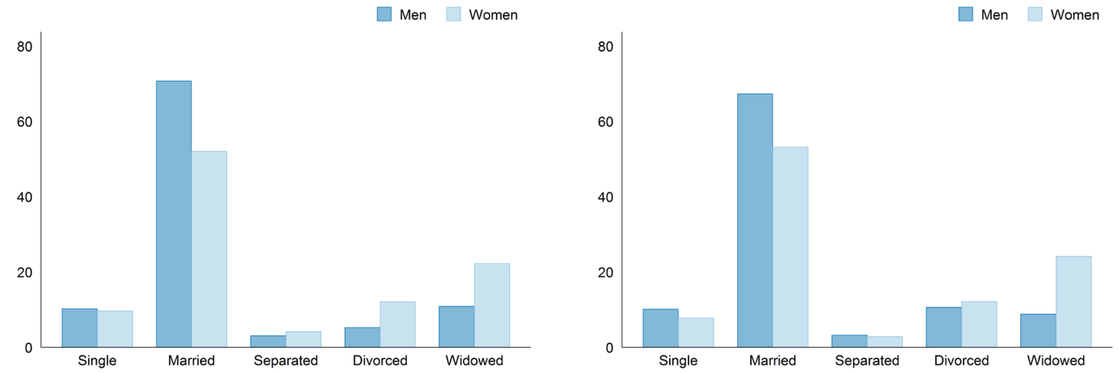


[4]DC2103SC – Country of birth by age. www.scotlandcensus.gov.uk. [Date accessed: 31/10/17]

Legal Marital Status

Figure 6 compares the distribution of marital status in the HAGIS sample with the distribution for individuals aged over 50 enumerated in the 2011 census.[5] The majority of the over-50 population are currently married. In both the HAGIS and the census data the proportion of men who are married (respectively 70.65% and 67.22%) is higher than the proportion of women (51.98% and 53.13%). Women are more than twice as likely as men to be widowed (22.21% as compared to 10.85% in the HAGIS data) and a larger fraction of women (16.18%) than men (8.27%) are separated or divorced. Divorced men are slightly under-represented in the HAGIS data. They represent 10.61% in the census data, as compared to 5.24% of the HAGIS sample. The percentage of men and women who have never married is very similar at around 10% for both genders.

Figure 6: Legal marital status in the HAGIS sample and in the 2011 Census



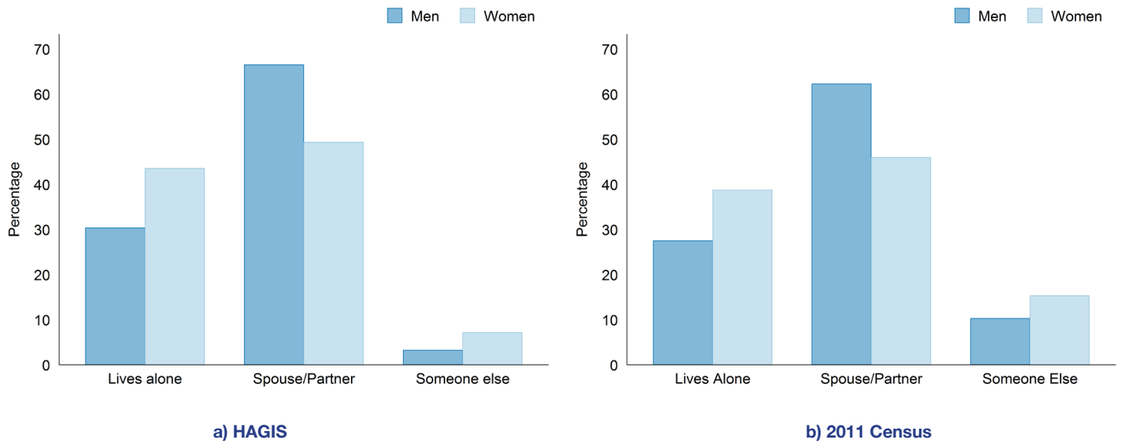
a) HAGIS sample **b) 2011 Census**

Living Arrangements and children

Most of the population aged 50 or above live with a spouse or partner, but a substantial percentage of older people live in a single household. Living alone is a condition that is especially common among women. Amongst HAGIS respondents 43.35% of women and 29.94% of men live as a single person. Comparable figures from the 2011 census[6] are 38.73% and 27.50% respectively, indicating that women living alone are slightly over-represented in the HAGIS population. A small proportion of men and women have other living arrangements and can be found to live with someone else, such as other relatives or friends.

[5]DC2102SC – Marital and civil partnership status by sex by age. www.scotlandcensus.gov.uk. [Date accessed: 31/10/17]
[6]DC1108SC – Living arrangements by sex by age. www.scotlandcensus.gov.uk. [Date accessed: 31/10/17]

Figure 7: Living Arrangements in the HAGIS sample and in the 2011 Census

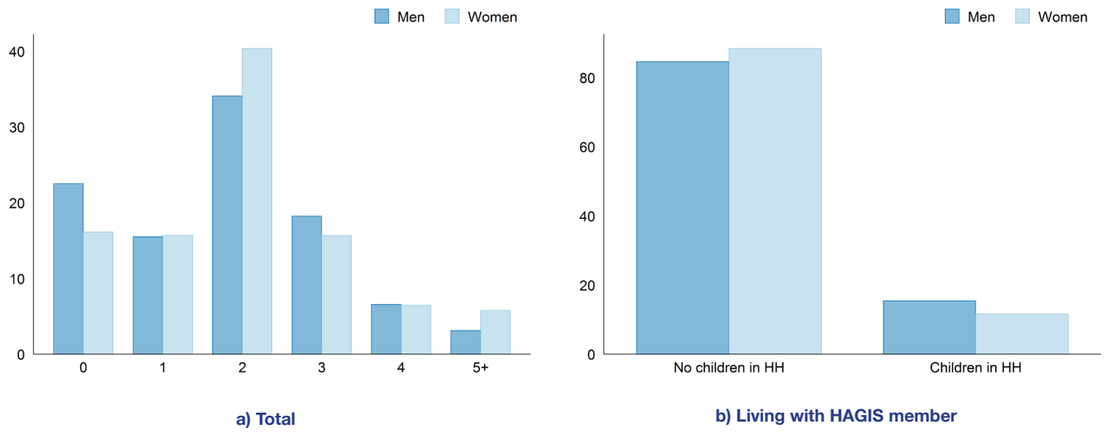


a) HAGIS

b) 2011 Census

HAGIS respondents were asked to report how many (living) children they have, including fostered, adopted and step-children. Figure 8 shows the total number of children reported by HAGIS respondents as well as the number of children who currently live in the same household as the HAGIS member. Women have a higher number of children, and are less likely to be childless (16.13% report they have no living children, whereas for men 22.52% do not have children). This difference between men and women is likely to be driven by increased re-marriage rates for women. Most respondents have two children (34.08% of men and 40.35% of women). A considerable proportion (27.77%) of both men and women have three or more children, with 4.34% having five or more children. Only 13.60% of children currently live with HAGIS respondents.

Figure 8: Number of Children



a) Total

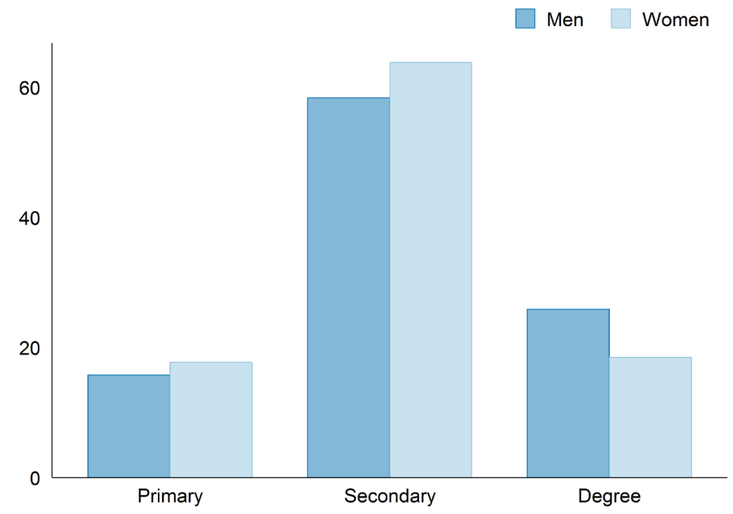
b) Living with HAGIS member

Education

The HAGIS questionnaire asks respondents about their highest level of completed education.[7] According to the HAGIS sample, 16.69% of older people in Scotland have completed no more than primary education, with 60.91% completing secondary education and 22.40% have been educated to degree level. The corresponding figure in the 2011 census[8] for degree-educated individuals in this age-group is 22.75%.

Figure 9 compares educational attainment across gender. In this older cohort men are more likely to have a degree than women (25.87% vs 18.48%). These figures stand in contrast with education attainment amongst younger cohorts, where women hold proportionately more education qualifications. In the 2011 census, 31.3% of men aged between 25 and 49 were degree educated, compared with 36.6% of women from the same cohort.

Figure 9: Highest Level of education completed – HAGIS respondents



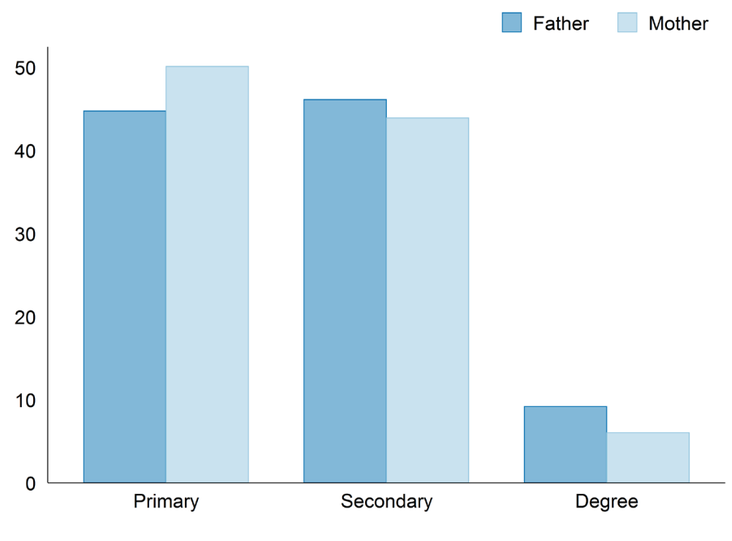
HAGIS respondents were also asked about the highest completed level of education of their parents. Figure 10 illustrates the education level of HAGIS respondents and their parents. There is a similar proportion of parents in both the primary and secondary education categories (around 45%), with less than 10% of the parents of HAGIS members holding a degree. The proportion of fathers who were educated to degree level is 9.19%, whereas mothers are almost 50% less likely to have had a university education (6.03%).

[7]Respondents were asked to record their equivalent education level according to 8 categories: Some Primary, Completed Primary, O level/grade, Highers, 6th year studies, HNC/HND, First degree, Postgraduate degree.

[8]DC5102SC – Highest Level of qualification by sex by age. www.scotlandcensus.gov.uk. [Date accessed: 31/10/17]

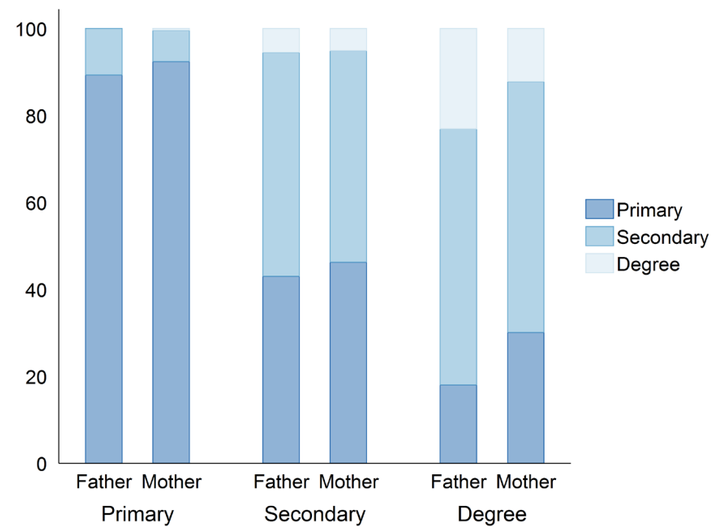
Comparing the education levels of parents with the education of the HAGIS members highlights the degree to which Scotland's population has become more educated over time, with a large decrease in the proportion educated only to primary level, and compensating increases in the proportions educated to either secondary or degree level. For the HAGIS respondents, both men and women are around 65% more likely to hold a degree qualification than their parents. The data also indicate that within a generation the gender difference in the likelihood of holding a degree fell around 10 percentage points.

Figure 10: Highest Level of education completed – parents of HAGIS respondents



With information on the education levels of both the HAGIS member and their parents it is possible to examine the extent to which education levels are transmitted across generations. Figure 11 shows each parent's level of education according to the HAGIS member's own level of education. The graph indicates that HAGIS members' own educational attainment is highly correlated with the education of their parents. Approximately 90% of HAGIS members who have no more than a primary education have parents who also had primary education only. Of those HAGIS members educated to secondary level, approximately 50% of their parents were also educated to secondary level, with a small proportion of (around 5%) holding a degree. In contrast, for degree-educated HAGIS members a far smaller proportion of parents had no more than a primary education (approximately 20% of fathers and 30% of mothers), and a considerable fraction had degree-educated parents (25% of fathers and 15% of mothers). We therefore conclude that the HAGIS data reveals evidence of substantial intergenerational transmission of education.

Figure 11: Parental Education Level by Own Level of Education



Conclusion

The HAGIS pilot study is representative of Scotland's older population. In this chapter we have compared socio-demographic characteristics of the HAGIS sample with official sources in order to show that the sample is representative along the dimensions of age, gender, area of residence, marital condition, living arrangements and education.

The primary objective of the HAGIS study is to collect new, previously unmeasured information about the older population of Scotland. Demonstrating that the HAGIS sample is representative along dimensions that we can validate with official sources, gives us confidence that analysis of these newly measured data will reflect realistic circumstances of the older population of Scotland.

3. Help and Unpaid Care

3. Help and Unpaid Care

Judith Phillips and Feifei Bu, University of Stirling

- There is diversity in the demographics and landscape of help and care in Scotland.
- Compared to other surveys there is continuity with women as the predominant care givers, recipients of care and sandwich carers.
- 11% of respondents spent over 50 hours a week providing care.
- 10% of carers were sandwich carers caring for both an adult and a child.
- Those in most deprived communities are more likely to provide long hours of care than those in less deprived communities. People with high level of deprivation are more likely to receive help with Activities of Daily Living (ADL) activities; whereas people from the medium deprivation group are those who are mostly likely to receive help with Instrumental Activities of Daily Living (IADL) activities.

Introduction

Over the last two decades unpaid or 'informal' care provided by close family, relatives, friends and neighbours has become a central focus of social policy. There are many reasons for this:

The shift in orientation of social care to less reliance on the state and the privatization of provision of 'formal' care along with a shrinking care workforce set against an increasing demand and need for care has created a 'perfect storm';

Higher costs of care provision both to individuals and local authorities as well as care providers has questioned the financial sustainability of the existing 'social care model';

The uncertainty and impact of other policy areas such as health, migration, employment, particularly post Brexit has raised issues of who will provide care, as well as the balance between informal and formal care;

Increasing recognition of the role and impact of caring on employment (Gomez-Leon, 2017), physical and mental health (Vlachantoni et al, 2016) and consequences for later life particularly for women (Benson et al, 2017).

The importance of looking at care across the lifecourse is increasingly recognised as critical if we are to understand the dynamics of ageing and later life. HAGIS provides a starting point for this in Scotland and enables a comparison with other similar data sets across Europe (SHARE) and beyond enabling the Scottish data to be viewed in a wider context.

This chapter presents the data from the HAGIS study including who provides and receives help and informal care by gender, age, ethnicity, marital status and deprivation. Additionally, it presents the nature and scale in terms of time given to caring for an adult and how this impacts on physical and mental health, feelings of social isolation and employment.

Methods

- Descriptive analysis
- Weighting acknowledgement
- Scottish Index of Multiple Deprivation (and how used with HAGIS)

Scale and nature of help and unpaid care

Help

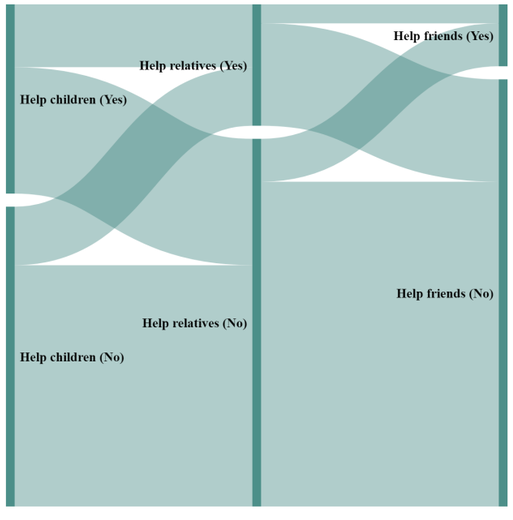
HAGIS shows that in the last 2 years, excluding childcare, 38% of respondents and/or their spouse spent at least 1 hour a week helping adult children and/or grandchildren with practical household tasks (e.g. gardening, shopping and household chores) and help with paperwork, which increases to 53% if childcare is included[9].

24% provided help to other relatives, while 13% provided the same kinds of help to friends and neighbours. About 66% of the respondents (and/or their spouse) provided *help to others (regardless of recipients), among whom 64% provided help to one type of recipients, 30% to two, and about 6% to all three types* (children/grandchildren, other relatives, friends/neighbours). Figure 1 (a) shows how different types of help overlap with each other. For example, among those who help with their children/grandchildren, 33% of them also help with other relatives, and 17% also helped with friends or neighbours.

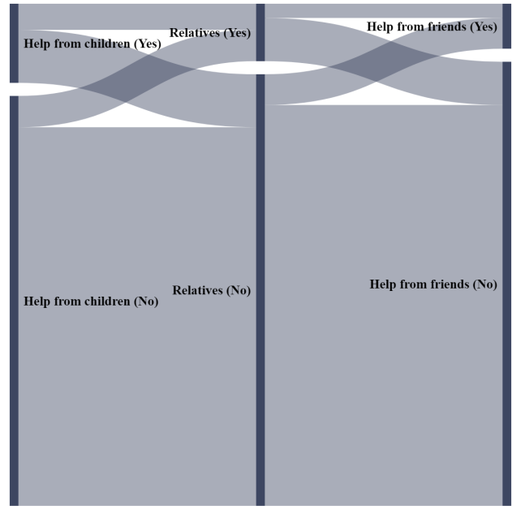
In return, 22% of respondents (and/or their spouse) received at least 1 hour a week of help from adult children and/or grandchildren, 12% from relatives and 9% from friends and neighbours. In total, about 34% of respondents (and/or their spouse) received help (regardless of sources of help), among whom 38% receiving help from more than once source (see Figure 1 (b)).

[9]This set of questions referred to not only the respondent but also his/her spouse/partner. It could potentially inflate the percentage of people providing or receiving help when couples both responded to these questions. To correct this, we randomly selected one respondent from each

Figure 1. Giving and receiving help from others in HAGIS



a) Giving help

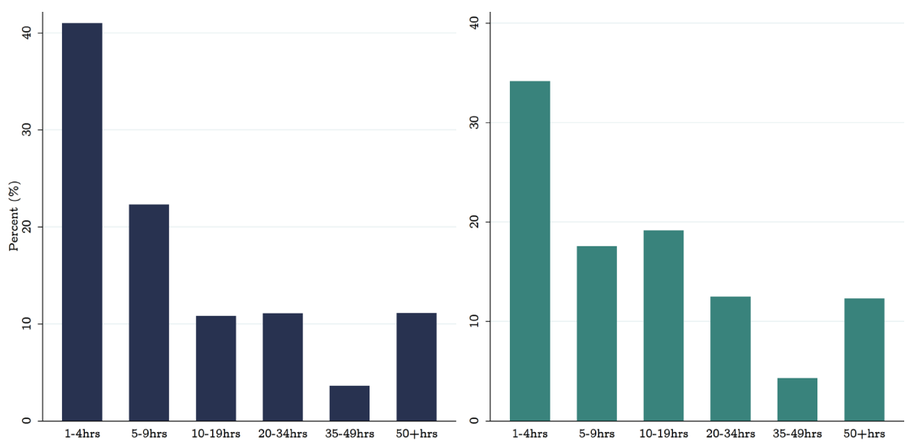


a) Receiving help

Unpaid caregiving

24% of respondents reported having 'looked after or given help or support to family members, friends, neighbours and others because of long term physical or mental health disability or problems related to old age'. Figure 2 (a) presents the distribution of care intensity among informal carers who provided adult care. Approximately 41% of carers spent less than 5 hours per week on informal care-giving; while 11% spent 50 hours or more. In additional to adult care, about 28% of respondents reported having looked after or cared for children, among whom 34% spent less than 5 hours per week; while 12% spent 50 hours or more (see Figure 2 (b)).

Figure 2. Care intensity of adult and child care in HAGIS



a) Adult care

a) Child care

Among those who provided adult care, 42% of them also provided care to children. These 'sandwich carers' take up around 10% of the population. 14% respondents provided only adult care, 18% only child care, and 58% no informal care at all. Figure 3 presents the distribution by sex and marital status. Generally speaking, females are more likely to provide informal care than males. They are also more likely to be 'sandwich carers'. Similarly, married people are more likely to be informal carers and sandwich carers than singletons or widowers.

Figure 3. Informal care giving by sex and marital status

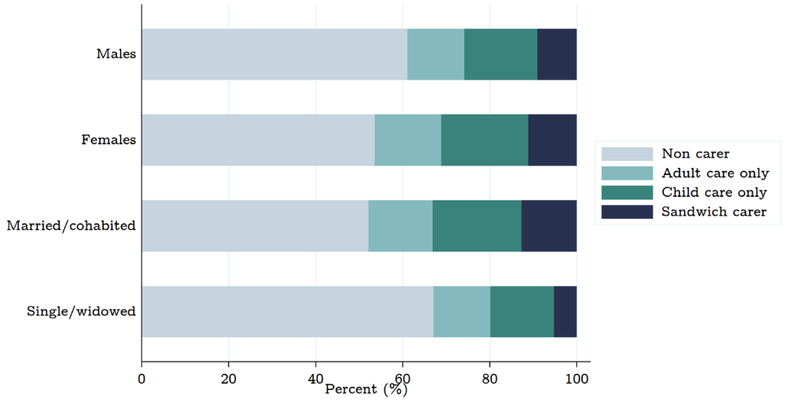


Figure 4 shows informal care giving by deprivation groups. There is a tendency that the most and least deprived groups are less likely to be carers compared to other groups. They, the most deprived group in particular, are also less likely to be sandwich carers. Further, we have also examined how deprivation is related to care intensity. As shown in Table 1, it is clearly that people from deprived groups are more likely to provide long hours of care compared with their less deprived counterparts. This is consistent with the findings from the 2011 Census showing that there are differences between least and most deprived areas with the percentage caring for more than 35 hours increases with increasing deprivation.

Figure 4. Informal care giving by deprivation levels (SIMD)

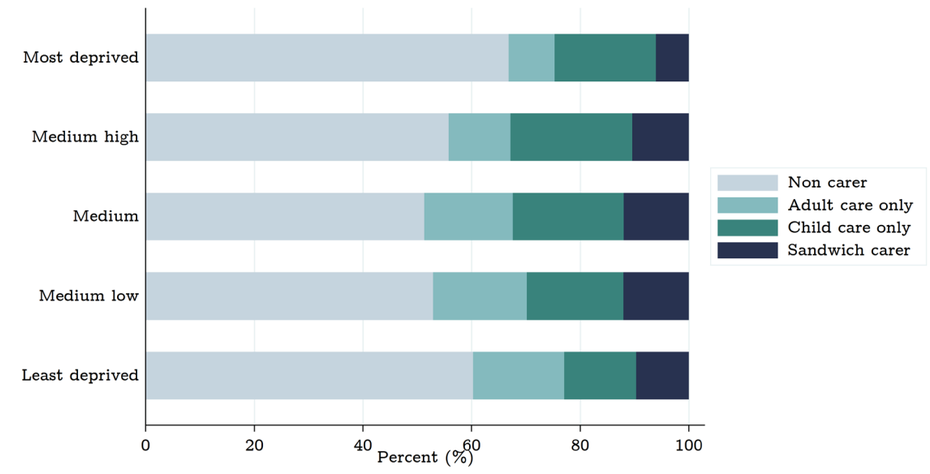


Table 1. Care intensity by deprivation groups

	Most deprived	Medium high	Medium	Medium low	Least deprived
1-4	32.3%	28.4%	34.1%	50.5%	50.2%
5-9	22.1%	25.2%	34.9%	14.9%	16.3%
10-19	6.9%	8.44%	6.0%	14.7%	15.1%
20-34	14.2%	15.3%	5.5%	12.6%	10.7%
35+	24.5%	22.8%	19.3%	7.3%	7.8%

Informal care giving is also related to age. As shown in Table 2, people from younger age groups are more likely to be providing care, which is true for both males and females. The 60 to 69 age group appears to be less likely to provide care compared the 50 to 59 group for males. However, there is little difference between these two age groups for females.

Table 2. Percentage of people providing either adult or child care by sex

Age groups	Males	Females
50-59	39.8%	42.7%
60-69	30.4%	46.0%
70-79	20.6%	27.6%
80+	3.0%	8.6%

The data finds continuity with other studies in that caregiving is a traditionally female role within and outside the household. However, HAGIS found slightly more respondents providing care than the Scottish Health Survey (SHeS). The Scottish Health Survey which asked the same question found that for adults over the age of 16, 5% said they provided help up to 4 hours a week and 3% over 35 hours of care a week. Scotland's 2011 census however identified 9% of respondents as carers (given the same HAGIS question) with 11% of the population over 16 identified as carers and over 4% providing 35 hours or more of care per week. The disparity between the different surveys can be partially explained through the different methods of data collection – both HAGIS and the Census being collected at household level rather than an individual level in SHeS. Further explanations for differences between the SHeS and the census are discussed in (Scottish Government web address here).

Given the time between the 2011 Census and the HAGIS data collected in 2016 we see slight change in the proportion of the population that provides care.

ADL, IADL and Receiving Care

10% of respondents had at least one ADL problem. Of those 72% had difficulties dressing, 28% walking, 57% bathing or showering, 22% eating, 33% getting in and out of bed and 20% using toilet. On average, about 47% of them received care from different sources. The nature of such help came from spouses or partners with daughters playing an important supportive role. Similarly, around 10% of respondents had at least one IADL problem, in relation to which, 49% had difficulties preparing a meal, 56% doing household chores, 61% shopping, 14% making phone calls, 17% taking medications and 24% required help with managing their money. Among those who need help, about 83% received help from others. Again, partners and spouses followed by children were significant in providing care.

As shown in Table 3, being old, female and married made it more likely that there would be help with ADL and IADL activities (or they were more likely to report getting help). Deprivation is also related to care receiving. The results show that people with high level of deprivation are more likely to receive help with ADL activities; whereas people from the medium deprivation group are those who are mostly likely to receive help with IADL activities.

Table 3. Receiving help with ADL and IADL activities by age, sex, marital status and deprivation level

		Received help with ADL	Received help with ADL
Age	50-59	44.2%	72.0%
	60-69	46.5%	78.3%
	50-59	44.2%	72.0%
	80+	48.9%	96.9%
Sex	Males	42.9%	65.5%
	Females	50.1%	97.0%
Marital	Married/cohabited	59.0%	85.7%
Status	Singleton/widower	36.1%	80.2%
SIMD	Most deprived	57.5%	81.0%
	Medium high	67.0%	80.2%
	Medium	27.3%	91.3%
	Medium low	32.5%	83.4%
	Least deprived	34.4%	83.9%

In additional to informal care, 36% of respondents reported having received paid help in the last 2 years.

Informal care remains a female dominated area in terms of who gives and who receives care – being female you are more likely to receive as well as give care at various times of life. The impact of this pattern on employment and physical as well as mental wellbeing is explored below.

Impact on employment

The HAGIS data also finds that people who are employed are more likely to provide unpaid care (see Table 4). This will have implications for employment, income as reported in other studies (Evandrou and Glaser, 2003). In the HAGIS study however about 7% of people who worked reduced their hours because of caregiving and few mentioned the reason for retirement as providing care. However, 5% did mention the ill-health of a relative or friend as the main reason for retirement.

Table 4. Employment and care giving by age groups

Employment status	Giving care (below age 65)	Giving care (65+)
Not working	37.0%	21.8%
Working	41.0%	28.0%

Impact on physical and mental wellbeing

In HAGIS, respondents were asked to rate their own physical and mental health on a scale of 1 to 5. Ordered logistic regression models were fitted to examine the relationship between care giving and health. The results are presented in Table 5. We see that carers tend to report better physical health than non-carers, after adjusting for sex, marital status, age and deprivation. This relationship is not necessarily causal indicating that being a carer improves one's health. An alternative explanation is people with better health condition are more likely to take on a carer role. As for the relationship between care giving and mental health, we find no significant association.

Table 5. Results from ordered logistic regression models of carers' subjective physical and mental health

		Subjective physical health (N=855)		Subjective mental health (N=847)	
		coef	SE	coef	SE
	Carer	0.44*	(0.18)	0.01	(0.18)
	Female	0.01	(0.16)	-0.10	(0.16)
	Married	-0.06	(0.17)	0.46*	(0.18)
Age	60-69	-0.57*	(0.25)	-0.20	(0.25)
	70-79	-0.47†	(0.26)	-0.19	(0.26)
	80+	-0.39	(0.26)	0.19	(0.29)
SIMD	Medium high	0.53*	(0.25)	0.15	(0.26)
	Medium	0.81**	(0.27)	0.61*	(0.29)
	Medium low	1.10***	(0.27)	0.68*	(0.24)
	Least deprived	1.17***	(0.24)	0.39	(0.24)
	Cut 1	-1.47	(0.33)	-2.42	(0.38)
	Cut 2	-0.18	(0.32)	-0.85	(0.33)
	Cut 3	1.24	(0.32)	0.75	(0.33)
	Cut 4	3.12	(0.34)	2.62	(0.35)

Notes: 1) † p<0.1 * p<0.05 ** p<0.01 *** p<0.001; 2) the reference category for age is 50-59, for SIMD is the most deprived; 3) probability weight was used

Further, we generated a continuous score of loneliness based on the short-form UCLA Loneliness Scale (UCLA-6) (Russell, 1988) using factor analysis[10]. The results from an ordinary least squares (OLS) model indicate that the relationship between care giving and loneliness is not statistically significant.

Further analysis and caveats

There are a number of issues to be addressed going forward. This chapter briefly explores informal or unpaid care which is often under reported particularly by women, as care giving is seen as a normal part of their role within family /community life or they do not see emotional support as a caregiving task. In addressing this issue of under reporting, Rutherford and Bu (2017) draw attention to the importance of acknowledging both the wording of 'care', 'help' 'support' and who to ask in the survey (care giver or recipient). In analysing ELSA data they find that under reporting by carers is concentrated amongst those providing fewer than nine hours per week to support a spouse.

In line with other studies (e.g. ELSA) more personal care is given to family, however we know how many respondents give personal help to relatives, friends and neighbours but we do not know how many received help in terms of personal care from these sources in the last 2 years.

Conclusions

HAGIS provides a snapshot of informal or unpaid care and has potential to look at this topic across the lifecourse. It will also provide a lens on informal vis a vis formal care when health and social care data are merged. This will provide a very powerful platform on which to address research regarding the future nature, intensity and scale of care in Scotland as well as enable policy and practice to deliver tailored solutions to the challenges of health and social care and support of carers and recipients of care.

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Evandrou, M and Glaser, K. (2003) Combining work and family life: the pension penalty of caring, *Ageing & Society* 23, 583–601. DOI: 10.1017/S0144686X03001314

Gomez-Leon, M., Evandrou, M. Falkingham, J. and Vlachantoni, A. (2017) The dynamics of social care and employment in mid-life, *Ageing & Society*, 35, 2. https://doi.org/10.1017/S0144686X17000964

Russell, D. (1988). The measurement of loneliness. In: Peplau, L. A.; Perlman, D. (Ed.). *Loneliness: sourcebook of current theory, research and therapy*. New York: Wiley, p. 81-104.

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4. Disability Benefits

4. Disability Benefits

David Bell, University of Stirling

- The HAGIS questionnaire includes validated measures of physical activity
- Levels of physical activity varies considerably across Scotland's older population
- Physical activity declines with age
- The relationship between physical activity and area deprivation is complex
- Females are less active than males, which is perhaps a reflection of frailty among older women
- Among those that might be classed as disabled due to their inability to carry out low level physical tasks, some, but by no means are all in receipt of disability-related welfare benefits.

This chapter examines the characteristics of HAGIS respondents who are claiming disability benefits that relate to personal care. These comprise Disability Living Allowance (DLA) and Attendance Allowance (AA). Individuals who have a physical or mental disability that is severe enough to require care or supervision may be eligible for these benefits. DLA is payable to those aged under 65, whereas AA is only available to those aged 65+. DLA will soon be replaced by Personal Independence Payments (PIP). However, most disabled respondents to HAGIS received either AA or DLA.

The Scottish Government will soon take control over a number of disability-related benefits. DLA/PIP (current expenditure £1465 million) and AA (current expenditure £485 million) account for more than half of the £2.7bn worth of benefits that the Scottish Government will administer in the future.

Neither AA nor DLA is means tested. Scotland also has a policy of "free personal care" whereby local authorities do not charge for care provision that relates to personal care.

The HAGIS questionnaire includes a battery of questions designed to calibrate functional disability. Individuals are asked whether they can perform each of a range of 11 activities (listed below). This measure is used in other ageing studies, including the Health and Retirement Study (Fonda & Herzog, 2004)They range from running or jogging 1.5 km to picking up a small coin from a table.

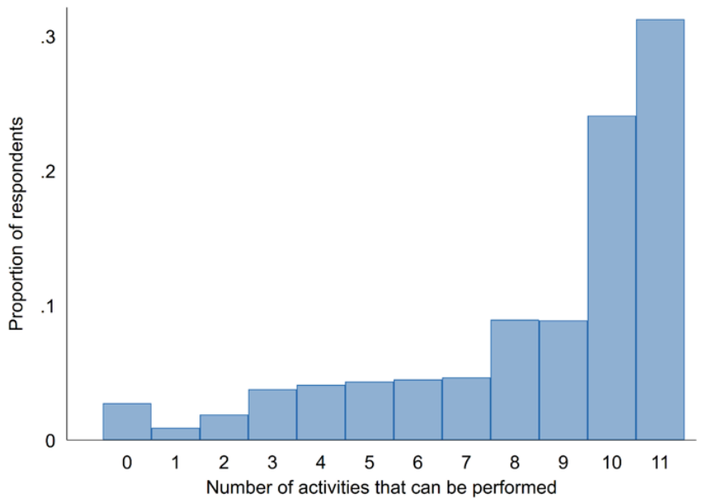
HAGIS – Measure of Physical Function

Because of a physical or mental health problem, do you have difficulty doing any of the activities on this card? Exclude any difficulties that you expect to last less than three months.
CAN SELECT MORE THAN ONE - SHOW CARD DIFFICULTIES_1

- Walking 100 meters (100 yards) (1)
- Running or jogging about 1.5 kilometres (1 mile) (2)
- Sitting for about two hours (3)
- Getting up from a chair after sitting for long periods (4)
- Climbing several flights of stairs without resting (5)
- Climbing one flight of stairs without resting (6)
- Stooping, kneeling, or crouching (7)
- Reaching or extending your arms above shoulder level (8)
- Pulling or pushing large objects like a living room chair (9)
- Lifting or carrying weights over 10 pounds/5 kilos, like a heavy bag of groceries (10)
- Picking up a small coin from a table (11)

The distribution of the number of tasks that the respondents reported they could perform is shown in Figure 1 below.

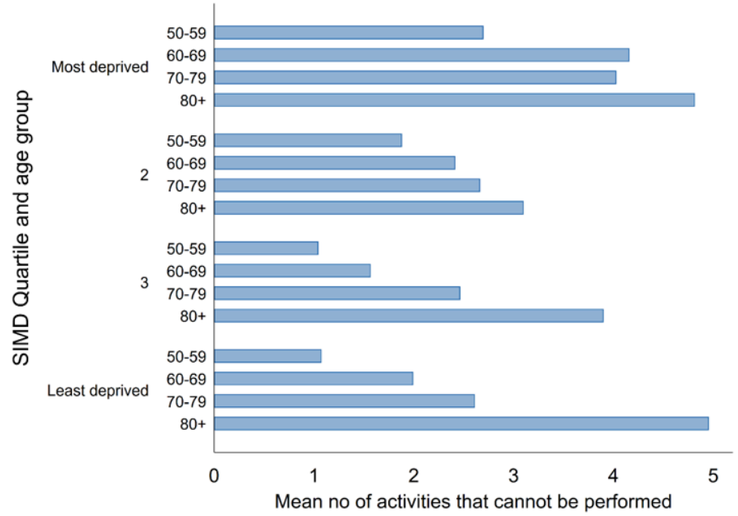
Figure 1: Number of activities that can be performed (weighted)



57% of the sample reported being able to carry out at least 10 of the activities. The remaining 43% had varying levels of inability to carry out the tasks. The most common inability was being unable to run or jog 1.5 km: only 35% of the sample felt able to carry out this task.

One might expect that the ability to perform the activities would decline with age. However, another potential influence might relate to Scotland's high levels of health inequality. Health inequalities in Scotland are usually calibrated by contrasting health measures across areas characterised by different levels of deprivation. The Scottish Index of Multiple Deprivation (SIMD) is a categorisation of levels of deprivation in Scotland's 6505 datazones based on a range of indicators covering topics such as crime, health, income, benefit dependency etc. are drawn from government statistical sources including the census. These indicators are drawn into a composite index which is then ranked. The distribution of data zones by their ranking is divided into deciles, quintiles, quartiles etc. which in turn can be used to help understand variations in social and economic outcomes across Scotland. In this case, our interest is in the mean number of activities that cannot be performed by age group and by level of deprivation. Results are shown in Figure 2 below.

Figure 2: Mean Number of Activities That Cannot Be Performed by SIMD Quartile and Age Group



4. Disability Benefits

Figure 2 illustrates how functional disability varies with age. Note that not only is there a general decrease in the number of activities that individuals can perform as the region increases, the same is true within each SIMD quartile. Thus, for those aged 50-59 living in the least deprived SIMD quartile, only one activity on average cannot be performed. For those aged 80+ living in the same type of area, an average of 5 activities cannot be performed.

The gradation by age is clearest within the least deprived SIMD quartile. In contrast, in the most deprived areas, the mean number of activities that the younger old (those aged 50-59) are unable to carry out is more than double that in the 3rd and least deprived quartiles. In the most deprived areas, disability is more evenly distributed across age ranges, suggesting that the "compression of morbidity" is much lower in deprived areas. These individuals experience longer periods of disability.

To confirm these results we estimated a negative binomial model of the number of activities that individuals were unable to perform where the right-hand side variables are age bands, deprivation quartile and gender. The excluded categories are those aged 50-59, the most deprived SIMD quartile and males. The model is estimated with robust standard errors. Results are shown in Table 1 below.

Table 1: Negative binomial regression on number of activities that cannot be performed

Variable	
Age 50-59 (ref)	
Age 60-69	0.418***
Age 70-79	0.608***
Age 80+	0.994***
Most deprived (ref)	
SIMD2	-0.283**
SIMD3	-0.710***
Least Deprived	-0.488***
Female	0.279***
Constant	0.360*
/lnalpha	-0.174*
bic	4353.481
N	1044
chi^2	185.842

legend: * p<0.05; ** p<0.01; *** p<0.001

4. Disability Benefits

In line with Figure 2, there is a clear and significant increase by age in the number of activities that HAGIS respondents felt that they could not complete. After controlling for age, there is also a significant reduction in the number of activities that cannot be performed (increase in the number that can be performed) between the areas within the most deprived SIMD quartile and other, less deprived, areas. However, perhaps surprisingly, the coefficient on the third deprivation quartile suggests that, controlling for other factors, the number of activities that cannot be performed is slightly less than in the least deprived quartile. Finally, the coefficient on gender is significant and suggest that females are slightly more restricted in the number of activities they can complete.

We now examine how claims for disability-related benefits i.e. AA or DLA vary by number of activities that can be carried out. Such analysis may indicate the extent of latent demand for benefits: if a large proportion of the functionally disabled already receive benefits, then the latent demand is likely to be small; conversely, where only a small proportion of the very disabled (those able to carry out very few of the activities) receive benefits, then there may be considerable potential for increased benefit uptake. This analysis is shown in Figure 3, which focuses on those unable to carry out at least six of the activities. This group was divided into three categories based on the number of activities that they felt unable to carry out i.e. those unable to complete 6 or 7 activities (labelled "Low"), 8 or 9 activities (labelled "Medium") and finally, the most disabled group who could only manage none or only one of the 11 activities (labelled "High"). This grouping was carried out to ensure reasonable sample sizes within each group. Together, there were 190 individuals within the sample at these levels of disability. Only 37 of these were at the highest level of disability (10-11) while 91 were unable to carry out 6 to 7 of the activities.

Figure 3: receipt of disability benefits by number of activities that cannot be performed

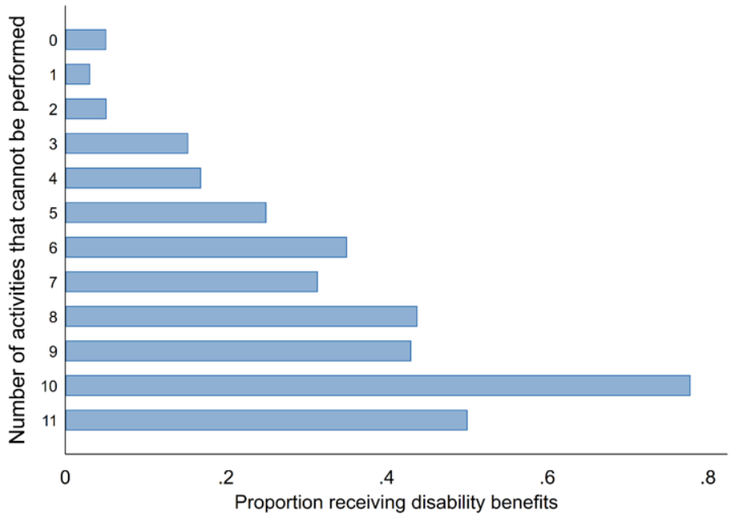


Figure 4 shows that increasing disability is associated with increases in the likelihood of receiving AA or DLA. Of those unable to carry out 8 or 9 activities, more than 40% claimed either AA or DLA. For those unable to carry out 10 or 11 of the tasks, more than half claimed AA or DLA. However, even for those with a seemingly significant level of disability, a large proportion were not in receipt of disability-related benefits.

There are a number of possible explanations for this finding. There may be error due to the relatively small sample. Some of the respondents may have forgotten whether or not benefits are being claimed and may have incorrectly assessed their ability to carry out the activities. Further, the questions asked in the HAGIS survey differ from those that are used to assess individual eligibility for disability benefits. Nevertheless, given the extent of the new commitments being taken on by the Scottish Government, there is a strong argument for continuing this type of research and seeking to understand why some seemingly seriously disabled individuals are not claiming disability -related benefits.

Conclusions

This chapter has examined data from HAGIS that relates to disability. Specifically, we focus on a set of questions which seek to determine which of a range of 11 tasks survey respondents are able to carry out. These range from the relatively easy such as picking up a coin from a table to running or jogging for 1.5 km. Results indicate that there is a clear age gradient in levels of disability: older people are significantly less likely to be able to engage with the activities. Secondly, levels of disability are significantly higher in the most deprived quartile of Scotland's data zones. This is true both unconditionally and also after accounting for differences in the ages of respondents across data zones. However, above the bottom quartile, there is no clear gradation in disability levels with reductions in deprivation.

Finally, the data indicate that, while individuals that are less likely to be able to carry out the tasks are more likely to claim disability benefits, there appear to be significant numbers of moderately to severely disabled people who, for whatever reason, are not claiming disability-related benefits. This is particularly important at this time because the Scottish Government is due to take responsibility for these benefits in the near future. Clearly, a finding that there may be latent demand for benefits is worthy of further critical examination. Both a larger sample size and further insights into what motivates respondents to claim that they can, or cannot, carry out the tasks included in the HAGIS question set would potentially be very useful.

5. Volunteering in Older Age in Scotland

5. Volunteering in Older Age in Scotland

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- The patterns of volunteering participation amongst HAGIS respondents are in line with other similar social surveys containing volunteering questions. The descriptive analysis shows the importance of the transition between employment and retirement as a key time for volunteering participation.
- We also show the association between volunteering participation and wellbeing. Volunteers have more positive expectations of their life expectancies than non-volunteers, and also rate themselves with higher subjective wellbeing.
- We show that there are associations between prosocial motivations (using volunteering as a proxy) and engagement with HAGIS. Volunteers were more likely to be enthusiastic about participating in HAGIS, and were also more likely to consent to administrative data linkage. This suggests a role for altruistic motivation in encouraging survey participation, and further work could consider the implications for how respondents should be asked for consent to data linkage.

Introduction

Volunteering has the potential for positive impacts on the health and well-being of older people (Nazroo & Matthews, 2012). A review of research into the relationship between volunteering and health, published by Volunteering England, described how the relatively small academic literature showed an 'overwhelmingly' positive impact of volunteering on health (Rochester, 2006).

Both the quantitative levels and qualitative nature of volunteering vary geographically, across a broad range of social and economic characteristics (Milligan and Conradson 2007; Musick and Wilson 2010), and the role of place (context) rather than socio-economic factors (composition) in influencing levels of volunteering continues to be debated (Mohan et al 2006). Rates of volunteering in Scotland vary by age, income and gender (Hurley et al 2008). With regards to rurality it is clear that the nature of the third sector in Scotland - that is the charities through which volunteers often participate and through which services are often delivered – varies in its distribution, with higher rates of charities per head in remote and rural areas compared to urban areas (Keller et al. 2012). Rates of formal volunteering have also – since data was first collected - been consistently higher in more rural areas of Scotland relative to more urban areas (Hurley et al 2008). Furthermore, research has found that this is the case even after controlling for the income and demographic differences (Harper and Rutherford 2011).

At the same time, changes in retirement ages, caring responsibilities and work in later life affect the capacity and opportunity for people to volunteer in older age. HAGIS provides an opportunity to understand the characteristics of volunteering amongst older people in Scotland, and this chapter describes the patterns in formal volunteering participation for the HAGIS pilot sample.

McPherson & Rotolo (1996) has argued that education is the most consistent predictor of volunteering. As years of education increases, the likelihood of volunteering increases (Hustinx, Cnaan, and Handy, 2010). It is also widely accepted that income affects the supply of volunteers (Menchik and Weisbrod, 1987). Marital status has been shown to impact on the decision to volunteer. A married individual is more likely to volunteer (Wilson, 2000) particularly if their spouse already volunteers (Freeman, 1997). Volunteering rises with age; this is partly explained through increasing social capital (Menchik and Weisbrod, 1987, Schoenberg, 1980). It is also a function of time available, as participation increases following retirement. An individual with large and extensive social networks is more likely to volunteer (Wilson and Musick, 1997, Jackson, Bachmeier, Wood, and Craft, Spring 1995, Marwell, 1993, McPherson, Popielarz, and Drobnic, 1992, Smith, Fall 1994).

Measuring Volunteering in HAGIS

HAGIS asks all respondents a broad volunteering question which is harmonised with ELSA:

Q: "Are you involved in voluntary work or charitable activity?"

A:
1. No
2. Yes, 1-4 hours per week
3. Yes, 5-9 hours per week
4. Yes, 10-19 hours per week
5. Yes, 20-34 hours per week
6. Yes, 35-49 hours per week
7. Yes, 50 hours or more a week

Below we explore how volunteering participation varies across individual characteristics.

Who volunteers in Older Age?

In the HAGIS sample, men volunteer at a higher rate than women. Participation is highest immediately following retirement age, falling to pre-retirement levels only for those aged over 80. Interestingly, despite the age gradient in participation, respondents who were in employment had a slightly higher participation rate than those in retirement. People who are married, and to a lesser extent living with a partner, are more likely to volunteer than those who are separated, divorced or widowed. Participation is lowest for those who are single and never married.

TABLE 1 Volunteering Participation

		Volunteering Participation (%)	Base
Sex	Male	16.8	457
	Female	15.0	588
Age	50 to 54	17.9	101
	55 to 59	12.0	153
	60 to 61	12.4	63
	62 to 64	11.5	108
	65 to 69	16.2	171
	70 to 74	24.0	157
	75 to 79	19.0	132
	80 to 84	13.6	92
	85 to 89	11.0	49
	90 or over	19.9	14
Highest Qualification	O-Level and below	7.0	533
	Highers / HND	16.22	287
	Degree-level	37.0	220
Employment Status	Retired	17.2	656
	Employed (including u	18.5	232
	Self-employed	19.3	53
	Unemployed	3.5	15
	Permanently sick or d	0.6	59
	Looking after home or	9.9	21
	Other (specify)	5.0	10
Marital Status	Married	18.5	603
	Living with a partner	14.9	54
	Single (never married)	9.3	84
	Separated	12.3	28
	Divorced	13.8	83
	Widowed	13.2	194
Total		16.0	1,045

In HAGIS, volunteering intensity is measured as the number of hours spent volunteering per week, shown in Table 2. More than two-thirds of volunteers do so for between one and four hours per week. Only about a sixth of volunteers commit more than ten hours per week to their volunteering. The intensity of participation by women is more polarised with men, with greater proportion both volunteering for a few hours and volunteering intensively. The number of volunteering hours decrease with age, falling dramatically above age 80. Surprisingly there is little difference in the pattern of volunteering hours between respondents who are employed versus those who are retired. The volunteers who are self-employed have much higher volunteering intensity, but this is based on a small sample of just 13 respondents. Volunteering participation is more intense for respondents who are married, and lowest for those who are divorced.

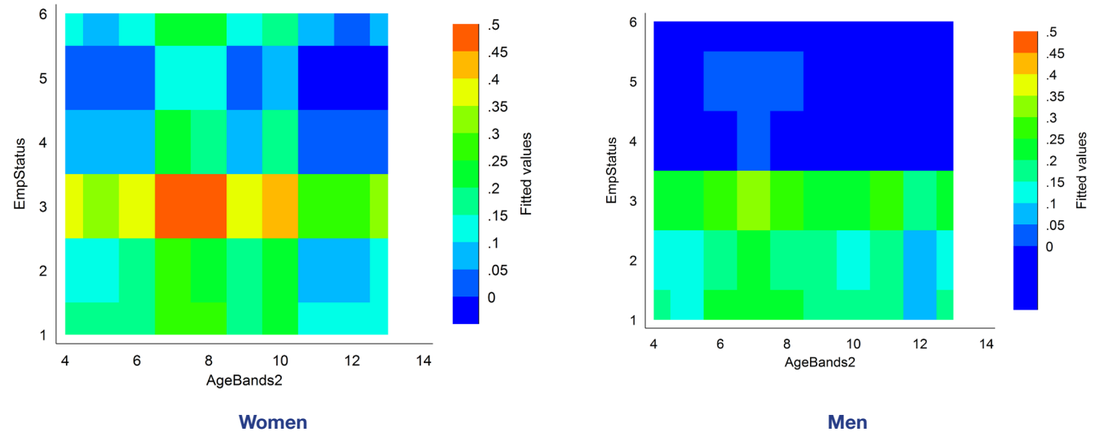
TABLE 2 Volunteering Intensity

		Volunteering Participation 1 – 4 hours per week (%)	Volunteering Participation 5 - 9 hours per week (%)	Volunteering Participation >10 hours per week (%)	Base
Sex	Male	66.7	20.9	12.5	79
	Female	73.3	11.0	15.7	101
Age	50 to 59	59.6	22.9	17.5	34
	60 to 69	68.8	13.9	17.3	63
	70 to 79	76.9	12.6	10.6	63
	80 +	84.3	13.1	2.6	20
Highest Qualification	O-Level and below	84.4	5.9	9.7	47
	Highers / HND	68.2	16.0	15.9	55
	Degree-level	63.8	21.6	14.7	78
Employment Status	Retired	73.0	13.8	13.2	122
	Employed	70.6	14.8	14.6	39
	Self-employed	48.4	36.7	14.9	13
Marital Status	Married	65.8	17.3	16.9	113
	Single (never married)	79.7	0.0	20.3	12
	Divorced	87.9	5.7	6.4	13
	Widowed	80.0	10.8	9.2	30
Total		69.5	16.6	13.9	180

Volunteering and Retirement

We can explore the interaction of age and employment status in the HAGIS sample by estimating a regression model of volunteering probability on sex, age and employment status. The heat map in Figure 1 shows the predicted volunteering probabilities for men and women by employment status and age. The group with the highest probability of volunteering are self-employed women in their 60s. Men's probability of volunteering is pretty constant whether retired, employed or self-employed, and is very low if they are sick or caring for others. Women, on the other hand, have a higher probability of volunteering even if permanently unwell, at least until they are into their 80s.

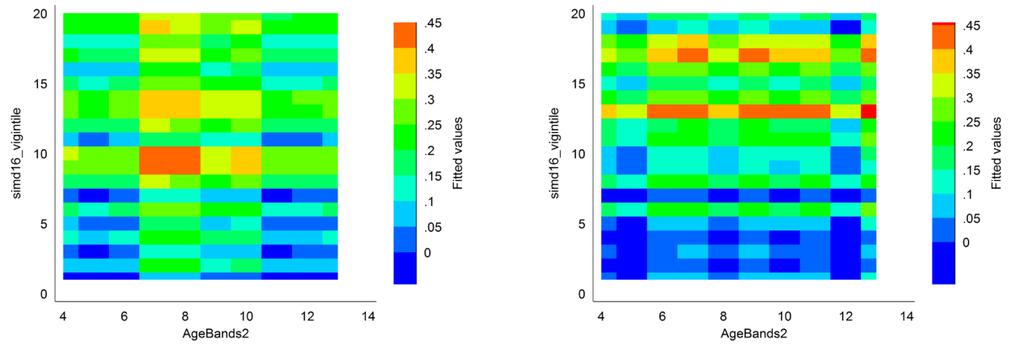
FIGURE 1 Heat map of Participation by Sex, Age and Employment Status



Women **Men**

Similarly, we estimated a regression model of volunteering probability on Age and SIMD. The predicted volunteering probabilities are shown in the heat map in Figure 2. Participation is lowest in the most deprived areas for both men and women. It peaks around retirement age for women, but is more variable across age for men. The boost in volunteering participation by deprivation occurs at a lower level of deprivation for women than men.

FIGURE 2 Heat map of Participation by Sex, Age and SIMD



Women **Men**

Volunteering & Wellbeing

People who volunteer have a more positive outlook on the life expectancy of both themselves, and others of their age, compared to non-volunteers. Table 3 shows that volunteers expect both themselves and others to live an average of three years longer, compared to the expectations of people who do not

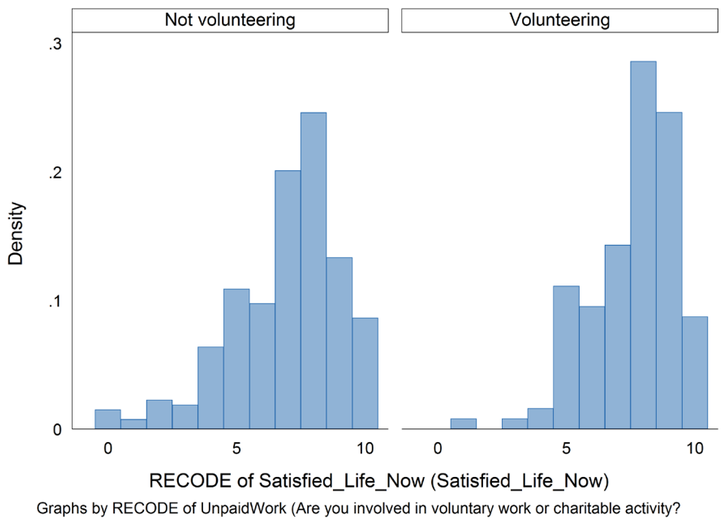
TABLE 3 Volunteering and Expectations of Longevity

Volunteering	Expect Others to Live to …	Std Deviation	Base
Not volunteer	80.95	12.03	566
Volunteer	83.60	8.70	129
Total	81.40	11.58	695
	Expect self to Live to …		
Not volunteer	81.64	9.82	536
Volunteer	84.89	6.52	124
Total	82.20	9.42	660

This difference remains even after controlling for age and sex differences between volunteers and non-volunteers. By estimating a regression of subjective life expectancy controlling for age and sex, we estimate that volunteers expect to live over two years longer than non-volunteers.

Volunteers also report slightly higher levels of life satisfaction (mean = 7.59, s.d. = 2.12) than non-volunteers (6.88, s.d. = 1.58). The histogram in Figure 3 shows that this is driven by a lower proportion of really low life satisfaction scores by volunteers.

FIGURE 3 Histogram of Life Satisfaction by Volunteering Participation



Volunteers seem to have bigger social networks. Respondents who volunteer report having an average of 4.3 close friends, compared to just 3.1 close friends for non-volunteers. Volunteers are also much less likely to report feeling isolated, left out, lonely, or depressed, as seen in Table 4.

TABLE 4 Volunteers are more connected to those around them

Hardly ever or never	Not Volunteer (%)	Volunteer (%)	Base
… lack companionship	54.87	71.62	391
… feel left out	58.44	71.04	413
… feel isolated from others	63.28	76.26	446
… feel in tune with the people around you	11.81	10.63	84
… feel lonely	58.13	74.95	415
… feel sad, low or depressed	46.16	62.23	353

Comparing Participations: Volunteering Participation and HAGIS Responses

The prosocial motivation that drives volunteering participation is likely to also lead to observing greater levels of other prosocial activities by individuals who volunteer. Volunteering participation was well-reflected in enthusiasm about participating in HAGIS. Survey respondents were asked to rate their enthusiasm about HAGIS on a five point scale. Table 5 shows that nearly a third of those who were very enthusiastic about HAGIS were volunteers, compared to only 10% of those who rated their enthusiasm at the bottom of the scale.

TABLE 5 Volunteering Participation and Enthusiasm About HAGIS

Enthusiasm about HAGIS		Volunteering Participation (%)	Base
Not enthusiastic	1	0.0	8
	2	10.6	132
	3	14.2	328
	4	19.1	302
Very Enthusiastic	5	29.7	93
Total		17.1	863

As part of the survey incentives, respondents were offered either a cash payment or for a donation to be made to charity on their behalf. Just over 22% of respondents chose the charitable donation. Of those, 20% volunteered, compared to just 14% of respondents who chose the cash payment.

TABLE 6 Volunteering Participation and Survey Incentives

	Volunteering Participation (%)	Base
No answer	14.1	78
Cash given	14.4	734
Charity Donation	20.5	235
	16.0	1,047

HAGIS respondents were also asked to consent to the linkage of their survey responses to administrative datasets, including health records, dentistry, social care, education and DWP/HMRC records. Volunteering participation is only slightly above average for those consenting to various forms of data linkage. However for those respondents who refused all forms of data linkage the rate of volunteering participation is half of the whole-sample average.

TABLE 7 Volunteering Participation and Data Linkage Consents

Linkage Consent	Consent Rate in sample (%)	Volunteering Participation (%)	Base
Health Records	85.2	16.9	893
Dentistry Records	81.9	17.1	858
Social Care Records	80.9	16.6	849
Education Records	80.4	16.2	842
DWP/HMRC Records	76.6	17.6	803
Refused all data linkage	12.2	8.9	127
Whole Sample		16.0	1,045

Conclusion

The patterns of volunteering participation amongst HAGIS respondents are in line with other similar social surveys containing volunteering questions. The descriptive analysis shows the importance of the transition between employment and retirement as a key time for volunteering participation. Further waves of HAGIS will provide us with the longitudinal data necessary to explore individual transitions between employment statuses, and how this interacts with volunteering.

We also show the association between volunteering participation and wellbeing. Volunteers have more positive expectations of their life expectancies than non-volunteers, and also rate themselves with higher subjective wellbeing. Respondents who volunteer report having a greater number of close friends, and are much less likely to report feeling lonely or disconnected from others. Further HAGIS waves will allow us to explore the causal relationship between volunteering and wellbeing in older age.

Lastly, we show that there are associations between prosocial motivations (using volunteering as a proxy) and engagement with HAGIS. Volunteers were more likely to be enthusiastic about participating in HAGIS, and were also more likely to consent to administrative data linkage. This suggests a role for altruistic motivation in encouraging survey participation, and further work could consider the implications for how respondents should be asked for consent to data linkage.

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6. Online Shopping and Service Use in an Older Population in Scotland

6. Online Shopping and Service Use in an Older Population in Scotland

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- 76% of Scotland's older population use the internet. Internet usage by older people in Scotland is higher than the average across OECD countries.
- The most common internet activities for older people are using email (67%), finding information about goods and services (66%) and online shopping (54%).
- Internet usage is less frequent as age increases. 56% of people aged 80 or over report that they never use the internet.
- Amongst internet users there is no age difference in the proportion using email. Older internet users are less likely to use the internet to find information or shop online.

Introduction

'Too old to be interested in online shopping and services?'

Societies are ageing not only in Europe but also in many parts of the world (Bailey, 2009; Settersten Jr, 2006; Zniva & Weitzl, 2016. Despite being a global phenomenon, the bulk of existing research is US-focused. The HAGIS (Healthy Ageing In Scotland) study provides an opportunity to explore ageing issues in the Scottish context. The focus of this chapter is on retailing and marketing. The behaviour and attitudes of older people are of considerable interest given the pace of technological advances in retail practices.

Attitudes of older individuals towards online searching for information about goods and services have not been widely investigated (Zniva & Weitzl, 2016), despite increasing technology awareness and usage. Age, personal circumstances and lifestyle have been shown to be important for marketing stimuli (Moschis, et al., 1993). While studies have investigated the dynamics of the ageing process (George & Ferraro, 2015; Mortimer & Shanahan, 2007), little is known about lifestyle and behavioural consequences of older people with regard to internet usage.

6. Online Shopping and Service Use in an Older Population in Scotland

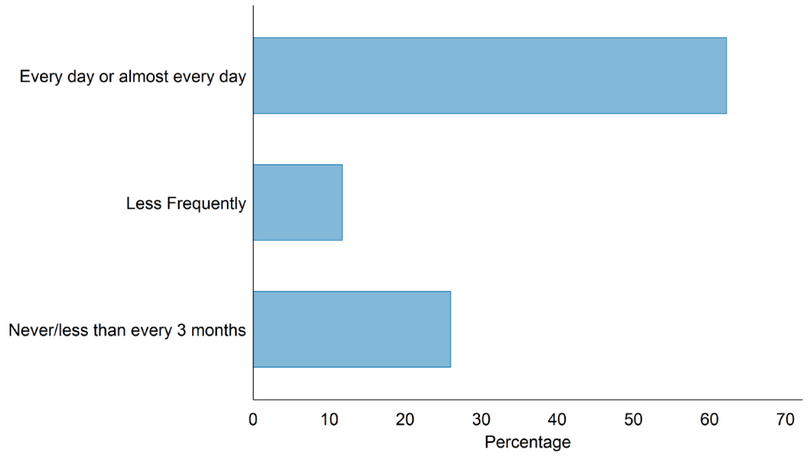
This chapter analyses the HAGIS pilot study with regard to internet usage by older people, specifically searching for information and online purchasing of goods and services as well as the use of email. These activities are becoming increasingly important as they are essential in a variety of sectors including finance and banking (e.g. Milner & Rosenstreich 2013; Harris, Cox, Musgrove, & Ernstberger, 2016), tourism (e.g. Borges Tiago, Couto, Tiago, & Dias Faria, 2016; Eby & Molnar, 2002), food (e.g. Silvera, Meyer, & Laufer, 2012) and retail (e.g. Lange & Velamuri, 2014). Often marketing practices and activities are designed by people far younger than the targeted group, which can lead to tensions and discrepancies between the desired and received message, and different understandings and perceptions of reality by practitioners and older consumers (Thompson & Thompson, 2009). The consequences are the maintenance or exacerbation of the well-known digital divide, as well as potentially lower sales for the businesses and unmet demands of consumers. Cameron, Richardson, and Siameja (2014) note older consumers' dissatisfaction with many existing products and services. The issue is thus not just how goods and services are accessed, whether online or in a physical retail setting, but also the suitability or otherwise of such products and services. Both chronological and perceptional age need to be taken into consideration for all marketing and retailing activities (Groeppel-Klein, Helfgen, Spilski, & Schreiber, 2017).

Analysis

The HAGIS project self-completion questionnaire contains questions referring to Internet usage. This data is combined with information from the main questionnaire about respondent demographics, which enables us to consider specific questions in terms of age. 75.6% of HAGIS respondents use the internet. The same proportion (75.8%) is recorded for comparably aged people in England (Banks, Batty, Nazroo & Steptoe, 2016). In an international context Scotland's older population have a relatively high rate of internet usage. The average percentage share of internet users aged between 55 and 74 in OECD countries is 62.8% (OECD, 2017). As shown in Figure 1, the majority of respondents (62.3%) use the internet frequently (daily or almost every day), whereas 26.0% never use the internet.[11]

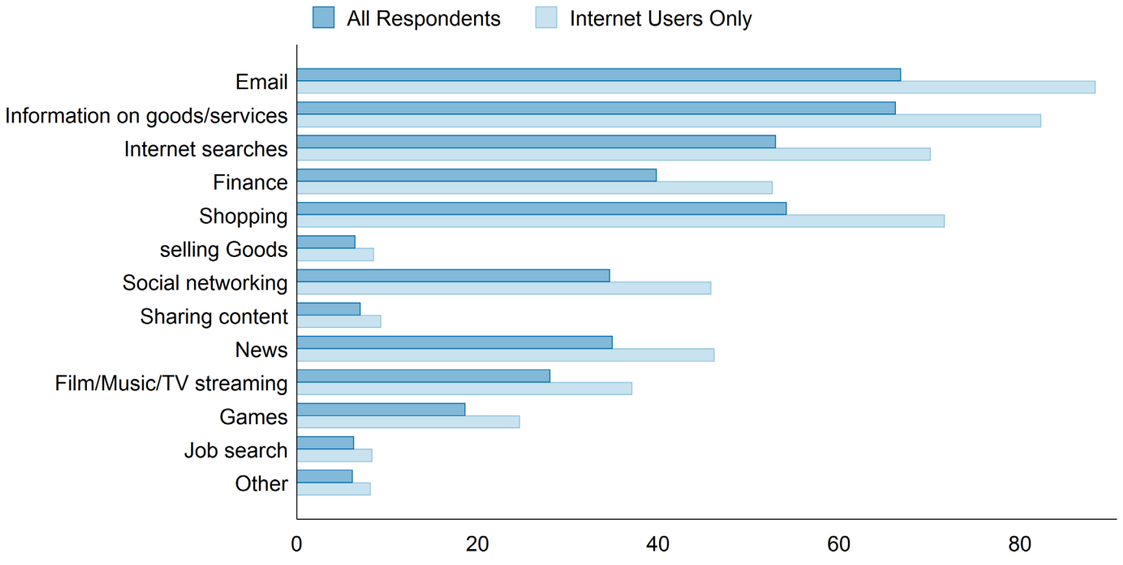
[11]Consistent with the methodology employed in the English Longitudinal Study of Ageing (ELSA), we define very infrequent internet users (less that once every 3 months) as never users.

Figure 1. Internet usage by Scotland's older population



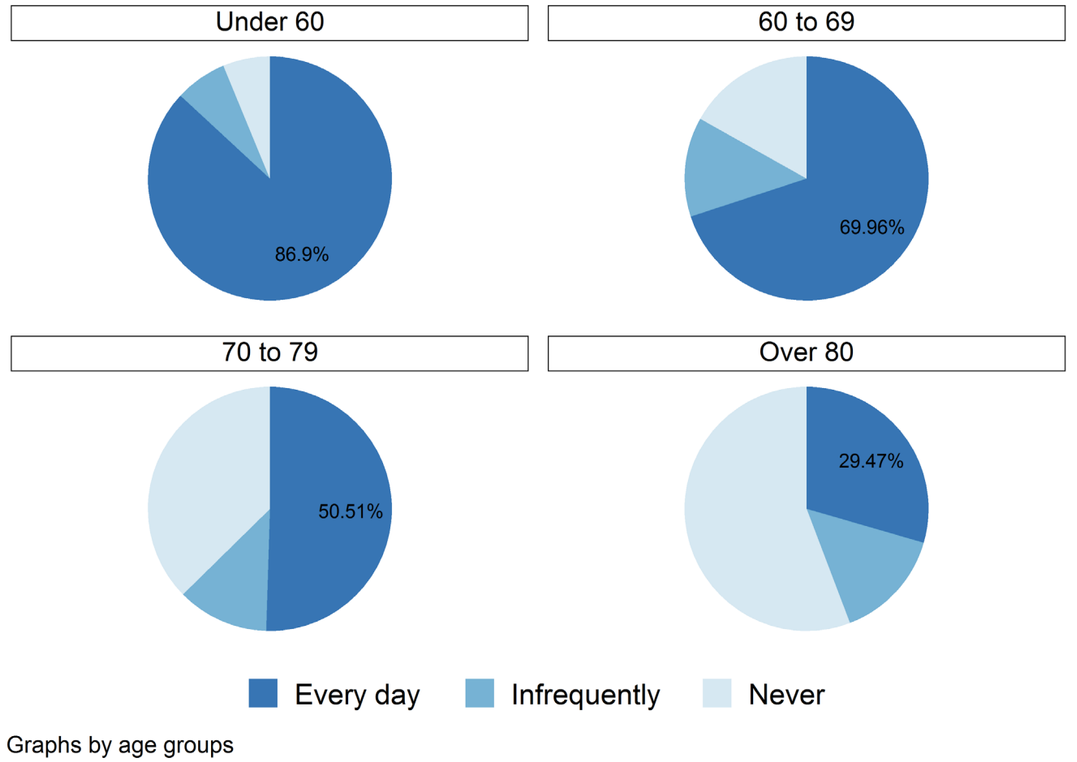
The HAGIS questionnaire asks respondents what type of activities they perform on the internet. The most commonly identified activities are using email, finding information about goods and services, and online shopping. Figure 2 shows the proportion of all older people and internet users who perform each activity. 66.8% of Scotland's older population use email, 66.3% use the internet to find information on goods and services and 54.2% use online shopping. If we restrict attention only to those individuals who report using the internet, 88.4% of internet users use email, 82.3% use the internet to find information about goods and services, 71.7% use online shopping.

Figure 2. Internet Activities



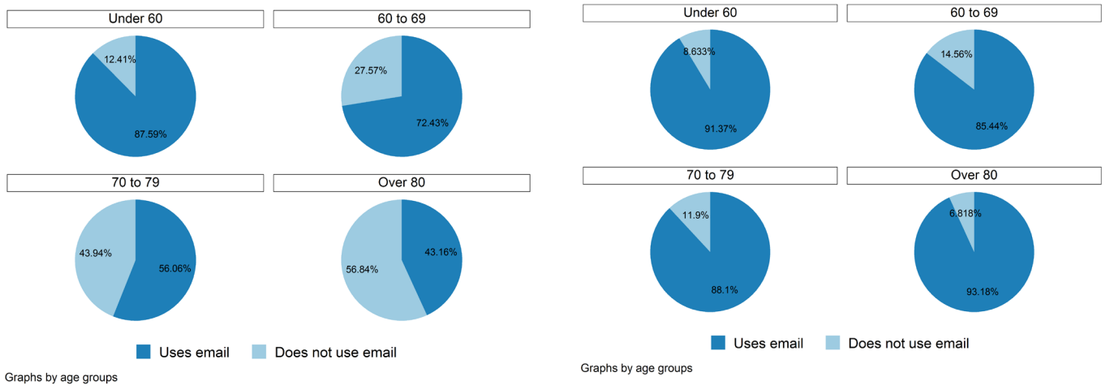
The use, and frequency of use, of the the internet decreases with age. Figure 3 depicts average internet usage by age group. 86.9% of HAGIS respondents aged under 60 used the internet daily. For the 60-69 age group daily use of the internet decreases to 70.0%, and further to 50.5% for the 70-79 age group. For individuals aged 80 or over, just 29.5% use the internet regularly. There is a converse and corresponding age gradient in the proportion who report that they never or seldom use the internet. In the under 60 age group 6.21% do not use the internet, increasing to 16.9% for the 60-69 age group, 37.4% for those aged 70-79 and 55.8% for over 80s.

Figure 3. Average internet usage by age groups.



Sending and receiving emails was the most common internet activity reported by HAGIS respondents. As with general internet usage the proportion of Scotland's older people using email decreases with age, as illustrated in Figure 4. Email usage is almost ubiquitous (87.6%) in the youngest age group. With each decade of age the proportion using email reduces. However, amongst internet users there is little difference in email usage across age groups, and no evidence of decreasing use of email according to age. Indeed the highest proportion of internet users using email is found in the oldest age group.

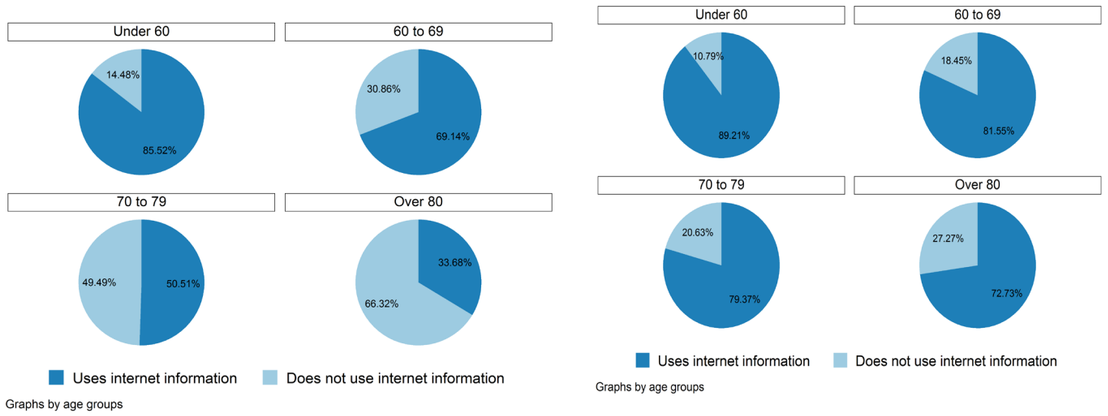
Figure 4. Email usage by age group



a) Total older population **b) Internet users only**

Figure 5 shows the proportion of all older people and internet users who use the internet to find information about goods and services. Again the pattern of decreasing use as age increases is observed. Although a popular activity across internet users, in contrast to email usage, there is a slight decrease in this activity across age groups for internet users.

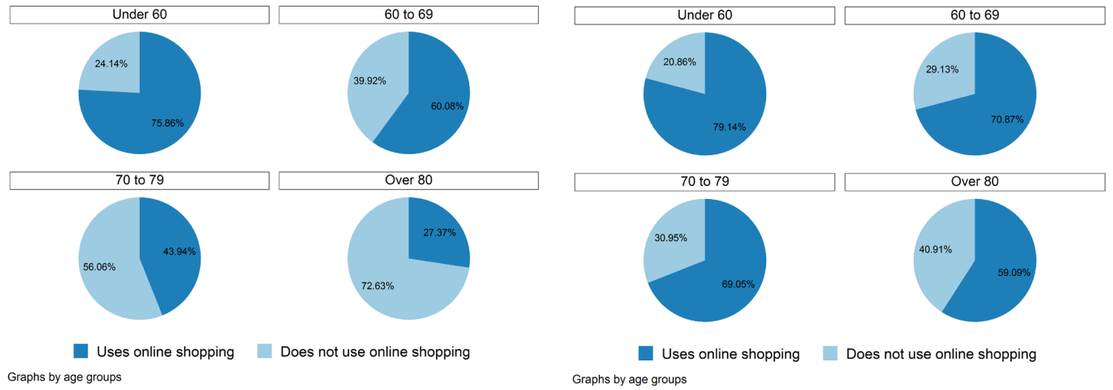
Figure 5. Finding information about goods and services using the internet by age group.



a) Total older population **b) Internet users only**

For both the total older population and older internet users there is a marked difference between age groups in the use of online shopping. As shown in Figure 6 most respondents in the under 60 age group (75.9%) report using the internet for retail transactions. A similar proportion in the oldest age group (72.6%) do not use online shopping. Amongst internet users there is also a marked decrease in online shopping with age. Given that email use amongst internet users does not differ significantly across age groups, this suggests that the decrease in online shopping by age does not reflect an aversion to the internet, and could therefore reflect higher preferences towards traditional shopping methods for older people.

Figure 6. Online shopping by age group



a) Total older population **b) Internet users only**

Conclusion

In the international context Scotland's older population engage with internet activities more than the OECD average. In this chapter we have described the pattern of internet usage in Scotland's older population. The proportion of individuals using the internet declines for older age groups. Email is the most popular internet activity, for which there is little difference across age cohorts for internet users. In contrast the use of the internet as a tool to search for information about goods and services or for online shopping decreases with age amongst internet users. In particular there is a pronounced aversion to online shopping in the oldest age groups, which may reflect higher preferences for physical retail outlets for older people.

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7. Older Workers

7. Older Workers

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- Economic activity rates for older people in Scotland have increased over the past decade.
- 68% of men and 55% of women aged 50-64 in the HAGIS study are working, around 20% are retired, with the remainder unemployed, unable to work through illness or disability, caring or looking after the family home
- 26% of degree-educated individuals have already retired by age 65.
- Only 18% of individuals who identify themselves as being in poor health are in work
- Hours of work decline gradually from age 50 onwards as individuals cut their working hours as they approach retirement. Women are more likely to be in part-time employment prior to retirement than men.
- Almost 40% of older people expect to retire before the State Pension Age (SPA), 30% plan to retire when they become eligible for the state pension, and 30% after they have passed the eligibility criterion.
- 42% of HAGIS respondents do not have any pension arrangements in addition to state provision. 49% are enrolled into an occupation pension scheme. 23% have a private pension. 14% have both an occupational and a private pension.
- There is some evidence to support the finding that those in the middle of the income distribution are likely to remain in work longer than the relatively poor and the relatively rich.

Introduction

Older people comprise an increasingly important group within the labour force. In Scotland, the increase in the economic activity rate, i.e. the proportion of the population who are working or available for work, observed over the last decade has been largely due to increasing labour force participation among the old. Data from the ONS Labour force survey shows that the economic activity rate for the 50+ age group increased from 64% to 71%. In contrast, there was little change in the activity rate of those aged less than 50. Labour supply behaviour is changing most rapidly among those aged 50+. This is particularly important for the Scottish government, which is particularly concerned about changing labour supply responses should it decide to adopt a different income track structure from that being followed in the rest of the UK.

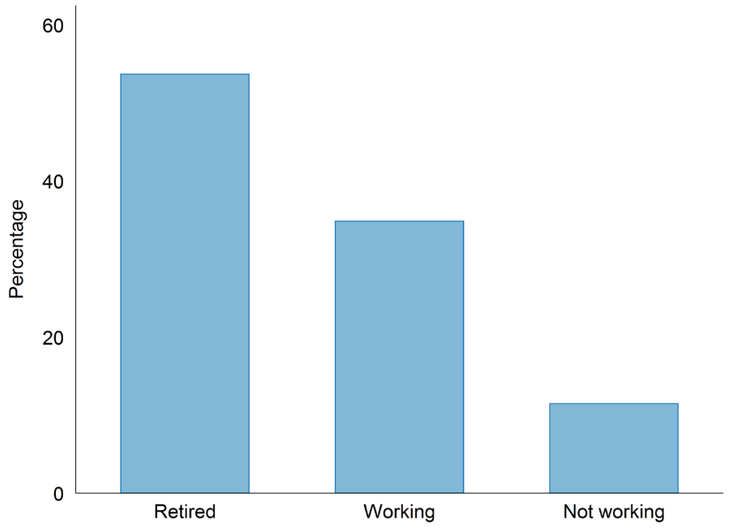
Not only is it important to understand what factors induce individuals to continue working, it is also important to grasp the reasons why they choose to work full-time or part-time. Understanding these working patterns as individuals transit from work to retirement. Thus, this chapter first considers the labour force participation of HAGIS respondents and how it varies across individual characteristics such as age, gender, education and self-reported health status. We then focus on the pre-retirement period, examining working patterns, income, retirement expectations and pension provision.

These issues relating to work and income are important for both the UK and Scottish governments. Not only is it important to design policy to avoid poverty and ill-health in later life, it is also desirable to ensure that older people who wish to continue working are able to do so. This is clearly in the interest of the individuals concerned, and is particularly relevant for the Scottish Government, which has a strong incentive to maximise the income tax receipts which now form part of its revenues.

Labour Market Status

Respondents to the HAGIS pilot survey comprised a representative sample of the Scottish mainland population aged 50 and over. Employment status of all HAGIS participants is shown in Figure 1. The majority (53.68%) of respondents are retired, 11.46% are unemployed, unable to work through illness or disability, caring or looking after the family home. The remaining 34.85% are either employed or self-employed.

Figure 1: Employment Status of HAGIS participants



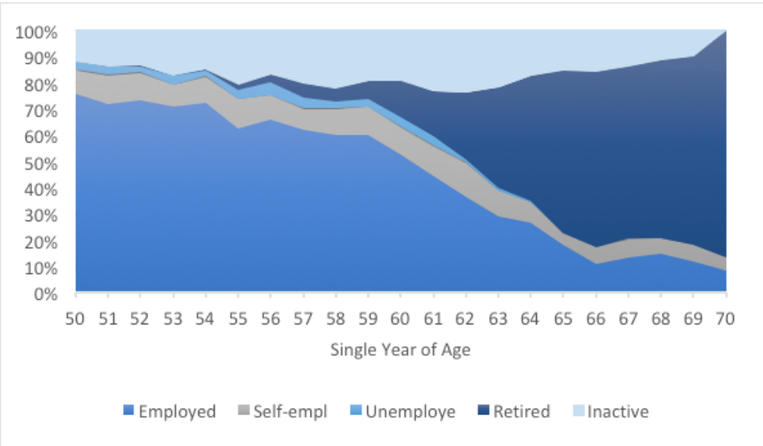
Those working are more likely to be among the younger respondents. 65.33% of those aged 50-59 are working; this proportion drops to 30.70% among those aged 60-69, particularly around SPA. Most of the male respondents will have reached SPA at 65; for the female respondents, the majority will have qualified for a state pension at age 60, but a relatively small number within the sample will have been affected by the raising of the pension age for women.

Figure 2 shows the declining share of those working by age group. Very few Scots continue to work into their 70s. By that age almost all (93.95%) are retired. The share of those not working also declines with age: this group are mostly defined by the reason that they are not active in the labour market. These classifications have less meaning after SPA.

Figure 2: Employment Status by Age Group

Given the relatively small sample in the HAGIS pilot, it is worth demonstrating that these data are consistent with more established indicators of the labour market in Scotland. Figure 3 shows employment status by single year of age for 2015-16, drawn from the ONS Labour Force Survey (LFS). With the large sample size of the LFS, it is possible to show how employment status varies by single year of age. Nevertheless, Figures 2 and 3 both exhibit a rapid transition from work to retirement between ages 60 and 69. Figure 3 shows that this withdrawal from the labour market is concentrated among those aged 60-65.

Figure 3: Employment Status by Age in the Labour Force Survey



Source: Labour Force Survey

The average age of retirement has been rising in both Scotland and in the UK as a whole. In Figure 4, again drawing on LFS data, we estimate mean age of withdrawal from the labour market using the method proposed by Wild (2006). There is a gradual upward trend both in Scotland and in the UK which is more marked for females than for males. This may have been accelerated by the effects of increases in SPA for women. Such trends would be picked up by a longitudinal version of HAGIS. Data on choices made by individuals over time would give greater insights into retirement patterns than is possible from the essentially cross-sectional LFS.

Figure 4: Estimated Mean Age of Withdrawal from the Labour Market 2001-2017

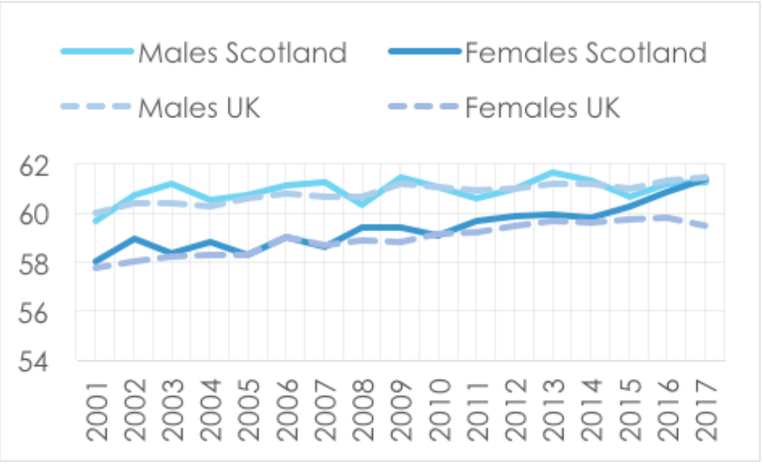


Figure 5 shows employment status of HAGIS participants by age group and gender. Age groups are defined by those under age 65 and those aged 65 or over. 68.21% of men and 54.91% of women in the under-65 age group are working. A larger proportion of females than males are not working due in part to differences in caring responsibilities. 17.60% of men and 19.59% of women in this age group are retired. There is a substantial contrast with those in the older age group, aged 65+, for whom almost all (91.93%) are retired.

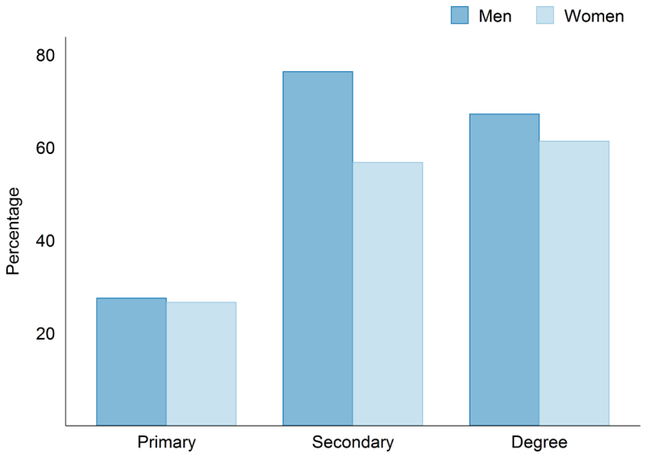
Figure 5: Employment Status by Gender

Are there differences in working patterns among older workers by level of education? Figure 6 highlights that individuals who have completed secondary education or above (O Grade/Highers/SYS or above) are much more likely to be working up to the age of 65 than those with lower levels of educational attainment. The relatively poorly qualified older individuals clearly face difficulties in maintaining engagement with the labour market: 55.36% of those aged under 65 are not in work. A large fraction of highly educated individuals in this pre-65 age group are also not working, but this is due to early retirement: 26.14% of those with a degree have already retired by age 65. This may reflect this group's greater access to occupational pension schemes than those with lower educational qualifications (see Section 4). Given that graduates are typically wealthier than those with lower levels of qualification, this finding is in line with Banks (2016) who argues that the data from the English Longitudinal Survey of Ageing show that "it is the middle of the wealth distribution that has the highest rates of labour market participation".

Figure 6: Employment Status by Education Level – HAGIS participants aged under 65

Figure 7 indicates that there are relatively small differences between men and women in the proportion of those working by level of education. Whether male or female, those with the lowest level of educational attainment are less than half as likely to be working (in either paid or self-employment) as the rest of the HAGIS population. Interestingly we see the proportion of degree-educated men who are working is slightly less than men who have completed secondary education, whereas the proportion of women who are working increases with education levels. In the current study it is not possible to investigate whether this difference between genders arises due to an increase in women returning to work or to slower rates of labour market withdrawal for women. However, this question could be addressed if data was available for individuals over time, as is planned with the longitudinal version of HAGIS.

Figure 7: Working by Education Level – HAGIS participants aged under 65



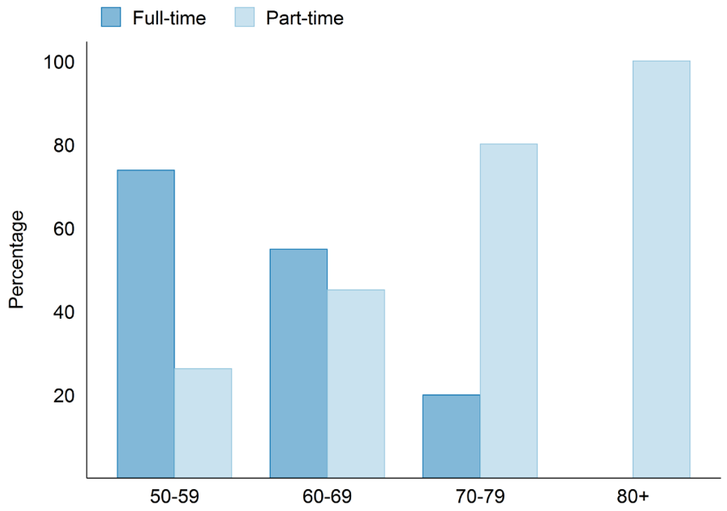
Health status is an important influence in employment status. The HAGIS questionnaire asks participants to rate their health on a 5-point scale. For the subset of individuals aged under 65, those who report their health as “excellent”, “very good” or “good” are equally likely to be working (around 65%). For those who feel that their health is “fair” the proportion who are working falls to 56.72%. As highlighted in Figure 8, there is a substantial decrease in working for those who self-identify as having “poor” health, for whom only 17.86% work. Interestingly in this under-65 age group the proportion who are retired is increasing in health status. 29.55% of individuals who report they are in “excellent” health are retired, falling to 19.64% for individuals in poor health.

Figure 8: Working by self-reported health status – HAGIS participants aged under 65.

Working patterns

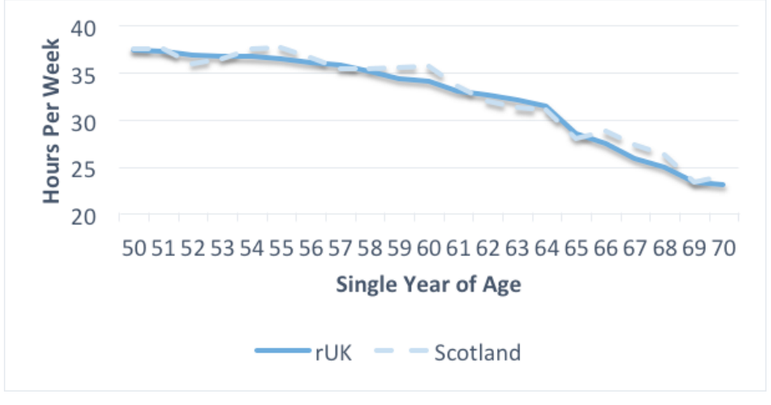
How much time do older workers spend working? Employment rates may be relatively high, but labour input may be falling if workers are cutting back on their weekly hours. Figure 8 shows that this description fits the pattern of older workers’ engagement with the labour market in Scotland. Those aged 50-59 typically work full-time: after individuals reach the age of 70, full-time work is rare.

Figure 9: Full-time/Part-time employment by age group



These patterns are confirmed by the Labour Force Survey. Again its larger sample enables a more finely grained analysis of older workers. Figure 10 shows how average working hours declined by single year of age in Scotland in 2016, with the pattern in Scotland being not significantly different from that the rest of the UK (rUK). The gradual switch from full-time to part-time working produces the declining trend in working hours by single year of age observed in figure 10 with mean hours following from around 37 hours per week for those aged 50 to around 30 hours per week for those aged 64. From age 65 hours of work decline faster so that by age 70 average working time is around 23 hours per week.

Figure 10: Average hours by single year of age



There are significant differences in working time by gender among older workers. Figure 11 shows the division between full-time and part-time working for males and females aged between 50 and 65 in the HAGIS sample. Whereas 84.21% of working men under the age of 65 are working full time, the female working pattern is more evenly split between full-time (55.56%) and part-time (44.44%). The suggested implication is that for males full-time working is more likely to be postponed until after SPA, whereas for women the SPA is a less important determinant of working time patterns.

Figure 11: Full-time/Part-time employment by Gender – HAGIS participants aged under 65

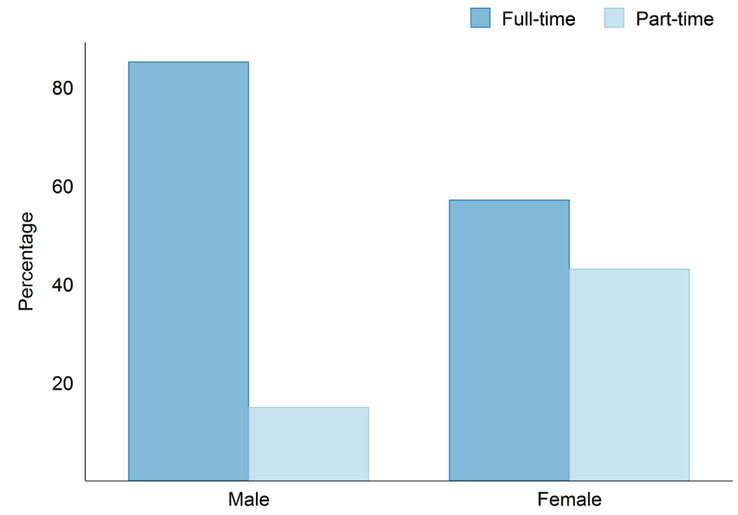
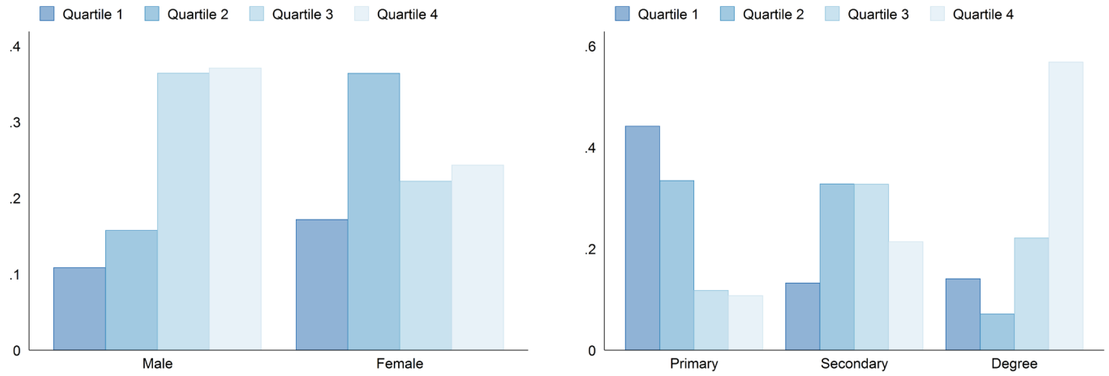


Figure 12 depicts the proportion of respondents in each quartile of the income distribution calculated from the HAGIS responses. Men are more likely to receive an income in the upper quartiles, i.e. above median earnings. In contrast a higher proportion of female HAGIS workers are found in the lower quartiles of the income distribution. Given the pattern of working hours shown in Figure 11, lower female incomes in HAGIS appear to be driven by choices (or constraints) over working hours. Unfortunately, with the relatively small sample size, more detailed analysis of gender differences in income is challenging.

Figure 12: Income quartile for HAGIS participants aged under 65, by Gender and Education



a) Gender

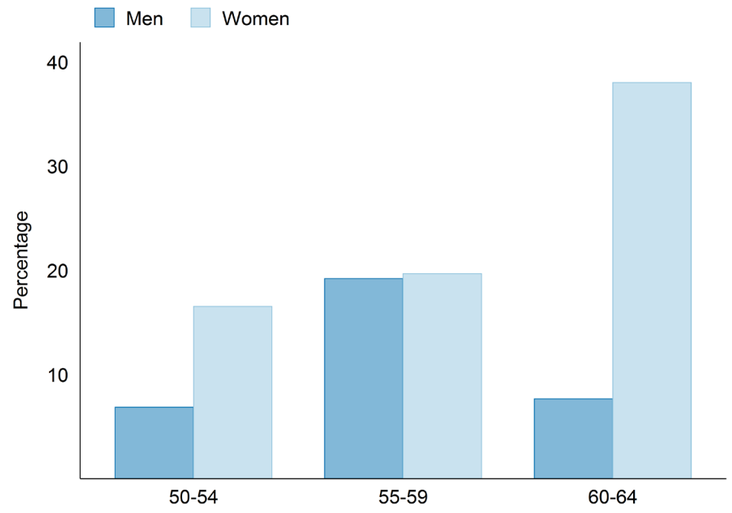
b) Education

There is a clear income gradient by level of education. 44.14% of individuals with less than secondary education have incomes in the lowest quartile, decreasing to 10.71% in the highest quartile. In contrast, for degree-educated individuals, 56.78% have incomes in the upper quartile.

Figure 13 shows the proportion of individuals receiving an income under the current £11,500 personal income tax allowance. For workers aged 54 and under, 6.84% of men and 16.51% of women receive an income below this threshold. An approximately equal proportion of men and women aged 55-59 (19.17% and 19.66% respectively) have incomes below the personal allowance. For the older age group there is a wide gender difference in the proportion of individuals who fall into the low-income bracket, 7.65% for men contrasting with 28.58% of women. The relatively low proportion of men aged 60-64 earning less than the personal income tax allowance is likely to be the outcome of a selection process where only better paid men choose to continue working beyond age 60.

These proportions are of particular interest to the Scottish government, since they partly determine its income tax revenues. The Scottish government does not set the personal income tax allowance, but it is in its interest that as many older workers as possible earn more than this threshold and therefore contribute towards its income tax receipts. As mentioned in the introduction, the labour supply of older workers has been the most fluid component of aggregate labour supply in the last decade. Policies that support continued attachment to the labour market may well have benefits both for individuals themselves as well as for the Scottish government's revenue stream.

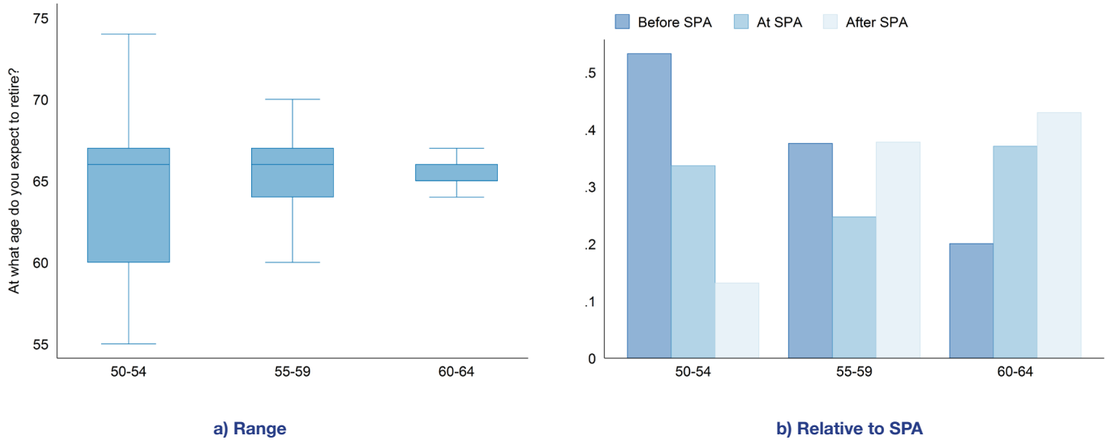
Figure 13: Proportion of workers earning under £11,500 – HAGIS participants aged under 65



Retirement expectations and pension provision

The HAGIS questionnaire asks those not already retired when they expect to retire. This question is of particular interest given that the default retirement age of 65 was phased out in October 2011, meaning that workers may opt to continue working after they have reached SPA. In addition, planned changes to the SPA mean that many of the younger HAGIS participants will not become eligible for a state pension until age 66, or later. Figure 14 shows the age at which HAGIS members expect to retire by their current age group, and the proportion expected to retire before, at, or after reaching the eligibility age for state pension receipt. For the 60-64 age group, who are closest to SPA, the range of expected retirement ages is quite narrow and over half expect to retire at either age 65 or 66. For this age group 37.06% expect to retire at SPA; 42.92% expect to work beyond SPA while 20.02% expect to retire before they reach SPA. The 55-59 age group reported a wider range of retirement age expectations, with half of this age group expecting to retire between age 62 and 67. The majority of this age group will be impacted by a new SPA of 67 years which is due to be introduced between 2026 and 2028. In this age group there is a more equal divide between those expecting to retire before, at, and after SPA (37.54%, 24.70% and 37.75% respectively).

Figure 14: Retirement Age Expectations – HAGIS participants aged under 65



a) Range

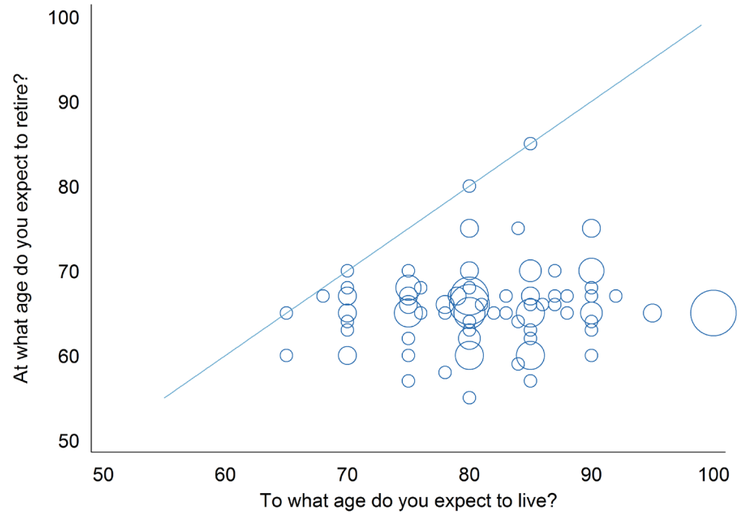
b) Relative to SPA

The youngest age group reported the widest range of ages at which they expect to retire, with half choosing ages between 60 and 67. Everyone in the 50-54 age group will be affected by the increased SPA and will therefore not become eligible to receive a state pension before age 67. In this age group a markedly high proportion of individuals (53.24%) expect to retire before SPA, with 22.64% at SPA, and 13.12% after SPA. For this age group, with the current HAGIS study it is not possible to distinguish between individuals who have planned early retirement before SPA, and those who have not incorporated the changes to SPA into their retirement expectations. For this reason, more detailed questions on retirement expectations will be incorporated into future waves of the HAGIS study. It is also important to understand how for individuals take account of predictions of increased longevity in forming their own subjective life expectancy.

The HAGIS survey also allows us to link expected age at retirement with subjective life expectancy. Using information on individuals' subjective life expectancy, in Figure 15 we compare the age at which a respondent expects to retire with the age at which they respect to live. The line indicates where expected retirement age is equal to expected age, and higher frequency of responses are indicated with larger markers on the graph. Unsurprisingly, most individuals indicate that they expect to retire before they reach the end of life. However, there is little evidence that expected retirement age increases with age expectations, with most respondents expecting to retire at around age 65.

Note also that our finding of greater variance in age at retirement expectations among younger people is consistent with Hamermesh's (1985) finding of greater variation in subjective life expectancy among the young.

Figure 15: Expected Retirement age with respect to Subjective Life Expectancy – HAGIS participants aged under 65



In Figure 15 the difference between expected retirement age and subjective life expectancy gives the number of years that respondents expect to live in retirement. As expected age increases, there is a corresponding increase in the expected duration of retirement. The average implied duration of retirement is 15.1 years, which is largely consistent with current life expectancy in Scotland and the current SRA. However, it is not consistent with recent experience of the actual retirement age as portrayed in Figure 4. Further investigation is required to determine the influences on expected of years of retirement and how these are channelled through both subjective life expectancy and expected retirement age.

We now investigate the extent to which individuals prepare for retirement by examining pension coverage for HAGIS respondents who are not already in retirement. Figure 16 shows the proportion of individuals covered by either an occupational pension scheme, or have private pension arrangements, or have a combination of both, by age group. Although there are slight differences in the composition of pension provision, the proportion of individuals with no pension coverage varies little by age group of those not in retirement, ranging from 35.35% to 44.21%.

Figure 16: Pension Coverage – HAGIS participants aged under 65

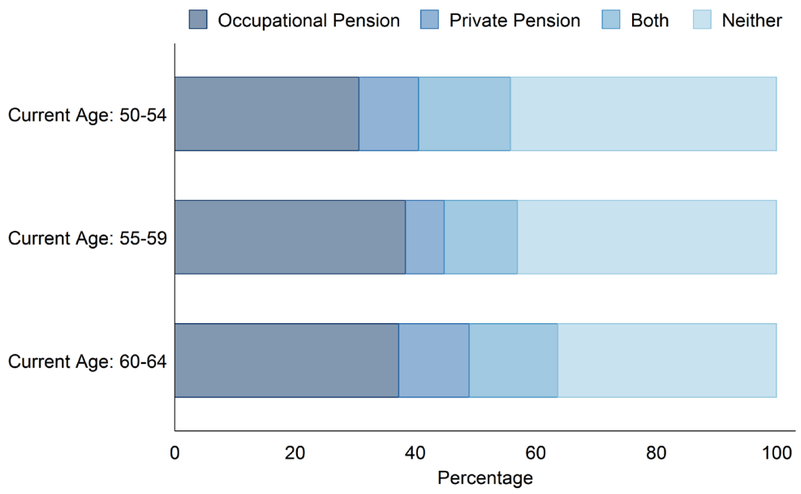
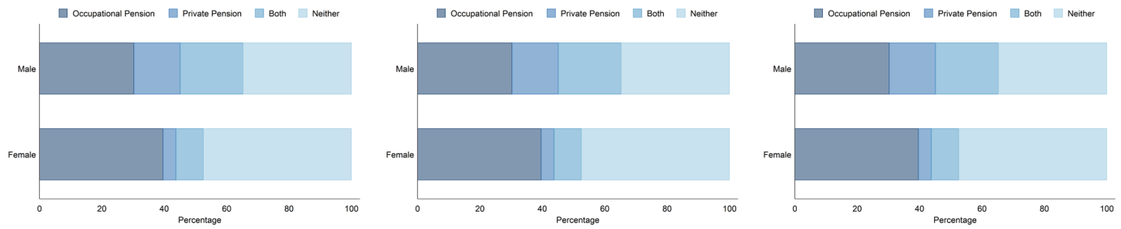


Figure 17 explores differences in pension coverage according to individual characteristics. Men are more likely to have pension arrangements than women (64.01% and 50.09% respectively). Individuals living alone are less likely to have pension coverage than those living in couples (46.29% vs 59.42%). Pension coverage is also increasing in education. Only 19.26% of individuals with the lowest education levels have some pension coverage other than the state pension scheme. For individuals with secondary education this increases to 58.28%, and for degree-educated individuals, 72.64% have pension arrangements in addition to state provision.

Figure 17: Pension Coverage by individual characteristics – HAGIS participants aged under 65



a) Gender **b) Household Comparison** **C) Education**

Conclusion

This section has examined the experience of older workers in Scotland through the lens of the HAGIS survey. The findings reveal a number of pointers for further research. These include the notion that the older workers labour market is the most dynamic margin of overall labour supply in recent times and therefore of particular importance to the Scottish government as it seeks to redesign the structure of income tax. Understanding labour supply responses to changes in tax design are key to projecting future revenues accurately. Longitudinal data provides significant advantages in providing this understanding, because it can track individual behaviour as tax policy changes.

Our report also highlights that the importance of education does not diminish as the population ages. Those with better qualifications are likely to have higher incomes and better pension provision than those that have relatively weak educational outcomes.

Very poor health also has a negative impact on labour market outcomes for older workers, though it is important to bear in mind that causality may run from labour market experience to poor health as well as in the opposite direction.

The gender income gap is also present among older workers. Women's earnings are more likely to be below the median and men's earnings above the median for those workers aged 50+. Men tend to transit from full-time to part-time work as they approach retirement, whereas women are more likely to be in part-time work irrespective of their age. Inevitably, this difference in working patterns has consequences for the gender pay gap among older workers. Further, the income gap continues into pensions. Men are less likely to be reliant on the state pension and more likely to have a combination of private and occupational pensions. Couples, who can pool their pension assets, are also more likely to have private and/or occupational pension cover than either men or women living on their own.

The younger old tend to have quite variable expectations of age of retirement. The variability declines as they age. While there is considerable anchoring around the SPA, mean expected years of retirement at 15.1 years, is broadly consistent with the current SPA and life expectancy in Scotland. However, recent history suggests that the mean age of retirement in Scotland is significantly below the SPA. A longitudinal study would give the opportunity to determine whether and why you are individual expectations of age of retirement are realised through comparison with the age at which they actually retire.

Results from HAGIS are mildly supportive of the finding that those in the middle of the income distribution are more likely to remain in work than the relatively poor, who are reliant on state support and the relatively rich, who have set aside pension provision that enables them to retire early. A fuller examination of this finding would be contingent on a larger sample. Longitudinal data would also help identify such effects more precisely.

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8. Time and Risk Preferences in Older Persons in Scotland

8. Time and Risk Preferences in Older Persons in Scotland

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- Understanding attitudes towards time and risk is important as we age as many decisions older people face involve uncertainty.
- In general women are more present orientated and less willing to take risks than men.
- University graduates tend to be more future orientated.
- Older individuals are more risk averse.

Time and risk preferences are receiving increasing interest as they are associated with individuals' level of investment in important outcomes such as health, pensions etc. Insights into time and risk preferences can therefore help inform interventions and policies aimed at encouraging these type of investments. For example, insights into individuals' time preferences have led to the introduction of pension auto-enrolment.

Decisions regarding outcomes such as health and pensions usually involve short-term costs (i.e. experiencing withdrawal symptoms when quitting smoking) in exchange for long-term benefits (being healthier, living longer after quitting smoking). Time preferences, which measure how present or future oriented an individual is, will therefore influence these decisions. An individual with a very high time preference rate effectively acts as if tomorrow is never going to come. As the benefits of these decisions are uncertain, at least at the individual level, risk preferences also play an important role. Individuals who are more risk seeking are less sensitive to risk and are therefore more likely to engage for example in risky health behaviours such as drug and alcohol use.

Time and risk preferences are known to vary widely across individuals (Frederick et al., 2002). Time and risk preferences of older persons is of particular interest as older persons face many decisions that involve time and/or uncertainty. For example, they may have to decide whether to undergo a risky medical procedure, when to retire, whether to adopt a healthier lifestyle on the advice from their doctor etc. It is also known that time and risk preferences change over the life-course, may be correlated with cognitive ability, and may be culturally specific. Results from student samples and general population samples can therefore not necessarily be generalised to older persons in Scotland.

Survey measures

The HAGIS survey collected information on time and risk preferences in two different ways. Time and risk preferences were elicited using the standard methods used in the economics literature by presenting individuals with a series of pairwise choices between different money amounts at different times (time preferences) and choices between a certain option and a gamble (risk preferences). It should be noted that these choices were hypothetical rather than incentivised. The survey also included broader measures or proxies of time and risk preferences as proposed by Dohmen et al. (2011) and Vischer et al. (2013).

The method used to elicit time preference is akin to a Multiple Price list, although presented as binary choices one at a time. Individuals were presented with 7 choices between receiving £1500 now or a higher amount in 1 months' time. The amount in 1 month time varied between £1506 and £1596. The implied time preference rates offered within these choices ranged from 0.049 to 1.105. If an individual is very present oriented they will always choose the amount now even when the amount at 1 months is relatively large as in choice 8 (£1596). If they are very future oriented then even a small increase may make them choose the future amount. The choice at which they switch from now (Option A) to the amount in 1 months' time (Option B) therefore indicates the extent to which an individual is present oriented. The later they switch the more present oriented they are.

	Option A	Option B	Implied annual rate
C1	£1500 now	£1506 in 1 month	0.049
C2	£1500 now	£1512 in 1 month	0.100
C3	£1500 now	£1518 in 1 month	0.154
C4	£1500 now	£1524 in 1 month	0.210
C5	£1500 now	£1536 in 1 month	0.329
C6	£1500 now	£1548 in 1 month	0.459
C7	£1500 now	£1596 in 1 month	1.105

Risk preferences were elicited through a similar method although fewer binary choices were used. Respondents had a choice between a certain income of £1500 per month or taking a gamble with a 50% chance of a higher income (£3000 per month) and 50% chance of a lower income. The lower income varied from £1000 to £1300. A highly risk averse individual would always choose the certain income of £1500 whilst a risk seeking individual may always choose the gamble as there is a 50% chance of receiving a higher income (as well as a 50% chance of receiving a lower income). Therefore, the later an individual switches to the gamble the more risk averse they are.

	Option A	Option B	Risk premium
C1	£1500 per month	50% chance of £3000 per month 50% chance of £1000 per month	33.3%
C2	£1500 per month	50% chance of £3000 per month 50% chance of £1200 per month	40.0%
C3	£1500 per month	50% chance of £3000 per month 50% chance of £1300 per month	43.3%

The broader measures of time and risk preferences were[12]:

- General willingness to take risks on a scale from 0 (unwilling to take risks) to 10 (fully prepared to take risks);
- Willingness to take financial risks on a scale from 0 (unwilling to take risks) to 10 (fully prepared to take risks);
- How impatient an individual is on a scale from 0 (impatient) to 10 (patient).

Completion rates

To assess the feasibility of the different measures in this sample it is explored whether individuals were able to successfully complete the questions. Table 1 shows that of those that returned the self-completion survey 36 respondents had missing values on all time preference questions and 75 respondents had some missing values. 18 respondents were multiple switchers in the time preference task, that is, after switching to option B (amount in 1 month time) they switched back to option A (amount now). This is irrational as there is no obvious reason to switch back to the amount now when the amount in 1 month time increases. The number of 'consistent' or 'valid' observations is therefore 576 (81.7% of those who returned the questionnaire). There were fewer missing values with respect to the risk preference questions and also fewer multiple switchers. In total, 662 respondents provided consistent responses across the three risk preference choices (93.9% of those who returned the questionnaire). It should be noted that there are fewer opportunities to be a multiple switcher in the risk preference questions as there are only 3 binary choices as opposed to 7 binary choices in the time preference task.

Completion rates of the more general time and risk measures were generally high. There were 686 valid responses for the impatience question (19 missing values), 697 for the general risk question (8 missing values) and 698 for the financial risk question (7 missing values).

[12]Note that these measures are recoded such that they can be interpreted in the same way as the economic measures. The higher the value on patience the more present oriented and the higher the value on willingness to take risk the more risk averse.

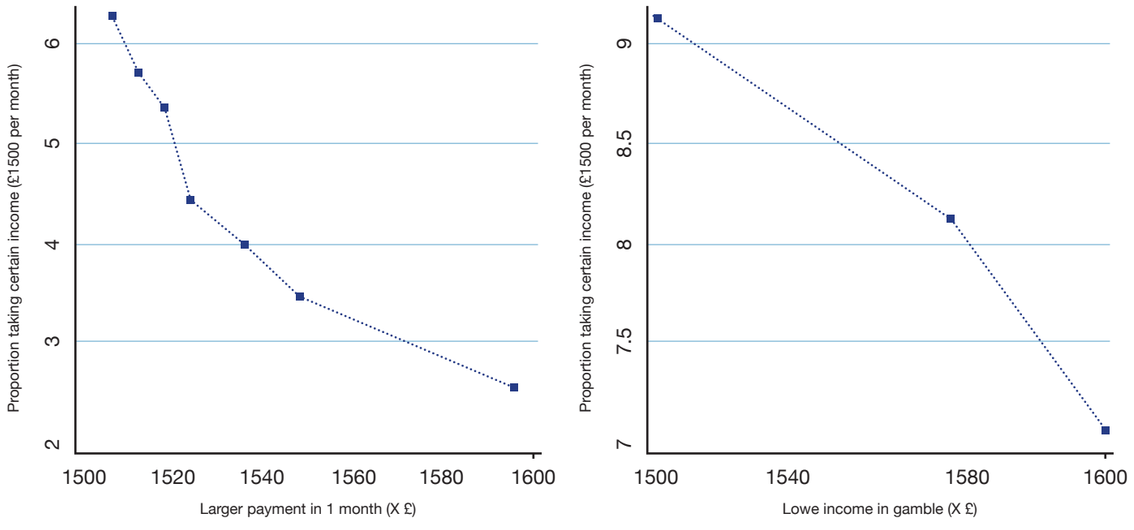
Table 1. Number of responses

	Time preferences		Risk preferences	
	N	**%**	**N**	**%**
Did not return the survey	352	33.3	352	33.3
All missing	36	3.4	25	2.4
Some missing	75	7.1	6	0.6
Multiple switchers	18	1.7	12	1.1
'Valid'	576	54.5	662	62.6
Total	1057		1057	

Descriptive statistics - time and risk preferences

Figure 1 shows that, as expected, the higher the amount in 1 month time (option B) the lower the proportion of respondents choosing the amount now (option A). Similarly, the higher the amount of the worst outcome in the gamble (option B) the lower the proportion choosing the certain income (option A).

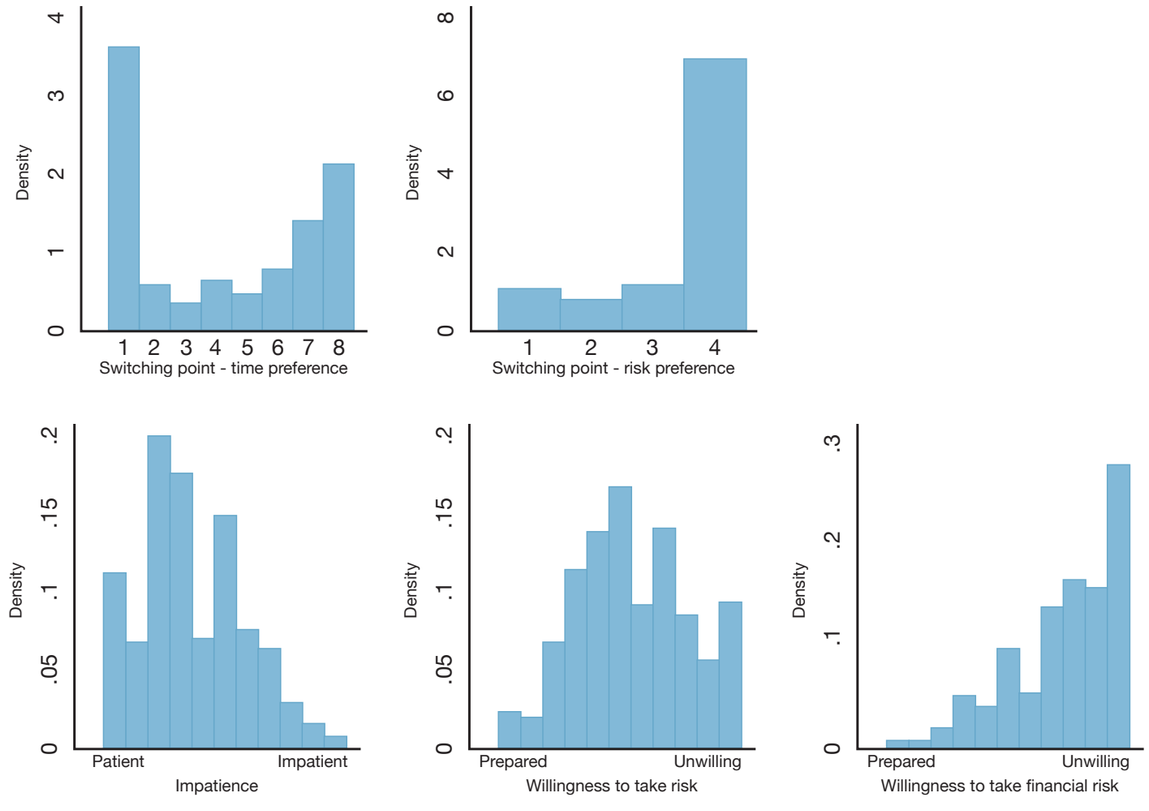
Figure 1. Choice profiles



The top part of Figure 2 shows the choice at which individuals switch from option A to option B. It shows that there is considerable variation in time preference in this sample. Around 37% of respondents always choose the amount in 1 months' time across all 7 choices. They are very future oriented and have an implied rate of less than 0.049. Around 21% of respondents always choose the £1500 now. They are very present oriented and have an implied rate greater than 1.105. There is less variation in switching points with regards to risk preferences with 69% of respondents always choosing the certain option. These respondents are relatively risk averse. Around 11% always chose the gambles and they are relatively more risk seeking.

In terms of the broader measures of time and risk preferences, the lower part of Figure 2 shows that respondents are relatively patient. In general respondents are unwilling to financial risks whilst there is more variation in willingness to take general risk.

Figure 2. Histograms of the different measures

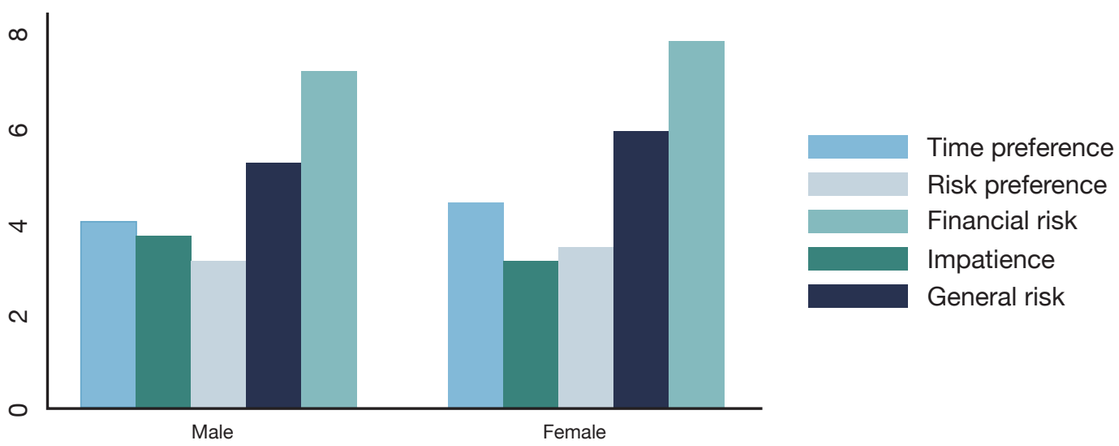


If the more general measures are good proxies of time and risk preferences we expect these to be correlated with the economic measures of time and risk preferences. The correlation between the risk preferences elicited using more standard economic methods and the broader risk measures is statistically significant and relatively high (0.2819 (p-value of 0.0000) in the case of general risk and 0.3265 (p-value of 0.0000) in the case of financial risk. The sign of the correlation between time preferences and impatience is not as expected (the later they switch i.e. the more present oriented the more patient they are) and is significant at a 10% level only (-0.0822 (p-value of 0.0504)). There is also a significant correlation between the economic measures of time and risk preferences (0.1745 (p-value 0.0000)).

Associations with individual characteristics

Time and risk preferences have been shown to be correlated with individual characteristics such as age, gender and education. Figures 3 to 5 show the mean values of the different measures by age, gender and education. The results[13] show that in the case of time preferences, females tend to switch later, that is, they are more present oriented. Respondents with a university degree tend to switch earlier, that is, they are more future oriented. The latter is in line with existing evidence. In the case of risk preferences, the results show that age is associated with risk preferences. Older individuals are more risk averse and this in line with other studies. Individuals with a university degree are more risk seeking. Surprisingly, there is no gender effect. There is however a gender effect and also a stronger age effect in case of the broader risk preference measures. In line with previous evidence, females are less willing to take risks. None of the individual characteristics are associated with impatience.

Figure 3. Time and risk preferences by gender



[13]These are based on the regression results where age, gender and education are all entered in the same regression model.

Figure 4. Time and risk preferences by age

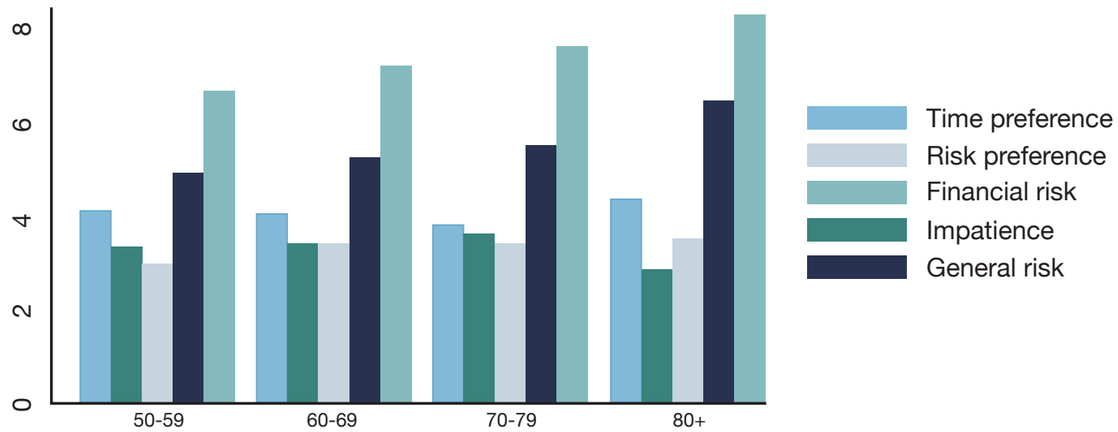
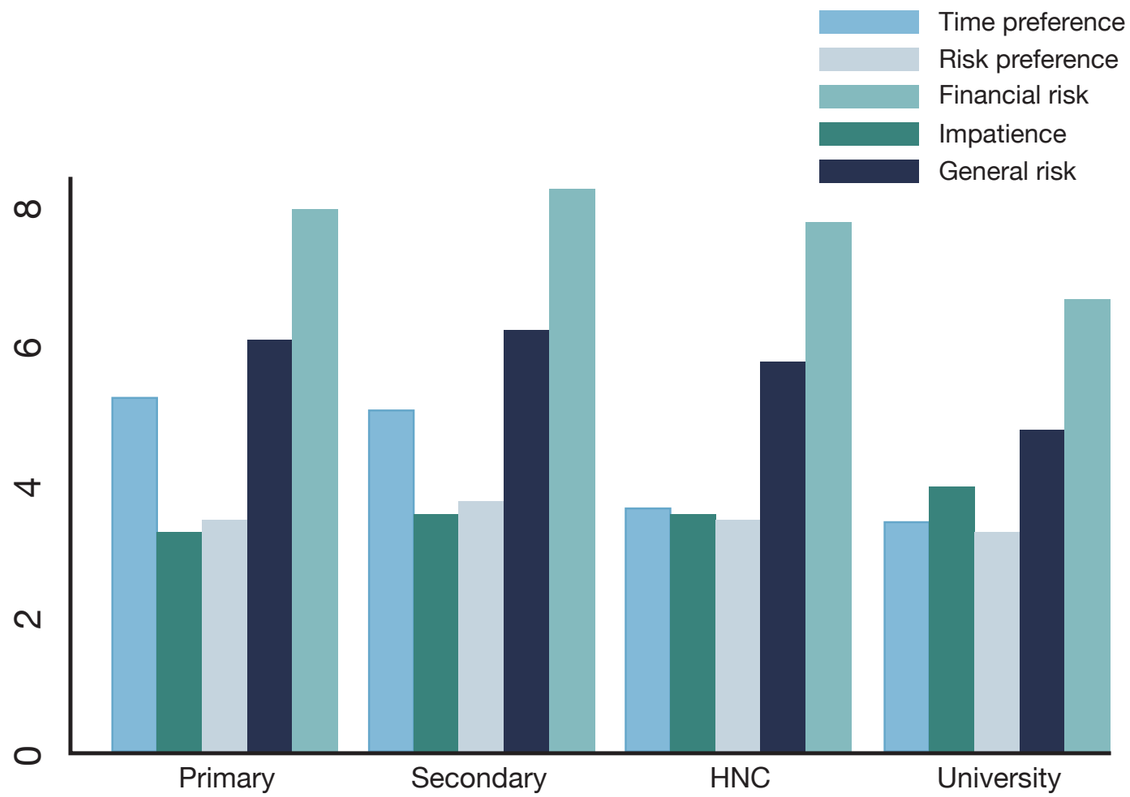


Figure 5. Time and risk preferences by education

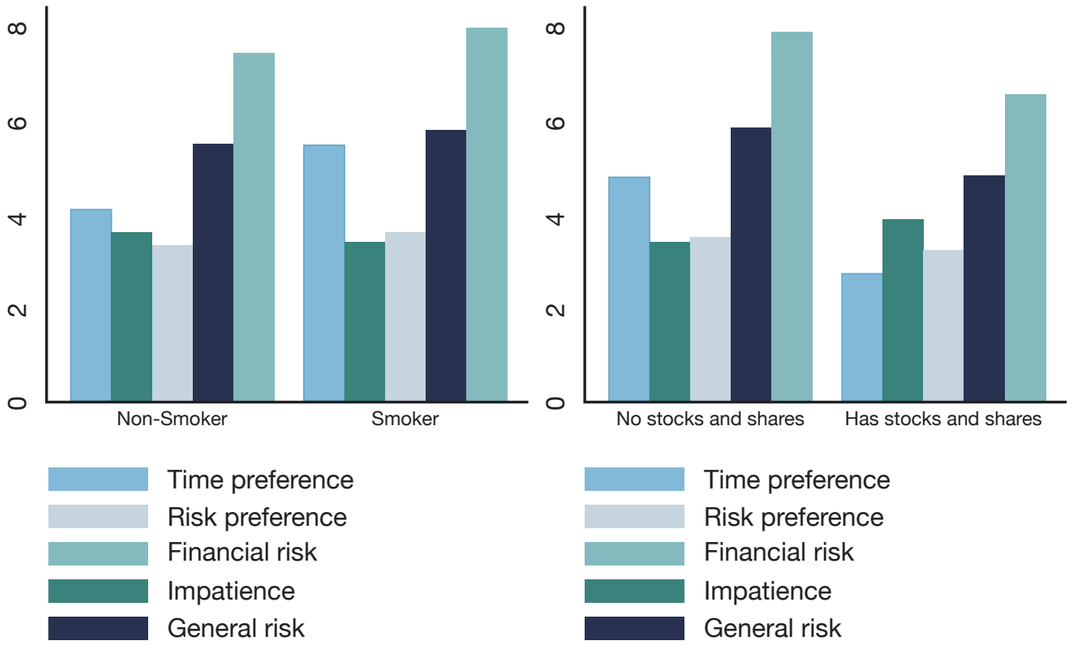


Do measures predict behaviour?

We focus on two behaviours: smoking and investing in stocks and shares. The relationship between time preference and smoking is well established (Barlow et al., 2017). The evidence on the relationship between risk preferences and smoking is more mixed with some studies finding no relationship, some studies finding that risk seeking individuals are more likely to smoke and some studies finding that risk averse individuals are more likely to smoke (Harrison et al., 2015). We therefore also explore another behaviour, investment in stocks and shares, which is inherently risky. The question asks whether the respondent or their spouse or partner have stocks and/or shares.

The results show that more present oriented individuals are more likely to smoke, although this is significant at a 10% level only. Impatience is not associated with smoking behaviour. Risk preferences are also associated with smoking behaviour. The more risk averse the individual is the more likely they smoke. This is found across all three risk measures. Impatience is not associated with smoking behaviour.

More present oriented are less likely to have stocks and shares. This may reflect that they are generally less likely to invest. The generic risk measures are associated with investments in stocks and shares, individuals who are less willing to take risks are less likely to have stocks and shares, and highly significant. However, whilst the risk preferences (economic measure) has the right sign it is not statistically significant. This may in part due to the limited variation in the measure.



Discussion

The time and risk preferences measures have been shown to be feasible (high completion rates) and valid (associations with individual characteristics such as age, gender and education, correlation between the different measures, and associations with behaviours such as smoking and having stocks and shares). An exception to this is the impatience measure. The impatience measure was not associated with age, gender or education, did not predict smoking or stocks and shares and was not correlated with the time preference in the expected way. This measure has not been used extensively and it is unclear whether there are inherent problems with the measure itself or whether this is not a good measure in this specific sample. Whilst the time preference measure performed better, one limitation is that present bias cannot be explored as period of delay between the two money amounts is not varied. Present bias is the enhanced significance individuals attach to immediate outcomes and it can help explain time inconsistent behaviour such as planning to go to the gym next week but failing to go when next week arrives. Completion rates were also lower for the time preference measure which is not surprising as it is cognitively more complex compared to the other measures.

The analysis shows that even in a relatively small sample there are statistical associations between time and risk preferences and important behaviours such as smoking and investments in stock and shares. The measures therefore have the potential to substantially enhance our understanding of important behaviours in older persons in Scotland and to inform policies and interventions to improve wellbeing and reduce inequalities.

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9. Financial Literacy

9. Financial Literacy

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- Financial literacy of older people in Scotland is quite low in an international context.
- Financial literacy is higher for men than for women, with evidence of decreasing financial literacy with age for both genders.
- There is no difference in financial literacy between older people in retirement and those who are working. For individuals in other employment status financial literacy levels are lower.
- Individuals with higher educational attainment have a higher degree of financial literacy.
- Older people who live alone tend to have lower levels of financial literacy than cohabitating individuals.
- Confidence in financial literacy is higher for men than women, and in those with higher levels of education and living in areas with lower deprivation.
- Financial literacy and confidence was associated with poorer subjective mental health.

Introduction

One of the key concerns that HAGIS attempts to address is whether older people have the knowledge necessary to make sound financial decisions. Such knowledge is often described as financial literacy. It is important because an absence of financial literacy exposes individuals to significant risk in relation both to their income and their wealth. Individuals who lack financial literacy are liable to make decisions that impair their standard of living and well-being.

Dynamic microeconomic models generally assume that individuals can make optimising decisions that involve trading off the present against the future (see the chapter on Time Preference by Van der Pol). Calculating such trade-offs requires an understanding of discount rates, of compounding and of present values as well as an appreciation of risk and uncertainty. A proportion of the population is unlikely to be able to make such calculations, exposing them to significant financial risk.

The study of financial literacy is relatively novel. For a review of recent research, see Lusardi and Mitchell (2014). One approach to understanding financial literacy is to view it as a form of human capital in which individuals choose to invest (Delavande, Rohwedder, and Willis, 2008). One might then expect that financial literacy would be higher in countries where individuals, for example, have to manage their own retirement savings, rather than where a company or the state fulfils this function. Similarly, those with higher levels of education have a greater incentive to acquire financial literacy, since income and education are positively correlated and therefore the financial costs of making an error are greater. Japelli (2010) argues that the international evidence is consistent with these arguments, namely that levels of education and high mandated social security contributions are associated with lower levels of financial literacy.

Decisions about retirement and pensions are a particular concern. With the decline in company pensions, individuals are increasingly faced with the responsibility of deciding how much to save, how to invest the savings and whether to withdraw capital from retirement savings to meet short run commitments. Since many important financial decisions are made around the time of retirement, one might expect this to be a time of maximum investment in financial literacy. Whether there is a subsequent decline in financial literacy after retirement will, in part, depend on the rate of depreciation of such financial knowledge, which may in turn be linked to the pace of cognitive ageing (see the chapter on Cognition by Fawns-Ritchie and Deary).

Financial decisions may be made on behalf of individuals, or of households. In a household context, one person can specialise in acquiring financial literacy and then make decisions on behalf of the household. Other members of the household will require less investment. The case for specialisation will be stronger, the stronger is the bond holding the household together. Thus, for example, specialisation may be weaker among cohabiting couples than among marriage partners. Nevertheless, this argument suggests that there is a case for exploring relative levels of financial literacy within households. These might be revealed, for example, by systematic differences by gender in financial literacy. This issue is explored in Fonseca et al (2012).

The human capital approach to financial literacy focuses on the demand for finance-related skills and implicitly assumes elastic supply. However, the costs of acquisition may be higher in areas where relatively few people have these skills. Smaller network size reduces the probability of informal knowledge exchange, leading to a reduction in average financial literacy in areas where, for example, education or income levels are below average.

From a psychological perspective, the ability to successfully answer questions relating to financial concepts may be related to an individual's health or state of mind. Difficulties in answering may be temporary or permanent. It is impossible to determine the direction of causation from a cross-sectional study. Though subjective health may be closely associated with facility to answer questions that probe, this possibility seems to have received little attention in the economics literature.

Typical questions designed to probe financial literacy pose a set of options. Individuals are usually expected to select one of these options or to respond that they "don't know". A random choice will result in some correct answers being selected. However, by asking individuals how confident they are in the responses they have made, some insight into the certainty with which they have selected their answers can be gained. Confidence in answers may also be linked to individual characteristics: this topic has been explored by Van Rooij, Lusardi and Alessie (2012) who compare performance in tests of financial literacy with an index of individuals' confidence in understanding economic concepts. They find that while measured financial literacy is closely associated with wealth accumulation, those who lack confidence in their facility with economic concepts accumulate significantly less wealth than implied by their objective scores in financial literacy tests.

In this chapter we examine some of these arguments using the HAGIS pilot dataset. We construct a simple index score to analyse participants' financial literacy and examine this across their social-demographic characteristics, exploring differences according to age, gender, education, employment status and living arrangements. We then present analysis of the relationship between financial literacy and self-reported physical and mental health. Finally, we place financial literacy amongst older people in Scotland in a national and international context.

Financial Literacy by socio-demographic characteristics

To compare financial literacy across individuals we derived a simple index score by aggregating correct responses across 6 internationally validated questions[14], widely used in literature. The six questions were:

1. Imagine that five brothers are given a gift of £1,000. If the brothers have to share the money equally how much does each one get?
2. Now imagine that the brothers have to wait for one year to get their share of the £1,000 and inflation stays at 0.6%[15]. In one year's time how much with they be able to buy?
3. You lend £25 to a friend one evening and he gives you back £25 the next day. How much interest has he paid on his loan?
4. Suppose you put £1,000 into a no fee savings account with a guaranteed interest rate of 2% per year. You don't make and further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?
5. And how much would be in the account at the end of the five years?
6. True or False: It is usually possible to reduce the risk of investing by buying a wide range of stocks and shares.

[14]The financial literacy questions are drawn from the Organisation for Economic Co-operation and Development (OECD) & International Network on Financial Education (INFE) toolkit for measuring financial literacy and financial inclusion (OECD, 2015). This toolkit has been developed to collect internationally

comparable data. The fundamental concepts of saving and investment decisions and their role in financial literacy were developed by Lusardi & Mitchell (2014).

[15]This inflation rate was current in the UK at the time of the fieldwork (valid on 20th September 2016).

The potential aggregate score therefore ranged from 0 (no correct responses) to 6 (all correct responses). The mean financial literacy score was 4.39, with 1.8% of HAGIS participants providing no correct responses, and 26.7% of respondents providing correct responses to all 6 questions.

We begin by examining differences in the aggregate financial literacy score across individual characteristics. As shown in Figure 1, mean scores were similar between the 50-59, 60-69 and 70-79 age groups for men (4.63, 4.71 and 4.74 respectively) but were significantly lower (4.28) for males aged 80 or over. For women there is more evidence of decreasing financial literacy with age. Mean financial literacy for women in the 50-59 and 60-69 age groups is 4.34 and 4.50 respectively, decreasing to 4.26 for the 70-79 age group and further to 3.83 for women in the oldest age group. As a result we also see an increase in the gender-difference in financial literacy by age. In the younger age groups the difference in the score between men and women is 0.29 (50-59 age group) and 0.20 (60-69 age group). This contrasts with a difference of 0.49 for individuals aged between 70 and 79, and 0.42 for the 80 and over age group.

Figure 1: Financial literacy score by age and gender

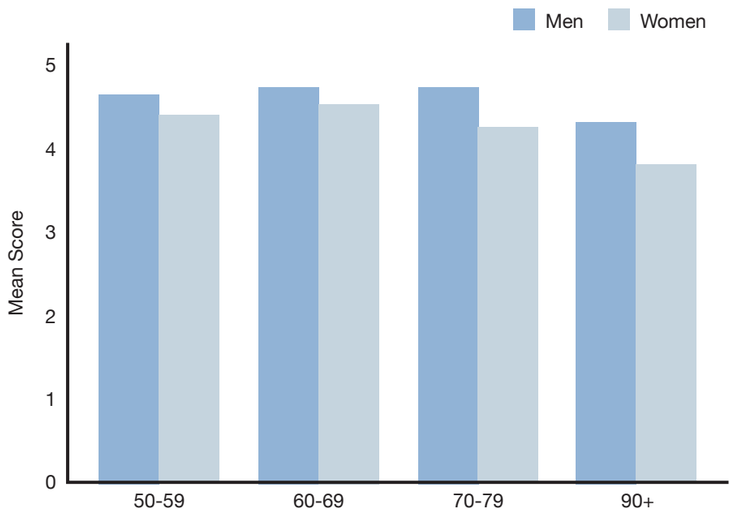
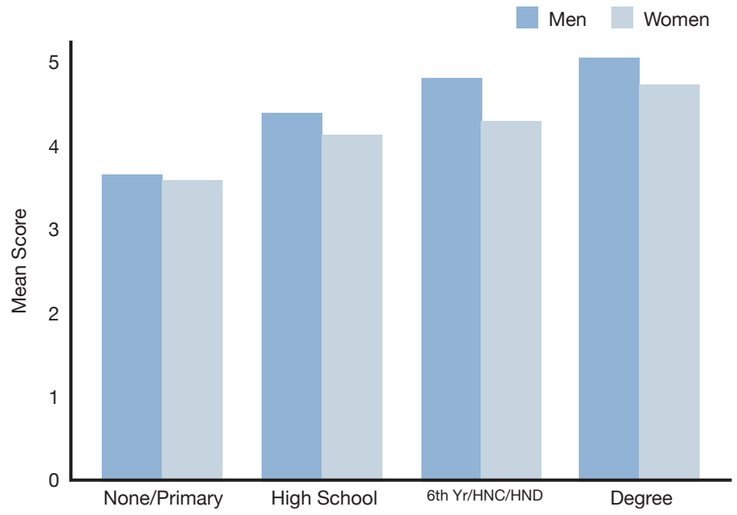


Figure 2 indicates that there is a clear education gradient in financial literacy for both men and women, which is consistent with the existing literature and with the argument that more educated people have a greater incentive to invest in financial literacy. Thus, those with the lowest level of educational attainment also have relatively low financial literacy scores. For these individuals there is no difference between genders (3.72 for men, 3.71 for women).

Gender differences emerge as education attainment increases. For respondents who have completed High School education the difference in mean scores is 0.32 (4.54 for men, 4.22 for women). This difference increases to 0.50 for HAGIS participants with further education (4.99 for men, 4.49 for women). For degree-educated individuals the difference in financial literacy scores between genders (0.31) falls to the same level as that of individuals with High School education attainment. Degree-educated men have a mean score of 5.21 as compared with 4.90 for women.

Figure 2: Financial literacy score by education and gender



Examining financial literacy by economic activity, Figure 3 shows there are similar levels between retired and working individuals, with the same gender difference, 0.42 for retired individuals as compared to 0.41 for those who are working (employed or self-employed). For participants who are neither retired or working (this category includes unemployment, caring for family and permanently sick or disabled) the mean financial literacy scores are lower for both genders, but particularly for men (3.07) as compared to women (4.03).

Figure 3: Financial literacy score by employment status and gender

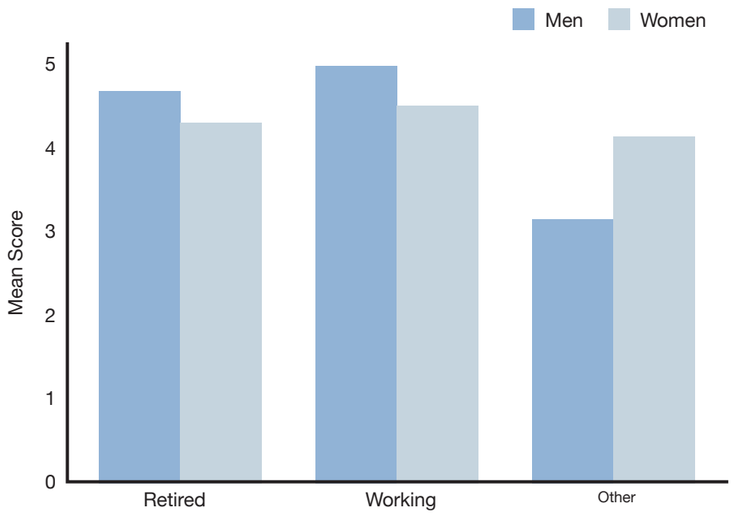
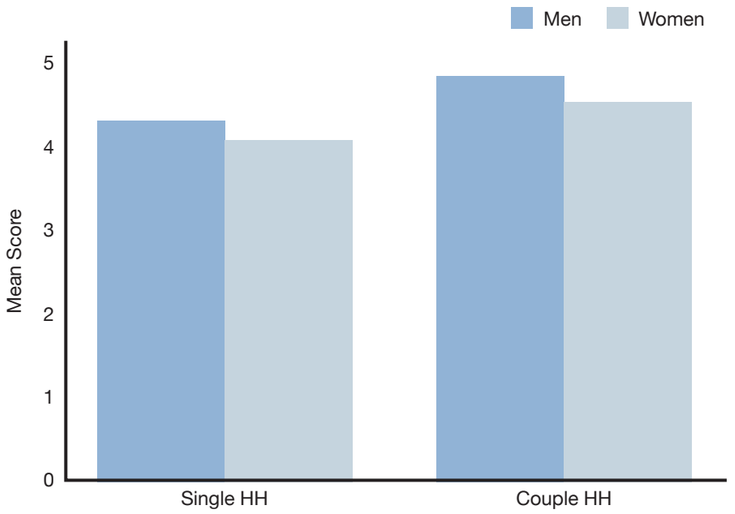


Figure 4 compares mean financial literacy scores by living arrangements. Individuals who live alone have a mean score that is around 0.5 lower than those who live with a spouse or partner regardless of gender. The score for single men is 4.25 as compared to 4.79 for cohabitating men. For women the comparative figures are 4.03 for those living alone and 4.49 for partnered women. We also see that the gender difference is smaller for single individuals as compared to individuals living in a partnership.

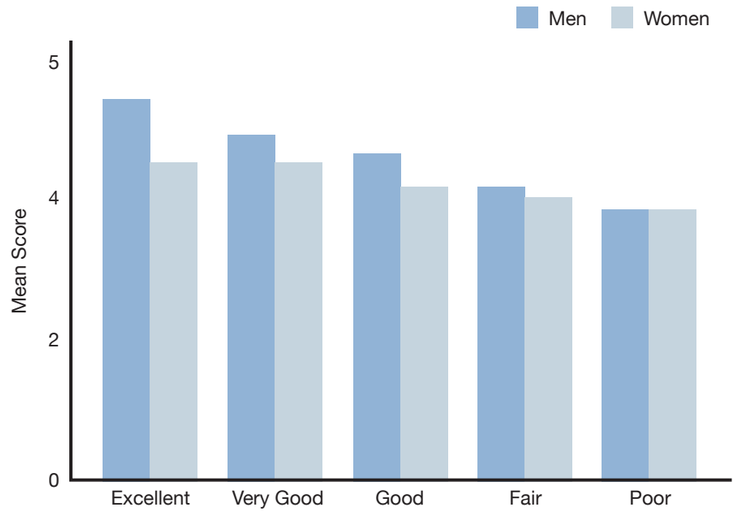
Figure 4: Financial Literacy Score by Living Arrangements and Gender



Financial Literacy by self-reported physical and mental health status

The HAGIS questionnaire asks participants to rate their physical health and mental health, each on a 5-point scale ranging from “Excellent” to “Poor”. Figure 5 shows a clear gradient in the financial literacy score for both men and women according to their self-rated report of physical health. For individuals who are in poor health there is no gender imbalance, however gender differences emerge with improved health status, with a larger association between high levels of health and financial literacy for men than women. For individuals who report that their health is excellent, the financial literacy score for men is 5.46 as compared to 4.56 for women.

Figure 5: Financial Literacy Score by Subjective Health Status and Gender



The relationship between financial literacy and self-reported mental health is shown in Figure 6. As with the subjective health measure, there is evidence of a strong positive association, which is particularly evident for men, who have a larger gradient in the mean financial literacy score by mental health status. For women, the evidence is weaker but is still suggestive that financial literacy is greater at higher levels of subjective mental health.

Figure 6: Financial Literacy Score by Subjective Mental Health Status and Gender

Regression Analyses of Financial Literacy Score and Population Characteristics

To analyse how these population characteristics are jointly associated with population characteristics, we developed some regression models of the financial literacy score (see Table 1).

Model 1 includes gendered living arrangements. These are clearly associated with financial literacy score. In comparison to cohabiting men, cohabiting women, and both single men and single women had a significantly lower score. The largest difference related to single women ($b = -0.64$, $p < 0.001$). Respondents with higher qualifications incrementally performed better across all levels of education ($p < 0.001$). There were no significant differences in financial literacy scores between retired respondents and those in employment. However the "Other" category (including permanently sick or disabled and those who look after the home or family) had a significantly lower score ($b= -0.40$, $p < 0.05$). Financial literacy was not socially graded, although respondents living in SIMD Q3, a relatively less deprived area achieved slightly higher scores ($b = 0.29$, $p < 0.05$). SIMD was not included in the subsequent models.

Model 2 further tested the association between financial literacy and subjective (general) health and subjective mental health, in addition to the socio-demographic variables tested in Model 1. The associations between financial literacy and both gendered living arrangements and education were robust. However, employment status was no longer significantly associated with financial literacy. Neither was subjective general health associated with our measure of financial literacy. But there was an interesting and significant association with subjective mental health. For example, those who self-reported their mental health as fair ($b = -0.38$, $p < 0.05$) or poor ($b = -0.59$, $p < 0.01$) achieved lower scores in comparison to those with excellent mental health.

In Model 3, both living arrangements and qualification displayed similar results in terms of the slope and significance of the coefficients as in Models 1 and 2. However, for those with fair or poor subjective mental health the association strengthened to $b = -0.56$ and -0.79 respectively and $p <0.001$.

Table 1. Regression Analyses of Financial Literacy Score and Population Characteristics

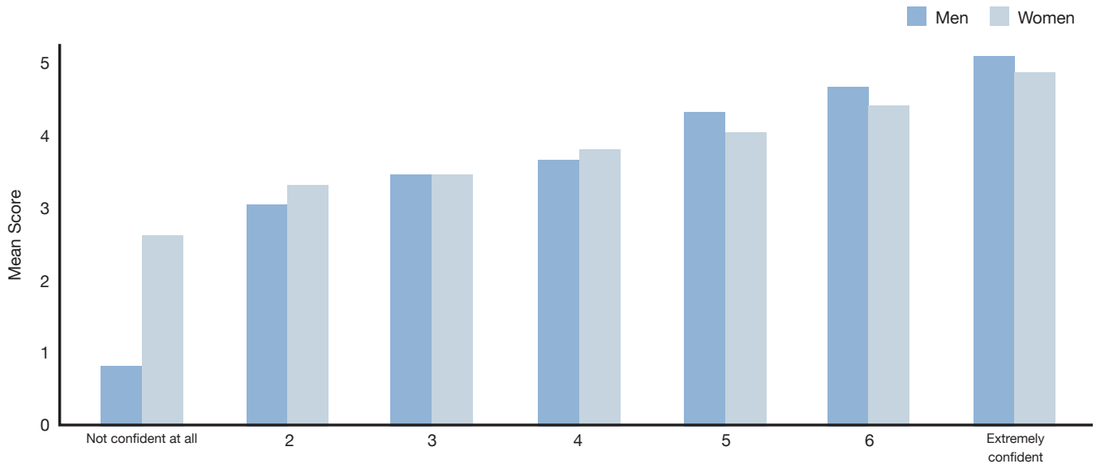
Population Characteristic	Model 1	Model 2	Model 3
Gendered Living Arrangements			
Cohabiting Male (Ref)	-	-	-
Cohabiting Female	-0.178*	-0.181*	-0.184*
Single Male	-0.278*	-0.230	-0.238
Single Female	-0.633***	-0.582***	-0.603***
Highest Qualification			
None/Primary (Ref)	-	-	-
High School	0.689***	0.688***	0.695***
6th Year/HNC/HND	0.877***	0.895***	0.928***
Degree	1.225***	1.191***	1.218***
Employment Status			
Retired (Ref)	-	-	
Employed	0.044	0.039	
Other	-0.401*	-0.255	
SIMD			
Q1 Most Deprived (Ref)	-		
Q2	0.158		
Q3	0.291*		
Q4 Least Deprived	0.150		
Subjective Health			
Excellent (Ref)		-	
Very Good		-0.122	
Good		-0.186	
Fair		-0.202	
Poor		-0.237	
Subjective Mental Health			
Excellent (Ref)		-	-
Very Good		0.139	0.065
Good		-0.037	-0.151
Fair		-0.383*	-0.556***
Poor		-0.589**	-0.790***
Constant	3.873***	4.231***	4.150***
r2	0.184	0.209	0.205
BIC	3412.373	3360.504	3365.064
N	1037	1022	1035

Note: * p<0.05; ** p<0.01; *** p<0.001

Financial Literacy Score and Confidence

After completing the financial literacy questions HAGIS participants are asked to rate how confident they feel about their answers on a scale from “Not confident at all” to “Extremely Confident”. This allows us to explore the extent to which participants have a realistic view of their financial knowledge. Figure 7 illustrates that for both men and women the confidence they feel in their answers is positively related to the mean financial literacy score. In particular, men who indicated the lowest level of confidence answered less than one question correctly on average. For both genders the degree of confidence increases with financial literacy, slightly more rapidly for men than for women.

Figure 7: Financial Literacy Score by Confidence and Gender



Regression Analyses of Confidence in Financial Literacy and Population Characteristics

A regression analysis of confidence in financial literacy score and population characteristics was conducted. In a separate analysis, confidence was associated with financial literacy score ($b = 0.53$, $p < 0.001$) demonstrating a positive association between confidence and ability.

In Model 1, we entered the same population characteristics as used when analysing the actual score, rather than one’s confidence in their score. For the gendered living arrangements, both single and cohabiting women were less confident than cohabiting men, and this was slightly stronger in single women ($b = -0.48$, $p < 0.001$) than cohabiting women ($b = -0.33$, $p <0.001$). Confidence in financial literacy was also graded by education with those with higher qualifications claiming greater confidence. There was no significant difference in the confidence levels of the retired and employed categories, but there was a small yet significant difference in confidence in those in the Other category ($b = -0.42$, $p <0.05$). Confidence in financial literacy increased across areas of high to low deprivation, with those living in the quartile3 exhibiting the greatest confidence ($b = 0.69$, $p < 0.001$).

In Model 2, the association between confidence and population characteristics were broadly similar. Women were less confident than men regardless of their living arrangements, although the effect size was relatively low. Those with higher levels of education and living in areas with lower levels of deprivation remained significantly more confident. Subjective health was not associated with confidence. However, those who rated their mental health as anything other than excellent were less confident and this was broadly graded (fair mental health $b = - 0.88$, $p < 0.001$).

In model 3, the previous associations between confidence and both population characteristics and subjective mental health remained broadly similar in strength and significance.

Table 2. Regression Analyses of Confidence in Financial Literacy and Population Characteristics

Variable	Model 1	Model 2	Model 3
Gendered Living Arrangements			
Cohabiting Male (Ref)	-	-	-
Cohabiting Female	-0.327***	-0.294**	-0.303**
Single Male	-0.095	-0.026	-0.028
Single Female	-0.479***	-0.453***	-0.453***
Highest Qualification			
None/Primary (Ref)			
High School	0.387**	0.355**	0.365**
6th Year/HNC/HND	0.598***	0.607***	0.615***
Degree	0.841***	0.717***	0.728***
Employment Status			
Retired (Ref)	-		
Employed	0.053		
Other	-0.420*		
SIMD			
Q1 Most Deprived (Ref)	-	-	-
Q2	0.363**	0.291*	0.301*
Q3	0.688***	0.641***	0.635***
Q4 Least Deprived	0.569***	0.547***	0.537***
Subjective Health			
Excellent (Ref)		-	
Very Good		0.163	
Good		0.076	
Fair		0.189	
Poor		-0.045	
Subjective Mental Health			
Excellent (Ref)		-	-
Very Good		-0.275*	-0.212
Good		-0.508***	-0.474***
Fair		-0.876***	-0.854***
Poor		-0.827**	-0.839***
_cons	4.871***	5.253***	5.315***
r2	0.148	0.177	0.174
bic	3606.324	3587.148	3570.848
N	1037	1033	1035

Financial Literacy in Scotland's older population in the international context.

There is a growing academic literature investigating financial literacy. Most of this has been inspired by the seminal work of Annamaria Lusardi and Olivia Mitchell, who designed three simple questions capturing financial knowledge and have conducted different surveys in the USA and around the world since 2004[16]. The measures of financial literacy identified by these authors capture the basic understanding of compound interest rates, inflation and risk differentiation (see Lusardi and Mitchell, 2014). For the sake of international comparison, we focus only on the scores of three HAGIS questions that are broadly similar to Lusardi and Mitchell. These correspond to the second, fifth and sixth question reported above[17].

Table 3 reports: (a) the proportion of correct answers to each question; (b) the proportion of respondents who answered all three questions correctly and (c) the percentage of people who answer "do not know" at least once. It is divided into four panels, showing broadly comparable figures from the HAGIS sample, other British samples, US sample and international surveys respectively.

The financial literacy of people aged 50+ in Scotland is quite low. Overall, very few people surveyed answered correctly all three questions (29.38%). 51.48% answered correctly the compound interest rate question, while a similar fraction answered correctly the inflation question (49.01%). Most of the respondent identified correctly that buying a wide range of shares or stocks is safer than otherwise (84.01%). 15.83% of participants responded that they do not know the answer to at least one of two questions related to interest compounding and inflation. This "opt out" option was not given with the question about understanding basic risk diversification. Hence, the higher rate of people answering correctly the risk question may be partly explained by respondents not having the possibility to opt out. In the other comparable surveys reported in Table 1, this question tends to have the lowest correct response rate. However, caution must be taken in comparing this particular financial literacy dimension across surveys as the question was framed differently.

Panel B reports figures from four waves of the British Election Study (BES) collected between 2014 and 2015 among a sample of British adults. The percentages reported for the Great Britain (GB) sample is the weighted figure across three waves. The Scottish sample reports weighted averages of a fourth wave that collected a boosted Scottish sample, with the motivation of tracking political and social perceptions following the referendum for Scottish independence of September 2014.

[16]For a summary, see Lusardi and Mitchell, 2014.
[17]The first question in Lusardi and Michell (2014) asks: "Suppose you have £100 in a savings account with an interest rate of 2% per year. If you never withdrew any money from this account, how much do you think there would be after 5 years?" The respondent has three possible answers: "More than £102", "Exactly £102", "Less than £102", "Do not know", "refuse to answer". The second question is "Imagine that the interest rate on your savings account was one 1 percent per year and inflation was 2 percent per year. After 1 year, would you be able to buy: More than today, Exactly the same as today, Less than today with the money in this account. The answer include "Do not know" and "refuse to answer". The final question is "Do you think that the following statement is true of false? Buying a single company stock usually provide a safer return than a stock mutual fund" Here the possible answers are "True", "False" "Do not know", "Refuse to answer".

The comparison between the HAGIS sample and these GB and Scottish samples is interesting because differences can be attributed to differences in the age composition of these studies. The GB and Scottish sample reveal similar level of financial literacy, with 40.2% and 37.3% of the respondents answering correctly to all three questions, respectively. Contrast this with the HAGIS survey and it is apparent that financial literacy is higher for younger people. Younger cohorts tend to answer correctly the interest rate and inflation questions, while the question assessing the understanding of risk was answered correctly by 48.7% of individuals in Great Britain and 46.6% of individuals in Scotland. 69.1% of the sample in Great Britain and 65.8% of the sample in Scotland responded correctly to the inflation question. Older people do better with the risk question, but recall that this difference may be due to survey and framing effects.

This difference in financial literacy levels may be partly explained by distinct levels of human capital, i.e., younger cohorts tend to be more educated and have been exposed to a variety of financial products early on.

The remaining of this table reports figures from the literature review presented in Lusardi and Mitchell (2014). Panel C presents comparison of the HAGIS sample and a financial-literacy survey conducted on people over 50 in the USA in 2004. Older people in Scotland tend to be slightly less financially literate than older people in the USA overall (29.4% in Scotland versus 34.4% in the USA answered the three questions correctly). Relative to the USA counterpart, the HAGIS respondents struggle with the concept of inflation. The difference between correct response rates is 26 percentage points in the case of inflation, and 15 percentage points in the case of compound interest rate.

Panel D compares the HAGIS sample with surveys from around the world with the caveat that these other surveys contain respondents of all ages. These comparisons show that the financial literacy of older Scottish people is lower than among most countries around the world, except USA and Japan.

Table 3: International comparison with academic literature

Country	Survey year	Interest rate	Inflation	Risk	All 3 correct	At least 1 "Don't know"
Panel A: *HAGIS sample*						
Scotland [a]	2017	51.5%	49.0%	84.0%	29.4%	15.8%[b]
Panel B: *BES sample (all ages)*						
Great Britain [c]	2014	81.3%	69.1%	48.7%	40.2%	31.3%
Scotland [c]	2014	80.9%	65.8%	46.6%	37.3%	34.0%
Panel C: *USA sample of 50+ (Lusardi and Mitchell, 2014)*						
USA	2004	67.1%	75.2%	52.3%	34.3%	-
Panel D**:** *International comparison (all ages)*						
USA	2009	64.9%	64.3%	51.8%	30.2%	42.4%
Netherlands	2010	84.8%	76.9%	51.9%	44.8%	37.6%
Germany	2009	82.4%	78.4%	61.8%	53.2%	37.0%
Switzerland[a]	2011	79.3%	78.4%	73.5%	50.1%	16.9%
Japan	2010	70.5%	58.8%	39.5%	27.0%	61.5%
Australia	2012	83.1%	69.3%	54.7%	42.7%	41.3%

Notes:
a Questions have slightly different wording than Lusardi and co-authors (see Lusardi and Mitchell, 2014).
b Respondents to the HAGIS survey were not given the option to answer “do not know” to the risk question, so this can be read as “at least 1 do not know out of 2 questions” instead of 3.
c Weighted averages from four waves of the British Election Study (BES) conducted in 2014 and 2015. Note that the figures for Great Britain are from three waves and include responses from Scottish people. The figures for Scotland are from a separate boosted wave that includes Scottish people only (see, Montagnoli et al., 2017).
The rest of the Table is from Table 1 and Table 2 in Lusardi and Mitchell (2014).

Conclusion

In this chapter we have examined how HAGIS respondents perform in tests of financial literacy. As in much of the relevant literature, there is a clear increase in financial literacy with education. There is little difference between retirees and those in work. However, those outside the labour market who typically have not reached state pension age tend to perform less well on financial literacy tests. There is little difference in aptitude with financial concepts by age and though men are typically more adept than women, those in couples fare better than both men and women living alone. These findings must be regarded only as measures of association: for example, lack of financial literacy may deter potential mates, just as being part of a couple may promote financial understanding. In addition, subjective mental health appears to have a strongly negative influence on financial literacy, though again it is difficult to determine the direction of causation.

We do find that individuals are able to make a reasonable assessment of their facility with financial concepts, though males are slightly more confident than females and confidence increases with higher levels of education. Interestingly, the financial literacy score was not socially graded yet confidence in the score was higher for those living in less deprived areas. Those with relatively poorer subjective mental health had less confidence and this effect was significant even in those who considered their mental health to be good. These findings present associations between confidence and population characteristics. Further research will be required to determine causality.

Although international comparisons must be treated with caution, our comparisons with already published scores suggest a lower level of financial literacy among older Scots. This must be a concern across a range of factors that affect older people’s well-being, such as debt, pension adequacy and the need for welfare support.

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10. Cognitive Function & Personality

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- Inspection of the psychometric properties of the cognitive tests and the personality measure in HAGIS showed that the test characteristics, distributions, and associations with other tests and demographic variables are as expected.
- A general measure of cognitive ability was created by entering five of the HAGIS cognitive tests into a principal component analysis. This general measure of cognitive ability was associated with performance on health literacy and financial literacy.
- The personality disposition of higher intellect had a small association with higher health literacy, and agreeableness with financial literacy, when controlling for cognitive ability.

Introduction

As part of the Healthy AGeing in Scotland (HAGIS) pilot study, measures of cognitive ability and personality were assessed. This report describes the cognitive tests and the personality questionnaire administered in HAGIS. Their psychometric properties are reported. One aim of the HAGIS pilot study was to investigate the relationship between cognitive ability and literacy measures. We test for associations between sociodemographic, cognitive and personality variables with two measures of literacy, i.e. health literacy and financial literacy.

Cognitive tests in HAGIS

Many of the tests administered in the HAGIS cognitive assessment were selected because they are thought to assess so-called 'fluid cognitive abilities'; these are abilities that show mean declines with increasing age, such as processing speed, reasoning, and some aspects of memory (Park & Reuter-Lorenz, 2009; Salthouse, 2004; Schaie, 1996). A vocabulary test — a measure of 'crystallised cognitive ability' — was included to estimate prior cognitive functioning. Mean levels of crystallised cognitive abilities tend to remain relatively stable across the adult life course, and do not show a substantial decline, especially in early older age (Park & Reuter-Lorenz, 2009; Salthouse, 2004; Schaie, 1996). Because of this stability, measures of crystallised ability can be used to estimate peak prior cognitive ability.

Owing to the method of data collection in HAGIS, the cognitive tests selected needed to be brief, easy to administer by individuals who are not experts in cognitive testing, and appropriate for administering within the participant's home. Where possible, tests were selected to harmonise with the English Longitudinal Study of Ageing (ELSA), and other longitudinal studies of ageing. Table 1 lists the cognitive measures included in HAGIS, the cognitive domains assessed, and the sources of each of the tests.

Table 1: Cognitive tests measured, the domains assessed, and the test source for each cognitive test in HAGIS

Test name	Cognitive domain	Source
1. Self-reported memory	Subjective memory	ELSA
2. Orientation in time	Global cognition	ELSA
3. Word recall (immediate and delayed)	Immediate and delayed verbal declarative memory	ELSA
4. Animal fluency	Executive function	ELSA
5. Letter digit substitution test	Processing speed	van der Elst et al. (2006)
6. Vocabulary	Vocabulary/crystallised ability	Adapted from COGNITO (Ritchie et al., 2014)
7. Matrices	Non-verbal fluid reasoning	Adapted from COGNITO (Ritchie et al., 2014)
8. Newest Vital Sign	Health literacy	Weiss et al. (2005)

Note: ELSA = English Longitudinal Study of Ageing.

Personality questionnaire in HAGIS

Personality was measured using the 50-item IPIP questions which measure the Big-Five personality factors of extraversion, agreeableness, conscientiousness, emotional stability, and intellect/imagination (Goldberg, 1992). This questionnaire consists of 10 items for each personality factor. Respondents are presented with a statement (e.g., "I make people feel at ease") and were asked to rate how accurately each statement described them on a 5-point Likert scale (very inaccurate to very accurate). This assessment was given as part of the self-complete questionnaire. The IPIP is free to use, and has been concurrently-validated in Scottish samples of younger and older adults using the leading Big-Five instrument, the NEO-Five Factor Inventory and the Eysenck Personality Questionnaire (Gow et al., 2005).

Psychometric properties

Cognitive ability

Missing data: During the HAGIS interview, it was possible for the interviewer to skip individual cognitive tests. Table 2 shows the number of respondents who skipped each test. Very few (n = 2) skipped the immediate word recall test. The percentage of respondents who did not complete the letter digit substitution test (LDST) and matrices test was higher (8.5% and 10.6%, respectively). This is higher than would be expected when testing community-dwelling respondents. This might be because interviewers were not expert in cognitive testing.

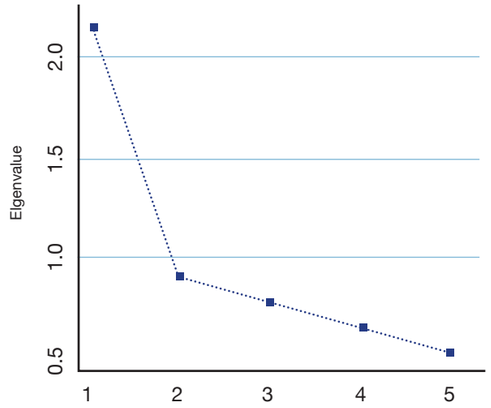
Table 2: Number of respondents and percentage of the HAGIS sample who did not complete each of the cognitive tests

	N with missing data	% of sample with missing data
Word recall - immediate	2	0.2%
Word recall - delayed	36	3.4%
Animal fluency	24	2.3%
Letter digit substitution test	90	8.5%
Vocabulary	44	4.2%
Matrices	112	10.6%
Newest Vital Sign	68	6.4%

Dealing with outliers: All subsequent analyses with the cognitive tests are performed following the removal or winsorization of scores in order to deal with outliers. Individuals who scored 0 on a test were removed, as this suggests that respondents either could not complete the test, or did not understand the task. None of the cognitive tests contains materials that would be likely to lead to a zero score for any individual; in cases (e.g., matrices, vocabulary) where items have a range of difficulty, they contain very easy items that all respondents would be expected to solve correctly. For animal fluency and LDST, scores were winsorized 3 SDs from the mean. Scores on the immediate and delayed word recall task correlated highly (Spearman's r = 0.66); therefore a total word recall variable was created by summing the score on immediate and delayed word recall.

General cognitive ability: To create a measure of general cognitive ability, scores on total word recall, animal fluency, LDST, vocabulary, and matrices were entered into a principal components analysis (PCA). Eigenvalues and scree plot (Figure 1) indicated that one component should be extracted. The first unrotated principal component explained 44% of the total variance across the five tests used. The loadings for the five tests were: total word recall = 0.60, animal fluency = 0.73, LDST = 0.70, vocabulary = 0.58, matrices = 0.68. The scores from the first unrotated principal component will be used as a general measure of cognitive ability.

Figure 1: Scree plot of eigenvalues from total word recall, animal fluency, letter digit substitution test, vocabulary, and matrices

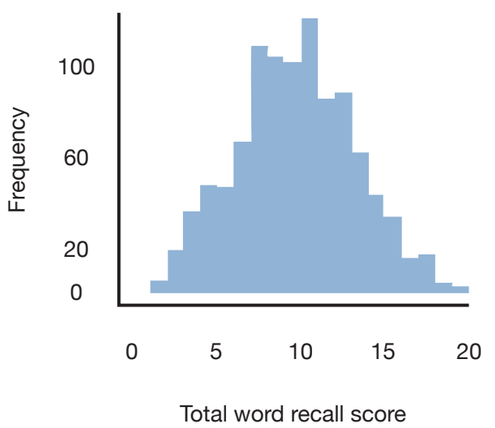


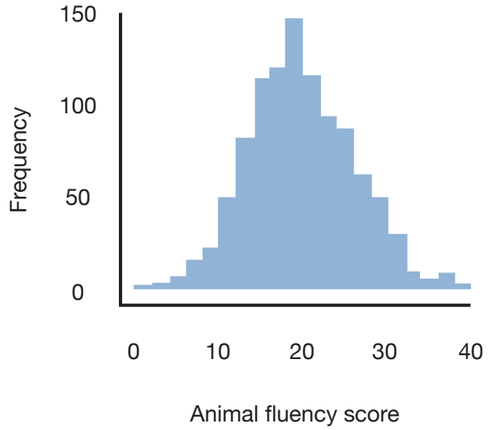
Distributions: We examined the distributions of the cognitive test scores, and of the two literacy measures (see Figures 2 and 3). The distributions of the five individual cognitive tests and general cognitive ability were relatively normally distributed. This confirms that the tests chosen are set at an appropriate level of difficulty for this population, and there were generally no marked ceiling or floor effects. Both the Newest Vital Sign (NVS), a measure of health literacy, and the financial literacy test show left (negative) skew and ceiling effects (i.e. a preponderance of high/perfect scores). There is, however, still substantial variability in the scores on these literacy measures.

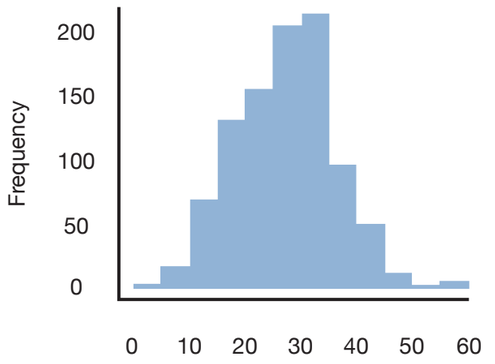
Test characteristics: Descriptive characteristics for the cognitive and literacy measures grouped by age group, sex, highest qualification, and Scottish Index of Multiple Deprivation (SIMD) quartile, are shown in Table 3 and Table 4. Figure 4 also shows the scores on general cognitive ability, vocabulary, and matrices grouped by highest educational qualification, and by SIMD quartile. Scores on all three cognitive measures tend to be higher in individuals with higher qualifications and who are in less deprived SIMD quartiles.

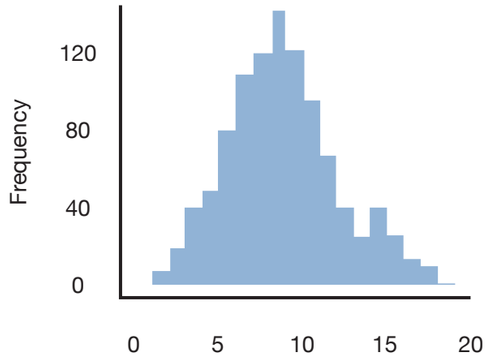
It is well established that diverse cognitive tests tend correlate positively with each other (Deary, 2012; Spearman, 1904; Wechsler, 2008), and that cognitive measures thought to assess fluid abilities tend to decline with age, while crystallised abilities tend to remain stable, or even increase with age (Park & Reuter-Lorenz, 2009; Salthouse, 2010; Schaie, 1996). To confirm that similar patterns were observed in HAGIS, correlations were calculated between age, and cognitive and literacy measures. Spearman rank order correlations are shown below the diagonal in Table 5 and partial correlations, controlling for age, are shown above the diagonal in Table 5. As expected, all cognitive tests, except vocabulary, decline with increasing age. Vocabulary remains relatively stable across the age range of the sample (r = -.094, p = .007). NVS declined with increasing age, whereas financial literacy remained relatively stable, indicating that the financial literacy test may be measuring more crystallised skills, whereas the NVS may be more fluid. All cognitive tests correlate positively with each other. Higher scores on general cognitive ability correlated strongly with higher scores on both the NVS and financial literacy, suggesting there is a large overlap between the cognitive skills involved in literacy measures and cognitive tests assessed here.

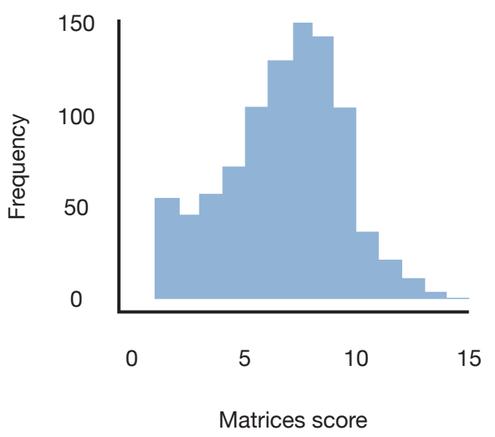
Figure 2: Distribution of scores for total word recall, animal fluency, letter digit substitution test, vocabulary test, matrices test, and a general measure of cognitive ability











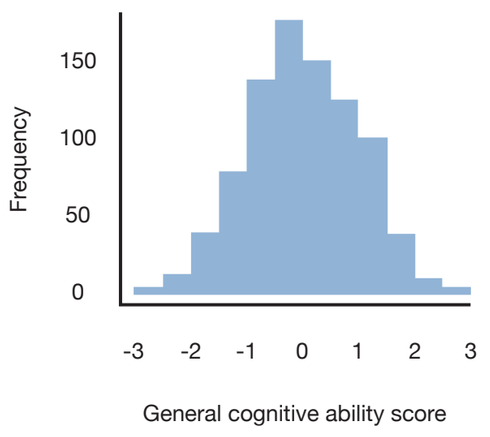


Figure 3: Distribution of scores on two measures of literacy; the Newest Vital Sign and a test of financial literacy

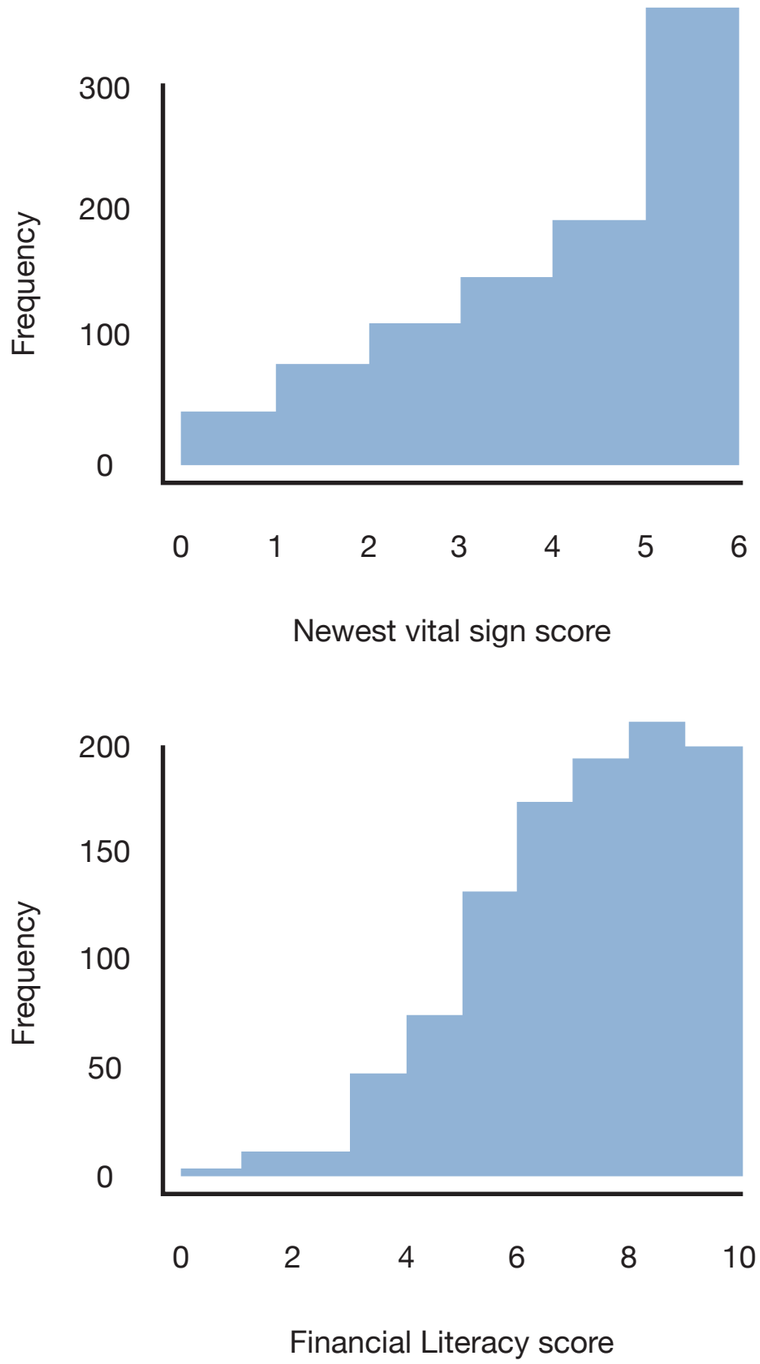


Table 3: Scores on cognitive measures in HAGIS, grouped by age group, sex, Scottish Index of Multiple Deprivation quartile, and highest qualification

	General cognitive ability		Total word recall		Animal fluency		Letter digit substitution test		Vocabulary		Matrices	
	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n
Age group												
< 60 yrs	0.34 (0.95)	234	11.62 (3.35)	253	21.98 (6.77)	258	30.95 (8.89)	247	8.94 (3.00)	256	7.87 (2.61)	246
60-69 yrs	0.11 (0.95)	308	10.62 (3.48)	338	20.94 (5.83)	341	29.23 (8.37)	332	9.46 (3.28)	337	7.45 (2.57)	325
70-79 yrs	-0.32 (1.00)	245	9.24 (3.38)	282	19.52 (5.91)	283	25.50 (8.45)	266	9.24 (3.45)	279	6.60 (2.71)	257
80-89 yrs	-0.37 (0.93)	84	8.73 (3.46)	123	17.26 (6.17)	134	22.83 (7.95)	107	9.73 (3.77)	125	6.29 (2.50)	99
≥ 90 yrs	-0.59 (0.91)	8	6.79 (2.58)	14	15.29 (5.70)	14	24.44 (8.59)	9	11.00 (4.18)	12	6.33 (3.00)	9
Sex												
Female	0.05 (1.01)	493	10.64 (3.58)	570	20.42 (6.55)	582	29.10 (9.07)	539	8.98 (3.18)	573	7.00 (2.65)	518
Male	-0.06 (0.98)	387	9.65 (3.51)	441	20.06 (6.04)	449	26.31 (8.44)	423	9.77 (3.51)	438	7.45 (2.68)	418
Highest qualification												
Primary or less	-0.78 (0.84)	144	7.89 (2.87)	195	17.00 (5.84)	210	22.90 (9.24)	180	7.40 (2.72)	199	6.04 (2.54)	164
O level/O grade	-0.17 (0.88)	282	10.63 (3.68)	319	19.77 (5.80)	315	27.68 (9.01)	293	8.22 (2.63)	313	6.84 (2.64)	296
Highers/sixth year studies/HNC/HND	0.09 (0.90)	248	10.52 (3.39)	279	20.71 (5.55)	284	29.25 (8.23)	274	9.49 (2.76)	278	7.44 (2.61)	261
First degree	0.61 (0.96)	115	11.36 (3.33)	125	23.30 (7.42)	127	30.83 (7.57)	121	11.78 (3.12)	128	8.07 (2.33)	122
Postgraduate/ higher degree	0.81 (0.82)	86	11.31 (3.34)	88	23.83 (5.89)	90	30.36 (7.44)	89	13.55 (3.15)	88	8.69 (2.43)	89
SIMD quartile												
1 (Most deprived)	-0.53 (0.96)	194	9.01 (3.38)	239	17.96 (6.31)	250	24.55 (9.54)	224	7.64 (2.65)	243	6.27 (2.53)	210
2	-0.01 (0.97)	184	10.79 (3.75)	211	20.04 (6.45)	209	28.55 (9.29)	196	9.01 (2.92)	212	7.17 (2.70)	201
3	0.27 (0.97)	261	10.91 (3.50)	293	21.67 (6.18)	295	29.38 (8.46)	280	9.99 (3.31)	287	7.60 (2.59)	272
4 (Least deprived)	0.14 (0.93)	242	10.05 (3.41)	270	20.99 (5.83)	279	28.57 (7.75)	264	10.37 (3.63)	270	7.53 (2.69)	255

Note: SIMD = Scottish Index of Multiple deprivation.

Table 4: Scores on the Newest Vital Sign and financial literacy grouped by age group, sex, Scottish Index of Multiple Deprivation quartile, and highest qualification

	Newest Vital Sign		Financial literacy	
	Mean (SD)	n	Mean (SD)	n
Age group				
< 60 yrs	4.91 (1.30)	249	7.76 (1.90)	262
60-69 yrs	4.79 (1.36)	318	7.84 (1.74)	348
70-79 yrs	4.15 (1.68)	259	7.55 (1.91)	289
80-89 yrs	4.05 (1.65)	103	7.13 (2.14)	140
≥ 90 yrs	3.33 (1.32)	9	6.79 (1.85)	14
Sex				
Female	4.57 (1.49)	535	7.38 (1.87)	594
Male	4.52 (1.57)	404	7.95 (1.90)	460
Highest qualification				
Primary or less	6.04 (2.54)	164	4.25 (1.63)	174
O level/O grade	6.84 (2.64)	296	4.33 (1.55)	285
Highers/sixth year studies/HNC/HND	7.44 (2.61)	261	4.69 (1.42)	264
First degree	8.07 (2.33)	122	4.88 (1.48)	121
Postgraduate/ higher degree	8.69 (2.43)	89	5.00 (1.35)	90
SIMD quartile				
1 (Most deprived)	4.41 (1.62)	215	6.93 (2.01)	254
2	4.53 (1.50)	197	7.58 (1.84)	219
3	4.78 (1.39)	272	8.03 (1.79)	299
4 (Least deprived)	4.43 (1.57)	256	7.89 (1.79)	284

Note: SIMD = Scottish Index of Multiple deprivation.

Figure 4: Mean scores, with standard error bars, for general cognitive ability, vocabulary and matrices, grouped by highest qualification and SIMD quartile.

Note: SIMD = Scottish Index of Multiple Deprivation. For qualifications, 1 = Primary or less, 2 = O level/O grade or equivalent, 3 = Highers, sixth year studies, HNC/HND or equivalent, 4 = First degree, 5 = Postgraduate/higher degree. For SIMD quartile, 1 = Most deprived, 4 = Least deprived.

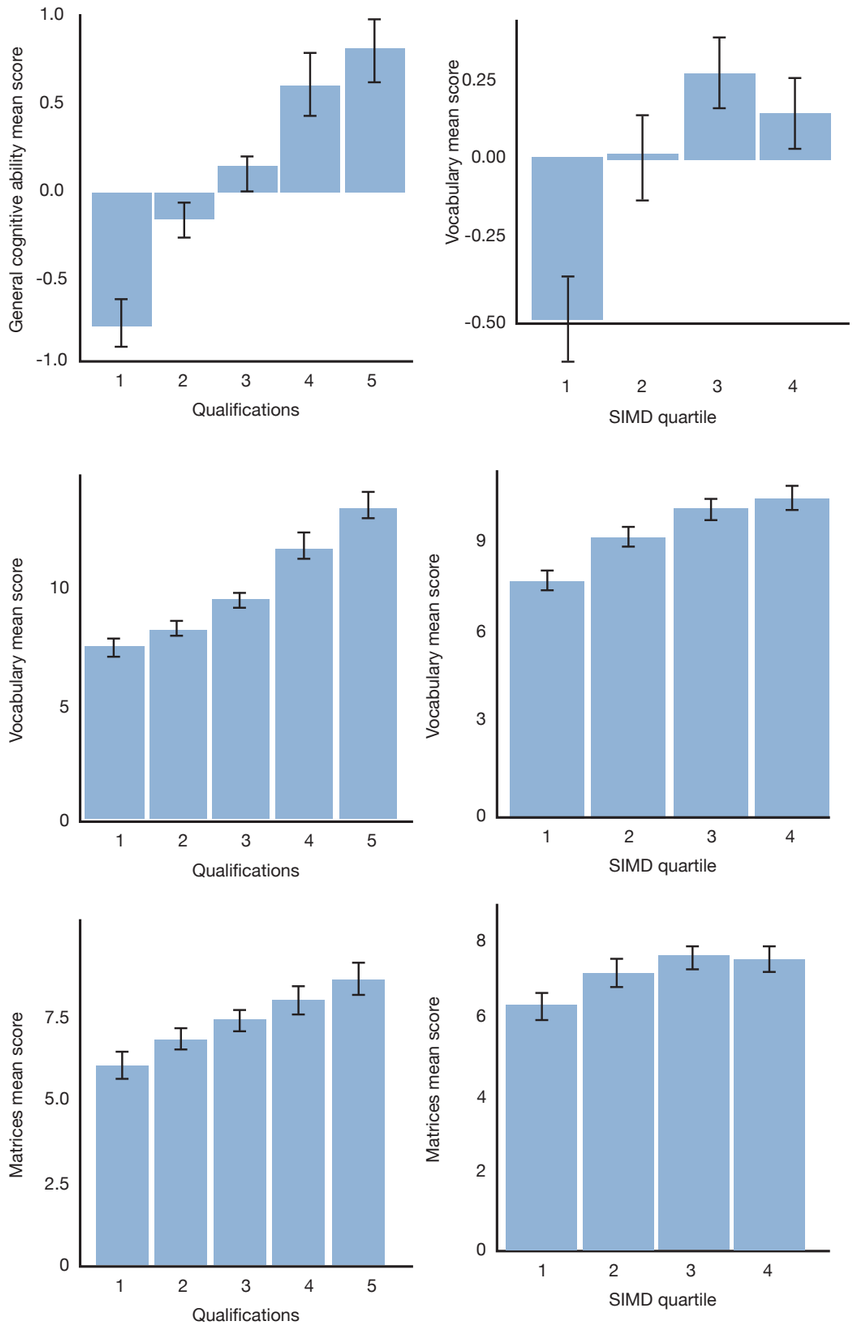


Table 5: Spearman rank order correlations (below the diagonal) and partial correlations, controlling for age (above the diagonal), between age, and cognitive test and literacy measures

	Age (in days)	General cognitive ability	Total word recall	Animal fluency	LDST	Vocabulary	Matrices	Newest Vital Sign	Finance literacy
Age (in days)	-	-	-	-	-	-	-	-	-
General cognitive ability	-0.269***	-	0.551***	0.713***	0.677***	0.605***	0.649***	0.375***	0.485*
Total word recall	-0.267***	0.583***	-	0.259***	0.232***	0.207***	0.216***	0.216***	0.209*
Animal fluency	-0.179***	0.723***	0.293***	-	0.443***	0.294***	0.260***	0.188***	0.336*
LDST	-0.301***	0.703***	0.294***	0.470***	-	0.211***	0.290***	0.212***	0.274*
Vocabulary	0.094**	0.555***	0.174***	0.271***	0.172***	-	0.404***	0.349***	0.431*
Matrices	-0.216***	0.668***	0.261***	0.289***	0.335***	0.373***	-	0.300***	0.363*
Newest Vital Sign	-0.216***	0.411***	0.261***	0.219***	0.262***	0.319***	0.332***	-	0.325*
Financial literacy	-0.036	0.476***	0.211***	0.337***	0.272***	0.426***	0.362***	0.325***	-

Note: n = 835. LDST = Letter digit substitution test. * p < .05, ** p < .01, *** p < .001

Personality

Structure of IPIP items: PCA, extracting 5 components, was carried out to determine whether the item loadings in HAGIS agreed with the item structure outlined in the IPIP, i.e. did each item load mainly on the Big Five dimension that the test constructor intended? These 5 components accounted for 42% of the total variance. Item loadings, with oblique (oblimin) rotation, are reported in Table 6. Generally, the component structure here agreed with that outlined in the IPIP questionnaire. For extraversion, agreeableness, conscientiousness, and emotional stability, all 10 items loaded over 0.3 on the appropriate factor. Four of the intellect items loaded less than 0.3.

Internal consistency: Internal consistency was calculated for scores on the 10 items of each component. Internal consistency was high for extraversion (Cronbach α = 0.82), agreeableness (α = 0.80), conscientiousness (α = 0.79), and emotional stability (α = 0.84). In line with the PCA results, internal consistency was satisfactory, but a little lower for intellect (α = 0.71).

Characteristics: Scores on the five IPIP personality factors, grouped by age group, sex, highest qualification, and SIMD quartile are shown in Table 7. Generally, scores on each of the personality factors were similar for different age groups, sex, qualification group, and SIMD quartile. HAGIS respondents with higher qualifications tended to score more highly on intellect than individuals with lower qualifications. Female respondents had slightly higher scores on agreeableness than male respondents. Spearman rank order correlations between the five personality components and health and financial literacy are reported in Table 8. All personality traits correlated positively. There was a positive correlation between intellect and NVS. Individuals who scored higher on intellect also scored higher on NVS (r = 0.159, p < .001). Financial literacy correlated positively with all five personality components, between r = 0.13 and 0.27 (all p < .01). The strongest association was between intellect and financial literacy. Higher intellect correlated 0.267 (p < .001) with higher financial literacy..71).

Table 6: Loadings from principal components analysis of the 50 IPIP items (n = 560)

	Loadings (oblique rotation)				
Item	Emotional stability	Agreeableness	Extraversion	Conscientiousness	Intellect
Am the life of the party	-0.04	-0.13	**0.69**	0.18	-0.18
Feel little concern for others	0.11	**0.38**	0.02	-0.05	0.06
Am always prepared	0.10	0.03	0.02	**0.54**	0.03
Get stressed out easily	**0.67**	-0.03	0.03	0.02	0.06
Have a rich vocabulary	-0.02	0.03	0.05	0.01	**0.67**
Don't talk a lot	-0.02	0.11	**0.57**	0.01	-0.08
Am interested in people	0.03	**0.57**	0.10	0.10	0.00
Leave my belongings around	0.10	-0.13	-0.10	**0.61**	-0.16
Am relaxed most of the time	**0.37**	0.13	0.06	0.16	0.06
Have difficulty understanding abstract ideas	0.18	-0.05	-0.04	0.03	**0.72**
Feel comfortable around people	0.22	**0.46**	**0.32**	0.05	-0.17
Insult people	**0.31**	**0.34**	-0.25	0.11	-0.03
Pay attention to details	-0.07	0.11	-0.01	**0.58**	0.17
Worry about things	**0.66**	-0.20	0.02	-0.12	0.17
Have a vivid imagination	**-0.32**	0.13	**0.33**	0.17	0.21
Keep in the background	0.05	-0.13	**0.73**	-0.03	0.04
Sympathize with others' feelings	-0.03	**0.67**	-0.05	0.10	-0.03
Make a mess of things	**0.31**	0.04	0.13	**0.45**	0.06
Seldom feel blue	**0.41**	0.07	0.11	0.14	-0.02
Am not interested in abstract ideas	0.09	-0.02	-0.01	-0.01	**0.74**
Start conversations	-0.06	**0.35**	**0.56**	0.01	0.00
Am not interested in other people's problems	0.14	**0.59**	0.08	-0.06	0.12
Get chores done right away	0.05	0.01	0.02	**0.61**	-0.17
Am easily disturbed	**0.59**	0.08	0.02	-0.03	0.04
Have excellent ideas	-0.06	0.03	0.25	**0.43**	0.27
Have little to say	0.05	0.11	**0.67**	0.01	0.10
Have a soft heart	-0.13	**0.64**	-0.05	0.02	-0.20
Often forget to put things back in their proper place	0.23	-0.19	-0.06	**0.63**	0.03
Get upset easily	**0.67**	-0.14	0.04	0.08	0.08
Do not have a good imagination	0.01	0.10	0.24	0.04	**0.35**
Talk to a lot of different people at parties	0.15	0.24	**0.62**	-0.04	-0.05
Am not really interested in others	0.25	**0.62**	0.12	-0.11	0.09
Like order	-0.13	0.05	-0.01	**0.65**	0.02
Change my mood a lot	**0.68**	0.11	0.01	0.05	-0.09
Am quick to understand things	0.11	0.22	-0.03	0.29	**0.38**
Don't like to draw attention to myself	-0.01	-0.29	**0.56**	-0.17	0.11
Take time out for others	0.04	**0.74**	-0.05	0.01	-0.02
Shirk my duties	0.29	0.23	-0.10	**0.33**	-0.06
Have frequent mood swings	**0.69**	0.11	-0.03	0.08	-0.03
Use difficult words	-0.17	-0.07	-0.04	-0.06	**0.67**
Don't mind being the centre of attention	-0.08	-0.01	**0.62**	-0.04	0.10
Feel others' emotions	-0.17	**0.61**	-0.05	0.11	0.06
Follow a schedule	0.03	0.14	0.00	**0.52**	-0.04
Get irritated easily	**0.62**	0.12	-0.03	-0.07	0.05
Spend time reflecting on things	**-0.39**	0.33	-0.11	0.19	0.27
Am quiet around strangers	0.17	-0.03	**0.64**	-0.06	-0.07
Make people feel at ease	0.05	**0.47**	0.28	0.09	-0.02
Am exacting in my work	-0.08	0.16	0.05	**0.48**	0.07
Often feel blue	**0.68**	0.09	0.10	0.11	-0.01
Am full of ideas	-0.14	0.07	**0.39**	**0.39**	0.18
Eigenvalues	4.89	4.70	4.53	4.03	2.84
% of variance	10%	9%	9%	8%	6%

Note: The loadings are calculated using the pattern matrix. Component loadings greater than 0.3 are in bold. Items shaded grey are the 10 items composed by the scale's author for each personality component.

Table 7: Scores on the five IPIP personality factors, grouped by age group, sex, SIMD quartile, and highest qualification

	Extraversion		Agreeableness		Conscientiousness		Emotional stability		Intellect	
	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n
Age group										
< 60 yrs	30.46 (8.22)	146	40.66 (5.56)	145	37.65 (6.49)	141	32.41 (8.26)	146	33.47 (5.41)	147
60-69 yrs	31.00 (7.13)	232	40.50 (5.95)	229	37.51 (5.92)	220	33.13 (7.29)	229	33.52 (5.69)	223
70-79 yrs	30.51 (6.42)	189	39.20 (6.44)	183	37.37 (6.17)	178	34.05 (6.89)	194	32.40 (5.85)	187
80-89 yrs	30.86 (6.95)	77	39.99 (6.29)	80	37.03 (6.51)	78	35.57 (5.93)	77	33.67 (5.30)	78
≥ 90 yrs	31.25 (5.23)	8	40.57 (7.89)	7	38.57 (8.06)	7	38 (4.90)	7	30.71 (3.90)	7
Sex										
Female	30.97 (7.08)	364	41.63 (5.59)	357	37.99 (6.11)	351	33.35 (7.14)	369	32.87 (5.29)	359
Male	30.47 (7.27)	290	38.23 (6.15)	289	36.75 (6.26)	275	33.84 (7.49)	286	33.58 (6.01)	285
Highest qualification										
Primary or less	30.74 (6.81)	105	38.89 (6.01)	109	35.57 (6.37)	100	32.02 (6.94)	106	30.72 (4.47)	99
O level/O grade	30.91 (6.29)	191	40.76 (6.16)	189	37.81 (5.97)	188	33.88 (7.26)	194	31.59 (4.59)	192
Highers/sixth year studies/HNC/HND	30.48 (7.32)	197	39.77 (6.12)	188	37.41 (6.21)	180	32.66 (6.77)	195	33.08 (5.42)	193
First degree	31.05 (8.29)	85	40.99 (5.30)	84	37.82 (6.30)	84	34.48 (8.03)	86	35.62 (5.65)	86
Postgraduate/ higher degree	30.83 (7.98)	71	40.04 (6.69)	71	38.86 (5.84)	69	36.62 (7.56)	69	38.48 (5.95)	69
SIMD quartile										
1 (Most deprived)	29.68 (6.45)	135	39.21 (6.47)	136	36.38 (6.93)	129	32.76 (7.33)	139	31.23 (5.07)	133
2	31.46 (7.41)	129	40.81 (5.91)	129	38.79 (5.80)	125	33.24 (7.61)	127	33.76 (5.59)	128
3	31.42 (7.68)	197	40.79 (5.85)	193	37.79 (5.87)	189	34.46 (7.17)	195	33.94 (5.51)	192
4 (Least deprived)	30.34 (6.85)	193	39.58 (6.05)	188	36.92 (6.11)	183	33.46 (7.15)	194	33.40 (5.87)	191

Note: SIMD = Scottish Index of Multiple Deprivation

Table 8: Spearman rank order correlations between personality components and the Newest Vital Sign and financial literacy

	Extraversion	Agreeableness	Conscientiousness	Emotional stability	Intellect	Newest Vital Sign
Extraversion	-					
Agreeableness	0.332***	-				
Conscientiousness	0.193***	0.448***	-			
Emotional stability	0.256***	0.255***	0.303***	-		
Intellect	0.269***	0.244***	0.292***	0.100***	-	
Newest Vital Sign	0.054	-0.018	0.072	0.035	0.159***	-
Financial literacy	0.134**	0.147***	0.192***	0.148***	0.267***	0.281***

Note: N = 523. * $p < .05$, ** $p < .01$, *** $p < .001$.

Associations between demographic, cognitive and personality measures with health and financial literacy

Introduction

Successful completion of the health and financial literacy tasks require processing and problem solving skills, as well as general knowledge relating to health and finance. It is unsurprising, therefore, that associations between health and financial literacy with cognitive function have been reported (Bennet et al., 2012; Finke et al., 2011; Kobayashi et al., 2015; Mõttus et al., 2014; Murray et al., 2011; Wolf et al., 2012). The correlations reported in Tables 5 and 8 show that health and financial literacy are correlated with both general cognitive ability and some of the personality traits. Therefore, this analysis sought to replicate previous findings that health and financial literacy are associated with cognitive function using a new measure of financial literacy, and also investigate the associations between these literacy measures with demographic variables and personality traits.

Method

Multivariate linear regression was used to investigate whether demographic, cognitive, and personality variables predicted health and financial literacy in HAGIS.

Literacy measures: Health literacy was assessed using the NVS, a 6-item test that involves respondents reading and answering questions based on information provided on a nutrition label. The HAGIS assessment included 10 financial literacy questions which were either multiple choice or required respondents to answer true or false.

Analyses: For each literacy test, five models were run. First, demographic variables were entered into the model. In Model 1, age in days at cognitive testing, and sex were entered as covariates. Highest qualification and SIMD quartiles were additionally added in Model 2. Qualifications were coded and entered as an ordinal variable as follows: 1 = less than primary; 2 = O level/O grade or equivalent; 3 = Highers, sixth year studies, HNC/HND, or equivalent; 4 = first degree; 5 = postgraduate/higher degree. SIMD quartile was entered as a multinomial variable, with 1 (most deprived) entered as the reference group. To determine whether cognitive function predicted performance on the literacy tests, general cognitive ability was additionally added to the model in Model 3. In Model 4, in addition to the demographic variables, the five personality factors were included to examine whether personality traits play a role in predicting health or financial literacy. A final model was run that included all demographic, cognitive and personality variables of interest (Model 5).

Results

Standardised betas and p-values for the association between demographic, cognitive and personality measures with health and financial literacy are shown in Tables 9 and 10, respectively.

NVS: With increasing age, performance on the NVS declined. For an SD increase in age, performance on the NVS declined by 0.2 SDs (Model 1, Table 9). Scores on the NVS did not differ by sex. Qualifications and SIMD quartiles were entered in Model 2. Having higher qualifications was associated with higher scores on the NVS. Deprivation was not associated with NVS scores. General cognitive ability was strongly associated with performance on the NVS. A one SD increase in general cognitive ability was associated with a 0.40 SD increase in NVS score (Model 3). Of the five personality factors entered in Model 4, only higher intellect was associated with higher health literacy. In a model including both general cognitive ability and the five personality components (Model 5), both general cognitive ability and intellect remained significant. All demographic variables included were no longer significant.

Table 9: Associations (standardised betas) between demographic, cognitive and personality variables with the Newest Vital Sign

	Model 1 N = 937	Model 2 N = 931	Model 3 N = 828	Model 4 N = 517	Model 5 N = 472
Age (days)	**-0.22*** **	**-0.20*** **	**-0.12*** **	**-0.19*** **	-0.08
Sex: Male	-0.01	-0.02	0.02	**-0.10***	-0.05
Qualifications		**0.15*** **	0.02	0.07	-0.02
SIMD quartiles					
1 – Most deprived		Reference	Reference	Reference	Reference
2		-0.03	-0.06	-0.06	-0.04
3		0.03	-0.04	-0.01	-0.06
4 – Least deprived		-0.06	**-0.11***	-0.01	-0.04
General cognitive ability			**0.40*** **		**0.41*** **
Extraversion				0.01	-0.01
Agreeableness				-0.09	-0.08
Conscientiousness				0.07	0.03
Emotional stability				0.04	-0.01
Intellect				**0.14** **	**0.12*** **

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Financial literacy: In Model 1 (Table 10), in which age and sex were included, older age was associated with poorer performance, and male sex was associated with better performance on the financial literacy test. Highest qualification and SIMD quartile were additionally entered in Model 2. Having higher qualifications was associated with higher scores on the financial literacy test. Individuals in the two least deprived SIMD quartiles had higher scores on the financial literacy assessment, compared to individuals in the most deprived quartile. General cognitive ability was strongly related to financial literacy scores. A one SD increase in general cognitive ability was associated with a 0.45 SD increase in financial literacy (Model 3). In Model 3, with general cognitive ability entered also, the direction of association between age and financial literacy changed. Whereas older age was associated with poorer performance in Model 1, older age was associated with better performance in Model 3 when cognitive ability was adjusted for. None of the personality factors were associated with financial literacy in Model 4. In the final model (Model 5), in which all demographic, cognitive and personality variables were included, higher general cognitive ability remained strongly associated with higher financial literacy. There was also a small but significant association between higher agreeableness scores and higher financial literacy. Older age, having higher qualifications and being male were also associated with higher scores on the financial literacy test in this model.

Table 10: Associations (standardised betas) between demographic, cognitive and personality variables with financial literacy

	Model 1 N = 1051	Model 2 N = 1044	Model 3 N = 872	Model 4 N = 553	Model 5 N = 491
Age (days)	**-0.12*** **	-0.05	**0.11*** **	0.01	**0.17*** **
Sex: Male	**0.15*** **	**0.13*** **	**0.16*** **	**0.12** **	**0.16*** **
Qualifications		**0.34*** **	**0.16*** **	**0.28*** **	**0.18*** **
SIMD quartiles					
1 – Most deprived		Reference	Reference	Reference	Reference
2		0.05	0.01	0.02	0.01
3		**0.13*** **	0.05	0.01	-0.05
4 – Least deprived		**0.08***	0.03	0.01	-0.02
General cognitive ability			**0.45*** **		**0.45*** **
Extraversion				0.06	0.05
Agreeableness				0.07	**0.09***
Conscientiousness				0.09	0.04
Emotional stability				0.04	-0.03
Intellect				0.08	0.01

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Discussion

This analysis found that general cognitive ability was strongly associated with performance on both health and financial literacy, in line with previous research (Bennet et al., 2012; Finke et al., 2011; Kobayashi et al., 2015; Mõttus et al., 2014; Murray et al., 2011; Wolf et al., 2012. To successfully complete these tests, respondents must use processing and reasoning abilities, as well as their acquired knowledge. Higher scores on intellect, the personality disposition toward having a rich vocabulary and being interested in abstract and difficult ideas, was associated with higher scores on the NVS, even when controlling for general cognitive ability, suggesting that both cognitive capability and desire to learn play a role in health literacy.

It is noted that both literacy measures used in this analysis are negatively skewed. Future analyses will use appropriate methods such as reversed-scored, zero-inflated Poisson regression to overcome possible problems with skewness in these analyses.

Conclusion

This report briefly investigated the psychometric properties of the cognitive tests and personality questionnaire administered in HAGIS. Collecting cognitive data in the HAGIS pilot study involved interviewers who are not familiar with cognitive testing and who have only undergone one day of cognitive testing training, and who then administered these tests in the respondents own home. Whereas this is in line with the method of data collection in ELSA and other longitudinal studies of ageing, it contrasts with traditional neuropsychological testing in which standardisation is more thorough. Inspection of the psychometric properties of the cognitive tests showed that the test characteristics, distributions, and associations with other tests and demographic variables, are as expected. For the personality questionnaire, we confirmed that the item loadings in HAGIS agreed with the item structure outlined previously and internal consistency for the personality factors ranged from adequate to very good. Thus, this analysis provides a quality check that the cognitive and personality data collected in HAGIS can be used with confidence by researchers.

We also investigated whether these cognitive and personality measures predicted performance on literacy tests. This report confirmed previous research which found that general cognitive ability is associated with performance on health and financial literacy (Bennet et al., 2012; Finke et al., 2011; Kobayashi et al., 2015; Mõttus et al., 2014; Murray et al., 2011; Wolf et al., 2012). In addition, we found that the personality disposition of higher intellect had a small association with higher health literacy, and agreeableness with financial literacy, when controlling for cognitive ability. Fuller analyses of these relationships will be conducted.

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11. Physical Activity and Health Behaviours in an Ageing Scottish Population

11. Physical Activity and Health Behaviours in an Ageing Scottish Population

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The analysis of the initial physical activity data from the HAGIS survey reveals that:

- Physical activity frequency declines with age across all intensities
- Physical activity frequency is higher in the less deprived SIMD quartiles (Q2, Q3 and Q4) than in Q1 (most deprived)
- Physical activity frequency is highest in Q3, and different from all other SIMD quartiles when examining moderate and vigorous activities
- Physical activity frequency for light activity (walking >10mins) is highest in least deprived SIMD quartile
- Physical activity frequency is higher at all intensities in males than females
- Age effects are not strongly evident in reported sitting time, but the most sitting time occurred in the 85-89 age band
- Sitting time is highest in the most deprived SIMD quartile (Q1) and lowest in Q3.
- Females report sitting less than males
- Perception of activity guidelines for a healthy lifestyle are much higher than the current minimum recommendations
- Reported number of days on which vigorous activity was performed did not associate with other health behaviours such as smoking, or fruit and vegetable consumption, but showed a moderate positive association with alcohol consumption in the last 7 days
- Odds ratios reveal that active respondents have significantly higher odds of several other positive health behaviours such as cancer screening, and report fewer self-reported health problems, than inactive respondents

Introduction

Population demographics in most developing and developed countries demonstrate an ageing profile, with growth in numbers of adults over 50 years of age (United Nations, 2010). With advancing age there is a general decline in physical, cognitive and physiological system functioning. However, a considerable body of evidence exists which suggests that maintaining, or increasing, physical activity has many beneficial effects for older adults (Doherty, 2003, Zubala et al., 2017). These benefits include delaying the decline of both physical and cognitive function. The ideal physical activity prescription for older adults includes aerobic exercises such as walking/cycling, resistance exercise such as heavy lifting, flexibility exercises such as stretching, and exercises that help to maintain or improve balance. The aerobic exercises should be performed for 150 minutes per week, if conducted at a moderate intensity. In addition, the other exercises are each recommended to be performed on 1-2 days per week (Bull et al., 2010, Chief Medical Officers UK, 2011).

11. Physical Activity and Health Behaviours in an Ageing Scottish Population

In an older adult population these physical activity recommendations should generally be individually tailored to the physical abilities, pre-existing medical conditions, and specific goals of each adult due to the increasing heterogeneity of functional and cognitive capacity.

Understanding older adult behaviour in relation to physical activity status can provide some insight into the future long term health and mobility of the population under investigation. The aim of this initial report is to describe the baseline physical activity data obtained from the HAGIS pilot study. The data provide some insight into aspects of health behaviours associated with ageing, socioeconomic status and gender. Additional insights into relationships between health behaviours (smoking/drinking and healthy eating) with physical activity behaviour are also investigated, and odds ratios of health behaviours and self-reported health problems are assessed in active adults compared to those who reported no activity.

Methods

HAGIS is a pilot study assessing baseline characteristics of over 1000 Scottish adults aged 50 years or more. The physical activity habits were ascertained on consenting adults within the 50+ age range by completion of a household survey. Activity habits were assessed through a series of questions focussed on intensity of activities (vigorous, moderate or light) as well as frequency (number of days) and duration (mins/day) but were not related to type of activity other than for light activity (walking). Sedentary behaviour was assessed by asking about sitting time. Respondents were asked about their knowledge of physical activity recommendations for a healthy lifestyle by being presented with seven different guideline durations per week ranging from 30 minutes per week to 210 minutes per week. The physical activity requirements for a healthy lifestyle question included an option for ‘Other’. This ‘Other’ category allowed respondents to present their own view of the activity recommendations, specifically if they decided not to choose one of the seven guideline answers presented to them.

The survey also gathered information about age, socio-economic status, gender, and a number of health behaviours such as smoking, alcohol consumption and fruit and vegetable intake. Age was classified into 5 year age bands from 50-54 onwards up to 90+ years. Socio-economic status was classified according to the Scottish Index of Multiple Deprivation (SIMD) with respondents assigned to SIMD quartiles (Scottish Government, 2016). Previous / current smoking habits were assessed by examining type of smoking and frequency of smoking. Alcohol consumption was assessed by considering frequency of alcohol intake in the previous 12 months, and amount / type of alcohol intake in the previous 7 days. Fruit and vegetable intake was assessed by asking for portions consumed on a typical day.

Due to the wide ranging nature of the overall survey, relationships between physical activity behaviour and other health behaviours could be examined. For these analyses the key discriminatory physical activity variable (number of days per week on which vigorous activity was performed) was assessed in relation to smoking habits, typical alcohol intake, vegetable intake, and fruit intake. In addition, odds ratios for a number of health behaviours and self-reported health problems were assessed in relation to activity status (those who report any activity) vs. a reference group of those reporting no physical activity.
Analyses were conducted using SPSS version 23 with weighting applied using the iHAGIS frequency weighting variable. Descriptive statistics were generated and analysis of variance conducted to identify differences in physical activity outcome variables in relation to age band, gender, and SIMD quartile. Post-hoc comparisons were conducted using Tukey tests where more than three grouping variables were present. Correlation analyses were conducted to associate the key discriminatory activity variable (vigorous activity) with other health behaviours. Odds ratios and 95% confidence limits were calculated in Excel 2016 without iHAGIS weighting according to Altman (1991). P-values were calculated according to Altman and Bland (2011).

Results

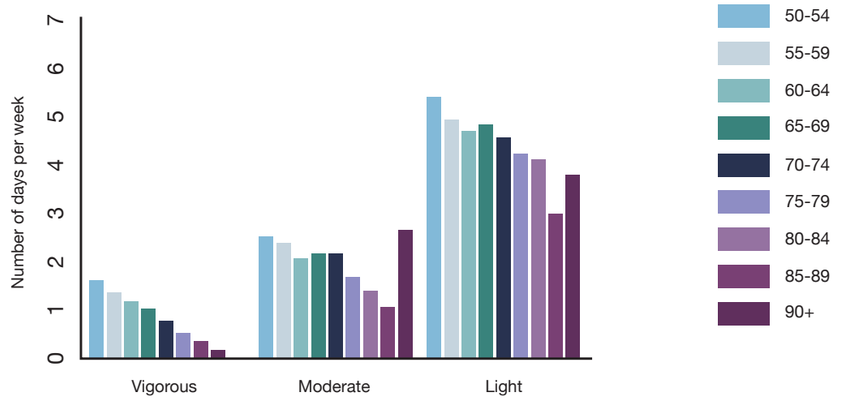
Data from 1057 adults were obtained from the household survey.

Activity intensity, frequency and duration

Analysis of the physical activity data revealed that that all intensities of physical activity (vigorous, moderate and light) declined in frequency with advancing age, being highest in the 50-54 age band and lowest in the 85-89 age band (Figure 1). Vigorous activity was performed on an average of 1.0 (range 0.0 to 7.0) days per week, moderate activity on 2.1 (range 0.0 to 7.0) days per week and light activity consisting of walking for >10 mins on 4.7 (range 0.0 to 7.0) days per week.

Activity duration data suggested a mean duration across all age bands of 2.0 (range 0.2 to 8.0) hours per day of vigorous activity, 1.7 (range 0.1 to 10.0) hours per day of moderate activity, and 1.9 (range 0.0 to 12.0) hours per day of light activity (walking) in a typical day for those who report activity. If 0 hours per day was inputted for respondents who indicated that no time was allocated to physical activity then the overall means become 0.5hrs of vigorous, 0.9hrs of moderate and 1.5hrs of light activity time per day. This analysis provides an overall mean of 2.9 hours per day of activity with a range of 0-20 hours per day.

Figure 1. Number of days per week on which some vigorous, moderate or light activity was performed in each age band. Values are mean (SEM) derived using the iHAGIS frequency weighting variable. All age bands are significantly different from each other with the exception of 65-69 and 70-74 year groups for Moderate activity.



Analysis of activity intensity and frequency in relation to SIMD quartile revealed that the lowest quartile (most deprived) undertook less activity at all intensities (mean vigorous 0.4, moderate 1.2, and light 3.9, activity expressed as days per week) compared with the other quartiles (Figure 2). Interestingly, the highest activity frequency for vigorous and moderate intensity was observed in quartile 3 (vigorous 1.5, moderate 2.6, days per week). Respondents in SIMD quartile 4 (least deprived) reported fewer days containing vigorous and moderate activity than those in SIMD quartile 3, but SIMD quartile 4 reported more days on which light activity took place (i.e. walking >10 minutes, mean frequency of 5.1 days per week).

Gender differences in activity frequency at each intensity were observed with females reporting lower frequency of activity at all intensities (Figure 3).

Figure 2. Number of days per week on which some vigorous, moderate or light activity was performed in each SIMD quartile. Q1 most deprived, Q4 least deprived. Values are mean (SEM) derived using the iHAGIS frequency weighting variable. All SIMD quartiles are significantly different from each other at each intensity.

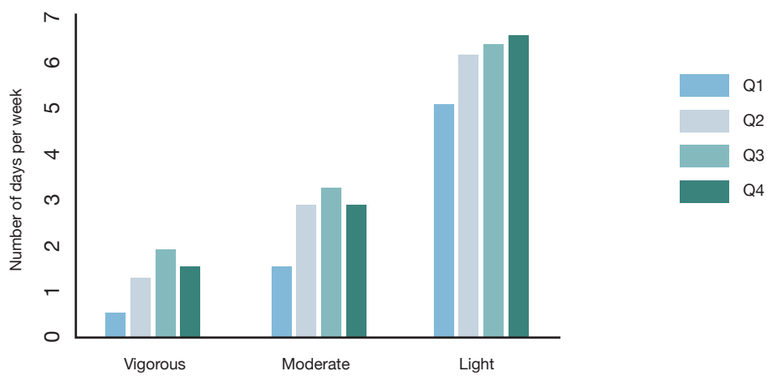
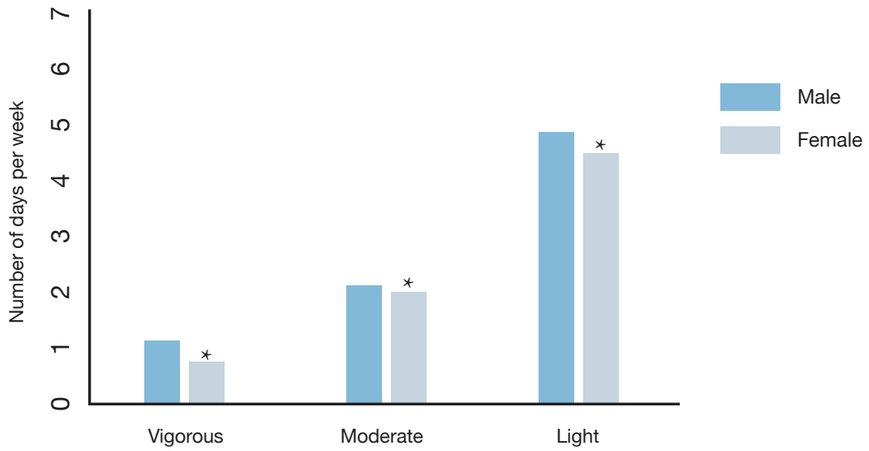


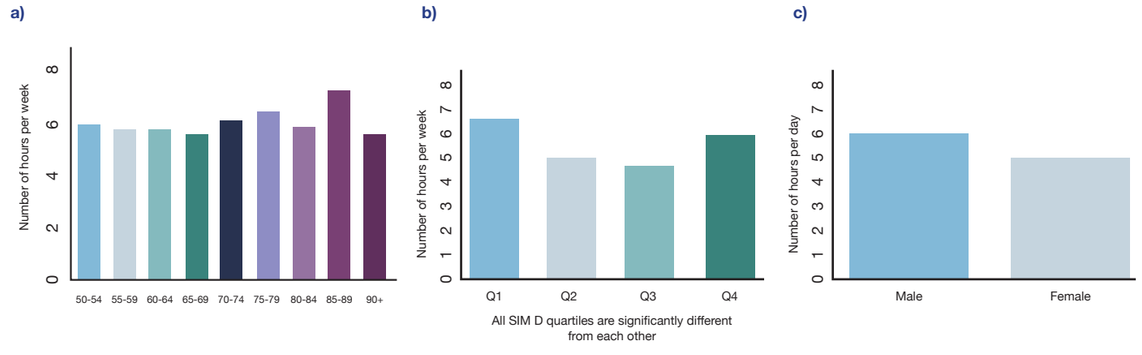
Figure 3. Number of days per week on which some vigorous, moderate or light activity was performed, by gender. Values are mean (SEM) derived using the iHAGIS frequency weighting variable. * significantly different from Males.



Sedentary behaviour

Sitting behaviour was different between age bands, SIMD quartiles and gender (Figure 4). Reported sitting time averaged 5.7 (range 0.5 to 12.5) hours per day across all age bands. Reported sitting time was highest in SIMD quartile 1 (most deprived) at 6.6 (range 0.5 to 12.3) hours per day, and lowest in SIMD quartile 3 at 5.1 (range 0.5 to 12.2) hours per day. Sitting behaviour was also different between genders with males reporting more sitting time (6.1 (range 0.5 to 12.0) hours per day) than females (5.3 (range 0.5 to 12.5) hours per day).

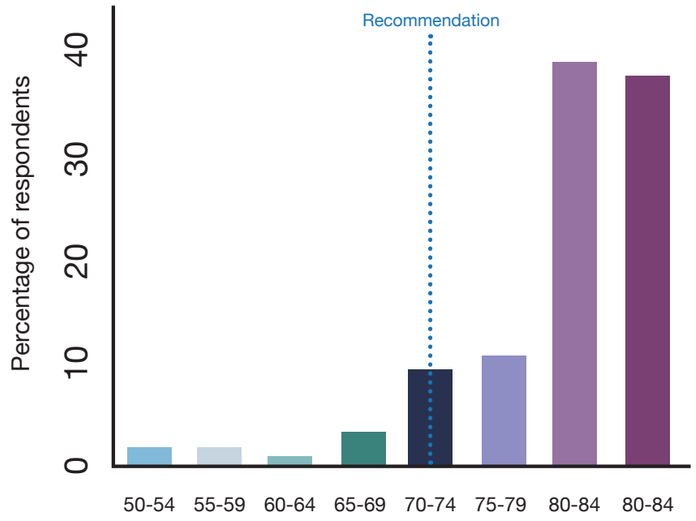
Figure 4. Number of hours per day of reported sitting time by age band (panel A), SIMD quartile (panel B) and gender (panel C). Values are mean (SEM) derived using the iHAGIS frequency weighting variable. All grouping variables were significantly different from each other.



Perceptions of physical activity guidelines

Participant perceptions of the duration of physical activity required for a healthy lifestyle generally overestimated the minimal aerobic exercise guidelines, with the mean response suggesting that over 180 minutes per week is recommended. When answering within the categories presented, the large majority (35.9% of respondents) indicated that 210 minutes or greater were required for a healthy lifestyle (Figure

Figure 5. Percentage of respondents indicating the physical activity requirements (minutes per week) for a healthy lifestyle. <10% of respondents indicated a value below the current minimum recommendation for moderate intensity activity. 35% of respondents indicated 'Other' which is broken down in Figure 6.

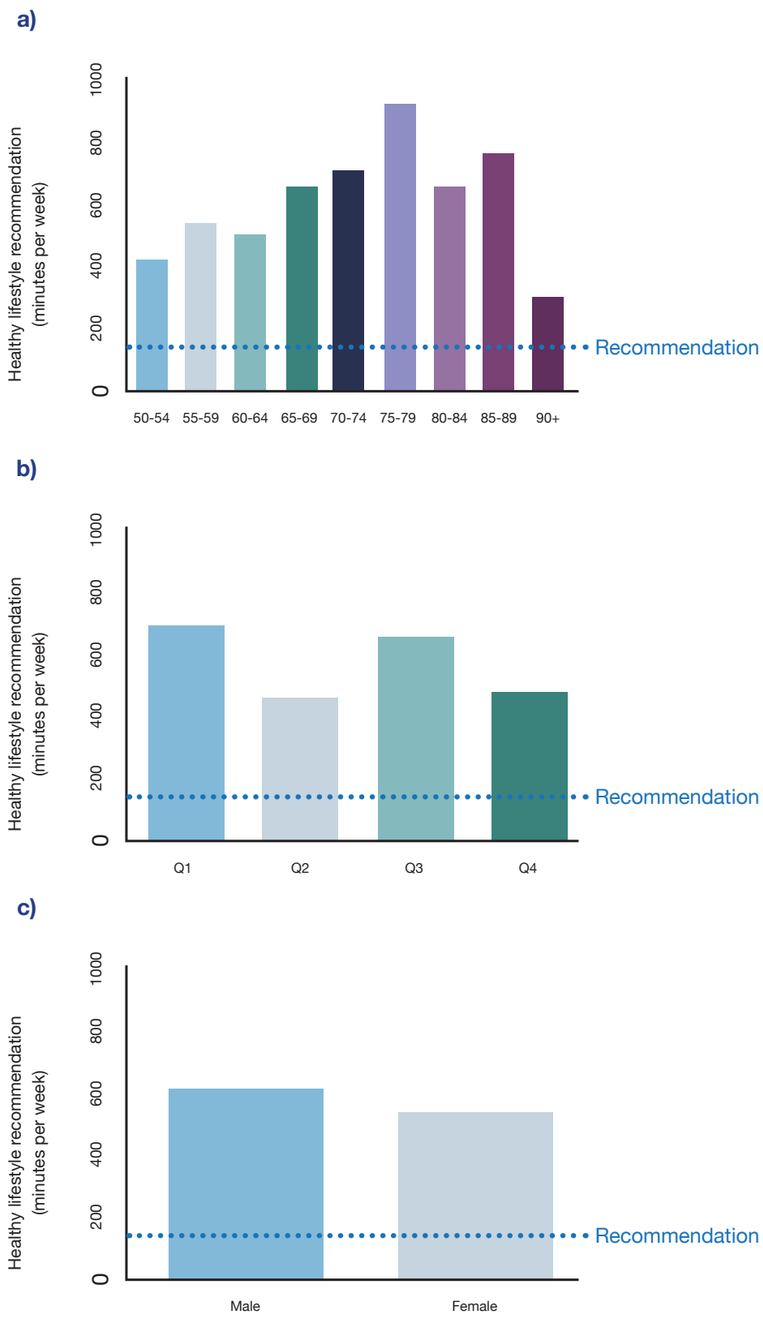


When the 'Other' category was explored it was evident that requirements for health were believed to be well beyond the minimum guideline regardless of age, SIMD quartile, or gender (Figure 6). Overall mean recommendation for physical activity in the 'Other' category was just over 570 minutes regardless of age band, SIMD quartile, or gender. Including all respondents 9.5% identified 150 minutes per week as the recommended physical activity per week for a healthy lifestyle. 69.6% believed it to be higher and 8.7% believed it to be lower. 12.2% said they did not know.

Associations between physical activity and other health behaviours

Correlation analyses between days of vigorous activity and other health outcomes revealed significant but modest positive associations with alcohol consumption in the last 7 days, particularly beer and wine consumption with r values of 0.15 ($p<0.01$) and 0.14 ($p<0.01$), respectively. No association was evident between either smoking behaviour, or fruit and vegetable intake (portions per day) with the reported number of days per week on which vigorous activity took place.

Figure 6. Healthy physical activity requirements (minutes per week) reported in the 'Other' category grouped by age band (panel A), SIMD quartile (panel B) and gender (panel C). All age bands are significantly different from each other with the exception of 65-69 and 80-84 yr age bands. All other grouping variables (SIMD quartiles and gender) were significantly different from each other and higher than the minimum recommendation.



Odds ratios were calculated for males and females to highlight health differences between active and inactive individuals (Table 1). Males who reported being active were significantly more likely to report other healthy behaviours. They were 1.67 times more likely to report having never smoked, and 3.52 times more likely to have undergone a bowel cancer screening test. However, they were no more likely to reach the recommended amount of fruit and vegetables and were twice as likely to report having had an alcoholic drink in the previous week. Similar, although less marked, trends ($p<0.10$) were observed in females where active individuals had higher odds of having a bowel cancer test, a breast cancer test and reporting having an alcoholic drink in the previous week. Active females also were no more likely to reach the recommended amount of fruit and vegetables per day. Although, they were significantly more likely to have never smoked.

Active males were also less likely to report having suffered moderate or worse pain, difficulty sleeping, difficulty moving, difficulty concentrating or shortness of breath (range 0.19 to 0.37). Active females were also less likely to report having suffered moderate or worse difficulty moving, difficulty concentrating or shortness of breath (range 0.22 to 0.30). They also reported similar but less marked trends ($p<0.10$) for moderate or worse pain, and difficulty sleeping (0.59 and 0.68 respectively).

Table 1. Odds Ratios (OR) and 95% confidence intervals (95%CI) for reporting some moderate or vigorous activity in the previous week rather than none compared to reference group for health behaviours and health problems.

		Male		Female	
		OR [95%CI]	p-value	OR [95%CI]	p-value
Health Behaviours	**Ever smoked for 1+ years**				
	Yes	REF		REF	
	No	1.67 [1.06 to 2.63]	**0.027**	1.47 [1.04 to 2.09]	**0.031**
	Bowel cancer test				
	No	REF		REF	
	Yes	3.52 [2.18 to 5.67]	**<0.001**	1.39 [0.95 to 2.02]	0.089
	Breast cancer test				
	No	-		REF	
	Yes	-		1.63 [0.95 to 2.82]	0.076
	Drink last week				
	No	REF		REF	
	Yes	2.02 [1.06 to 3.83]	**0.032**	1.66 [0.99 to 2.78]	0.053
	Fruit / veg portions per day				
	Low (0-2)	REF		REF	
	Some (3-4)	1.80 [0.84 to 3.84]	0.131	0.97 [0.48 to 1.99]	0.945
	Recommended (5+)	1.79 [0.89 to 3.59]	0.104	1.10 [0.57 to 2.14]	0.780
Self-reported health problems	**Pain**				
	None	REF		REF	
	Mild	1.02 [0.44 to 2.35]	0.972	1.39 [0.74 to 2.62]	0.314
	Moderate or worse	0.29 [0.13 to 0.63]	**0.002**	0.59 [0.32 to 1.08]	0.086
	Sleep difficulty				
	None	REF		REF	
	Mild	0.44 [0.20 to 0.93]	**0.031**	1.16 [0.61 to 2.21]	0.667
	Moderate or worse	0.37 [0.18 to 0.74]	**0.005**	0.68 [0.39 to 1.21]	0.191
	Moving difficulty				
	None	REF		REF	
	Mild	0.72 [0.36 to 1.44]	0.358	0.76 [0.43 to 1.33]	0.336
	Moderate or worse	0.21 [0.11 to 0.41]	**<0.001**	0.22 [0.12 to 0.38]	**<0.001**
	Concentration difficulty				
	None	REF		REF	
	Mild	0.62 [0.34 to 1.14]	0.125	1.10 [0.66 to 1.85]	0.731
	Moderate or worse	0.26 [0.12 to 0.57]	**0.001**	0.30 [0.16 to 0.55]	**<0.001**
	Shortness of breath				
	None	REF		REF	
	Mild	0.55 [0.27 to 1.15]	0.112	0.80 [0.45 to 1.41]	0.442
	Moderate or worse	0.19 [0.09 to 0.42]	**<0.001**	0.24 [0.12 to 0.49]	**<0.001**

Note: Active individuals were defined as reporting some moderate or vigorous activity in the previous week. Inactive individuals reported no moderate or vigorous activity in the previous week. Breast cancer test odds ratio only calculated for females. Fruit and veg portions per week were reported as total number of portions and simplified into low, some and recommended. Self-reported health problems were reported as none, mild, moderate, severe or extreme with the last three categories collapsed together due to low numbers reporting these categories.

Discussion

Consistent with the findings of other reports on older adult population samples, the frequency of physical activity declined with age across all activity intensities in this Scottish sample, and was associated with deprivation status and gender. Furthermore, there were considerable numbers of respondents who reported no activity. While objective measurements of activity status are required to confirm these findings, it appears that this Scottish sample is no different from other European or North American sample populations. The decline in activity with age band could be due to increasing issues with mobility, or existence/development of multiple co-morbidities with age. However, given the strong positive relationship between greater physical activity participation and lower incidence of mobility issues, it would seem prudent to highlight the benefits of increasing physical activity in this Scottish sample. Furthermore, data from the English Longitudinal Study of Ageing suggests that older adults who took part in moderate-to-vigorous activity at least once per week had 34%-50% lower risk for cognitive decline and dementia over 8-10 year follow up (Soni et al., 2017).

Frequency of physical activity across all intensities was greater in the least deprived SIMD quartiles (2, 3 and 4) compared with SIMD quartile 1 (most deprived). Physical activity was highest in SIMD quartile 3 for moderate and vigorous activity, and was highest in SIMD quartile 4 for light activity. Empana et al. (2016) investigated markers of cardiovascular health (including physical activity) in 8916 respondents in the Paris Prospective Study 3. They observed that ideal cardiovascular health decreased as deprivation index increased. These observations highlight the need to particularly target physical activity interventions at the most deprived groups. Interestingly, a study by Jones et al. (2009) observed that access to greenspace was not the key issue impacting upon activity status. However, these authors suggest that addressing the concerns about safety, and accessibility of greenspaces could possibly improve frequency of use in the most deprived areas.

In many aspects of the analysis it was evident that females reported lower values than males. In follow-up work it might be prudent to establish whether this reflects under-reporting in general by females, for both activity and sedentary behaviour variables. This could be established by using objective measurement technology. However, if these lower physical activity status observations in females hold true, it would suggest that research should be conducted into the underlying causes of these differences and that ultimately interventions should consider targeting females to improve participation in light, moderate and vigorous activity.

In the present evaluation the reporting of activity durations was inconsistent with previous literature. In a recent systematic review of older people's perspectives on participation in physical activity, Franco et al. (2015) report that some older people believe that physical activity is unnecessary or even harmful, others reporting a range of barriers to physical activities. Falck et al. (2016) highlight the issues of self-reporting physical activity in many population surveys and interventions. The self-reported data in the present analysis would exceed all objectively measured activity status evidence from the literature and should thus be interpreted with caution. Sedentary time / sitting time data were consistent with the patterns observed for activity frequency with the most deprived quartile (Q1) sitting the most, and quartile 3 sitting the least. Wheeler et al. (2017) recently proposed a link between sedentary behaviour, impaired glycaemic control, and cognitive decline. The authors suggest a role for increasing intermittent light intensity physical activity as a preventative strategy. It seems this might be a good approach for the most deprived areas in the present study sample.

Interestingly, perception of activity guidelines for a healthy lifestyle in the present sample are higher than the minimum guidelines. This may reflect acknowledgement by the respondents that more activity is likely to be better. One third of respondents considered 210 minutes as a recommendation and a third also considered >570 minutes as optimal. These values do not necessarily reflect the type of activity being performed, but likely include all forms of activity such as resistance exercise, flexibility, and aerobic activities. Current physical activity recommendations are for 150 min moderate physical activity per week, however those who get more are likely to achieve additional health benefits (Blair et al., 2004). However, such high targets may be unachievable for most and this misconception of the guidelines may contribute to disengagement with physical activity.

From the present analysis it seems that intervention is required particularly to target those who are inactive or have low activity status and this is most likely in older, most deprived groups, and in females. Planning of physical activity interventions for these groups should consider implementing the recommendations of the Rome statement (Freiberger et al., 2017).

In conclusion, it appears that the activity habits of this Scottish sample are similar to those reported in other populations. Future work following-up on this particular cohort would be useful to track longitudinal trends in physical activity and other health behaviours, and to link these data to health outcomes. Interventions to improve communication and understanding of the healthy active guidelines and to improve physical activity status in the population should be considered.

11. Physical Activity and Health Behaviours in an Ageing Scottish Population

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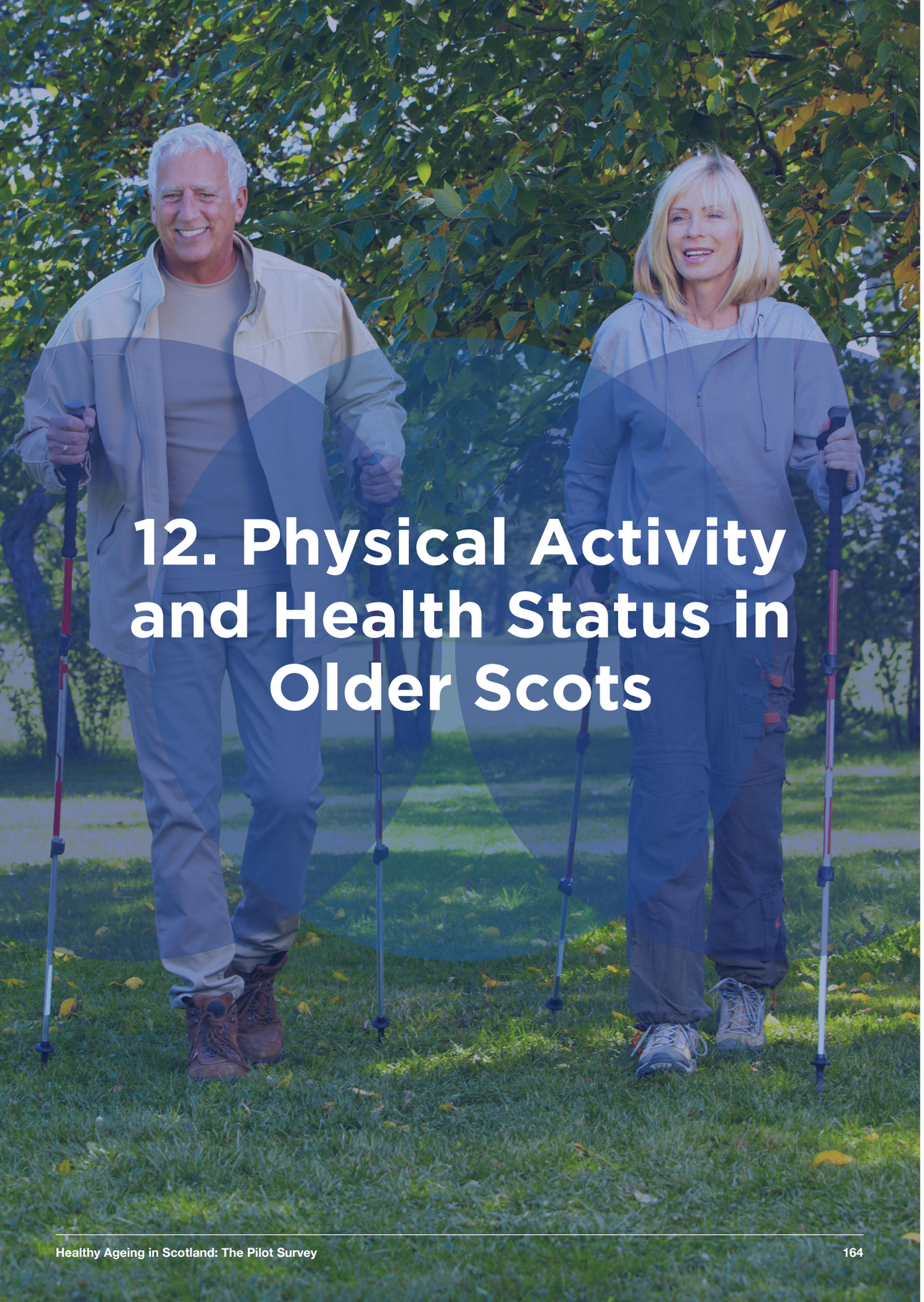


12. Physical Activity and Health Status in Older Scots

12. Physical Activity and Health Status in Older Scots

Rachel Crockett, University of Stirling

Introduction

- Physical activity is substantially lower in those who live in the most deprived quartile of neighbourhoods
- The observed decline in physical activity around the age of retirement is unlikely to be associated solely with increasing age
- The impact of physical activity on the maintenance of the ability to move easily is particularly marked
- While movement is a form of physical activity the absence of a linear relationships between the two variables, and sharp drops in physical activity in those who indicated mild and moderate problems with movement indicates that mobility is measuring something that differs from physical activity
- These findings underline the importance of physical activity in improving the health of older Scots

There is good evidence that engaging in health-related behaviours, maintains health across the life span and prevents the onset of chronic preventable diseases such as cardiovascular disease, type 2 diabetes and many cancers. An important behaviour to the maintenance of good health, including in old age, is physical activity (Crockett et al., 2017). In addition to delaying the onset of a range of preventable diseases, being physically active in old age is associated with reduced incidence of a range of health problems associated with ageing including cognitive decline (Beydoun et al., 2014; Norton et al, 2014), and physical disability (Cotter & Lachman, 2010). In addition, physical activity is associated with reduced problems with pain, sleeping and movement problems all of which have a significant impact on well-being and tend to increase with age (Thompson et al., 2017; Montgomery and Dennis, 2002; Foley et al., 1995, Crockett et al., 2017).

This chapter will use data from the Healthy Ageing in Scotland Study to explore the impact of physical activity on measures of self-rated health and well-being as well as mobility, pain and sleep.

Methods

Physical activity

The number of times a week respondents engaged in vigorous or moderate physical activity or walking and the number of minutes of each type of activity on one typical day were used to calculate the MET score (IPAQ Research Committee, 2005). The MET score is the amount of energy used during activity compared to resting. In the current analyses the MET minute score was calculated in two stages. First an indicator of the amount of each type of physical activity was calculated by multiplying the number of times a week that a person engages in the activity by the number of daily minutes. Second the weekly number of minutes was multiplied by the MET score for the activity:

- walking x 3.3
- moderate physical activity x 4
- vigorous physical activity x 8

The weekly scores for each type of physical activity were then added to give a total score of weekly MET minutes. In addition a categorical score was calculated. Respondents were categorised as undertaking:

- Minimal physical activity (600 or fewer MET minutes week)
- Moderate physical activity (between 600 and 2999 MET minutes per week)
- High physical activity (3000 MET minutes or more per week).

General health and well-being

Respondents were asked to rate their general health, emotional or mental health, and general health compared to other people of the same age, on a scale of 'excellent', 'very good', 'good', 'fair' or 'poor'. Respondents were also asked if they had visited their general practitioner in the last month with a binary response of 'yes' or 'no'.

Specific health problems

Respondents were asked to rate degree of aches and pains, difficulty with sleeping, and any problems with moving, experienced over the last 30 days on a scale of 'none', 'mild', 'moderate', 'severe' and 'extreme'.

Demographic variables

To reduce variation in the size of demographic groups in the analyses demographic variables were categorised, or collapsed, into broader categories.

- Age: 50-59 years; 60-69 years; 70-79 years; 80+ years.
- Sex: male; female (transgender or prefer not to disclose were included in the demographic analyses).
- Social deprivation: four equal groups from most deprived to least deprived.
- Marital status: married; single; never married; divorced or separated; widowed.
- Employment status: employed; pensioner; neither employed nor pensioner.
- Highest education: no educational qualifications; qualifications taken at 15 or 16; qualifications taken at 17/18; undergraduate degree; postgraduate degree.

Analyses

The statistical software package SPSS v.21 was used to analyse the data. Frequency weighted data were used. Descriptive statistics including estimated mean and 95% confidence intervals for physical activity in mean MET minutes per week by demographic variables were calculated.

To explore the relationship between general and specific health measures and physical activity, estimated means and 95% confidence intervals for physical activity mean MET minutes per week by ratings of the health outcomes and binary logistic regression was conducted. General and specific health measures were re-coded in to binary variables. Those responding that their health, mental health or health compared to others was 'good', 'very good' or 'excellent' were recoded as having good health and those indicating 'fair' or 'poor' health were recoded as not having good health. For specific health problems with pain, sleep and mobility, those responding that they had 'no' or 'mild' difficulties were re-coded as not having a problem, while those who responded that they had 'moderate', 'severe' or 'extreme' difficulties were recoded as having a problem. The predictor variable was physical activity as a categorical variable. The odds ratios with 95% confidence intervals for the impact of engaging in either moderate or high physical activity in comparison to not being physically active on the general and specific health measures were extracted.

In addition, hierarchical logistic regression was conducted using unweighted data to explore the impact of physical activity as a categorical predictor on each of the general and specific health problems, controlling for the age, sex and socioeconomic status. Odds ratios were again extracted for the impact of engaging in either moderate or high physical activity in comparison to not being physically active on outcomes.

Results

A total of 1022 respondents provided data for inclusion in the analyses of physical activity. Across the sample the estimated mean weekly MET score was 3942.07 (95%CI: 3553.46, 4330.69). Activity levels by a number of demographic characteristics are show in Table 1.

Table 1: Mean physical activity in weekly MET score by demographic characteristics (estimated mean and 95%CI)

Sample Characteristics	Mean MET Score (95% CI)
Age	
50-59	4869.84 (4020.69 - 5718.99)
60-69	4712.93 (3600.94 - 4744.93)
70-79	2881.65 (2395.74 - 3367.55)
80+	2328.73 (1621.17 - 3036.29)
Sex	
Male	4153.15 (3505.05 - 4801.20)
Female	3422.72 (2979.15 - 3869.29)
Marital status	
Married of living with partner	4235.73 (3734.45 - 4734.00)
Single, never married	3293.77 (1817.89 - 4769.66)
Separated or divorced	3267.72 (2442.28 - 4093.15)
Widowed	3363.38 (2541.70 - 4185.06)
Employment status	
Retired	3299.46 (2930.70 - 3668.22)
Employed	5659.36 (4786.34 - 6532.38)
Not employed or retired	1436 (908.39 - 1964.06)
Social deprivation	
Most deprived	2199.93 (1768.25 - 2631.6100)
2	5710.07 (4051.71 - 6163.23)
3	4243.76 (3482.49 - 5005.03)
Least deprived	4427.49 (3671.97 - 5183.01)
Highest educational qualification	
No qualifications	2313.08 (1809.28 - 2816.88)
15/16 exams	4306.91 (3375.73 - 5238.08)
Post 16 school or further education qualifications	4466.93 (3855.41 - 5078.45)
Undergraduate degree	4340.54 (3471.64 - 5209.45)
Postgraduate degree	3932.31 (2874.87 - 4989.75)

There are clear decreases in physical activity with age, the greatest drop being between those in their 60s and those in their 70s, with 95% confidence intervals showing this drop to be significant. Men were somewhat more physically active than women, but not significantly so and there were also no significant differences by marital status. Mean physical activity scores in those who had retired were significantly lower than in those who were still employed. This mirrors the drop in physical activity seen in those in their sixties, probably reflecting that most people retire during this age range. Lowest physical activity scores were observed in those neither working nor retired, the majority (62%) of whom were unable to work due to ill-health. The impact of social deprivation and educational qualifications on physical activity is similar. Those who are most deprived and those with no educational qualifications have significantly lower levels of physical activity.

Physical activity and general measures of health and well-being.

The impact of moderate and high physical activity levels on ratings of general and specific health compared to not being at least moderately physical active are shown in Table 2.

Associations between physical activity and ratings of health are shown in Figures 1a-d. Figure 1a shows linear decreases in ratings of health as physical activity decreases. Those who were moderately physically active were five times more likely to rate their health as good or better compared to those who engaged in minimal physical activity while those who engaged in high levels of physical activity were over ten times more likely to report good or better health.

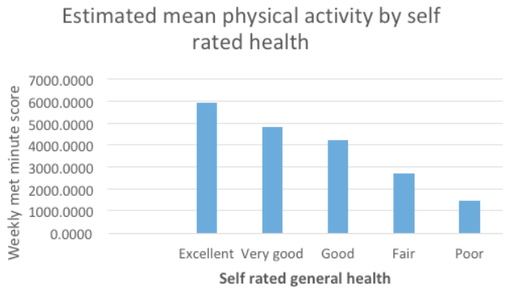
Table 2: Impact of moderate and high physical activity levels on ratings of general and specific health compared to not being at least moderately physical active weighted data and unweighted data controlling for age, sex and social deprivation (Odds ratios and 95% Confidence Intervals)

	Weighted data		Unweighted data controlling for age, sex and social deprivation	
	Moderately physically active (OR (95%CI))	Highly physically active (OR(95%CI))	Moderately physically active (OR (95%CI))	Highly physically active (OR(95%CI))
Good self-rated health	5.55 (3.69 - 8.48)	10.36 (6.77 - 15.84)	4.97 (3.36 - 7.35)	10.27 (6.70 - 15.72)
Good self-rated mental health	2.18 (1.42 - 3.39)	3.98 (2.57 - 6.18)	2.28 (1.53 - 3.41)	3.85 (2.50 - 5.94)
Good self-rated health in comparison to others	5.59 (3.55 - 8.82)	12.27 (7.49 - 20.10)	4.78 (3.13 - 7,28)	13.63 (8.12 - 22.87)
Has not visited GP in last month	1.89 (1.29 - 2.79)	2.59 (1.76 - 3.82)	1.91 (1.34 - 2.76)	2.94 (2.03 - 4.28)
No major pain problem	2.80 (1.69 - 4.62)	4.46 (2.73 - 7.28)	2.72 (1.67 - 4.42)	5.59 (3.39 - 9.21)
No major sleep problem	1.71 (1.04 - 2.80)	2.45 (1.52 - 3.95)	2.03 (1.26 - 3.26)	3.34 (2.07 - 5.40)
No major mobility problem	6.11 (3.60 - 10.39)	10.47 (6.05 - 18.11)	5.13 (3.09 - 8.52)	11.65 (6.60 - 20.56)

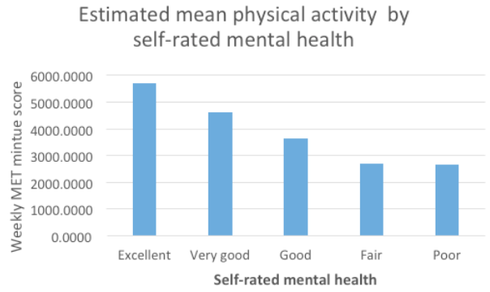
Although Figure 1b suggests those better mental health ratings are associated with higher physical activity, the pattern is more variable than for general health. This is reflected by the odds ratios which show statistically significant differences in the ratings of mental health across the three levels of physical activity are much smaller than for general health. Those with moderate levels of physical activity and those with high levels of physical activity were, respectively, twice as likely and almost four times more likely to rate their mental health as good or better compared to those engaging in minimal levels of physical activity. Self-rated health in comparison to other people of the same age (Figure 1c) shows substantially higher physical activity levels in those rating their health as good or better in comparison to others in contrast to those who rated their health in comparison to others as fair or poor. Odds ratios show that this pattern is significant with those moderately physically active being over five times more likely, and those highly physically active over 12 times more likely to rate their health in comparison to others as good or better. Finally, among general health indicators, Figure 1d suggests that those who have visited their GP in the last month tend to have lower physical activity than those who have not visited their GP in that time. Although the odds ratios are smaller than for the other outcomes (OR=1.71, 95%CI: 1.04-2.80 and OR=2.45, 95%CI: 1.52-3.95) they are significant confirming this association.

Figure 1: Relationship of physical activity with a) self-rated health, b) self-rated mental health, c) self-rated in health in comparison to others, d) visits to the general practitioner in the last month (estimated means).

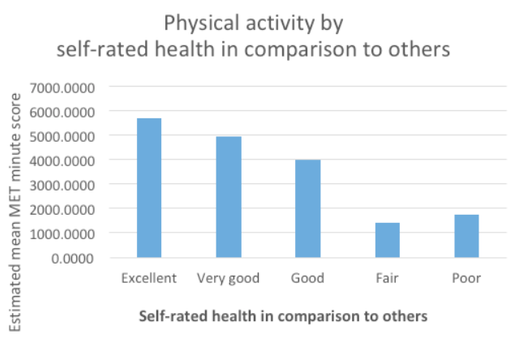
a)



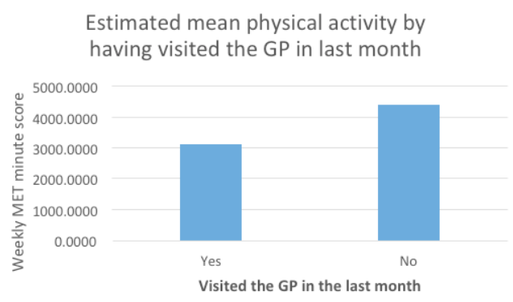
b)



c)



d)



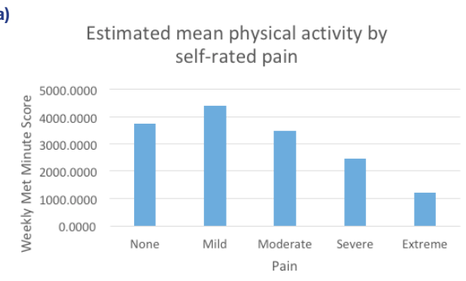
Physical activity and associations with pain, sleep and mobility

Figure 2a suggests that pain was greater in those with lower physical activity levels than those who engaged in more physical activity. Logistic regression supports this pattern finding that those with which found that those with moderate physical activity were more than twice as likely to experience little pain and those with high levels of physical active were more than four times more likely to experience little pain (Table 2). Figure 2b suggests a somewhat similar pattern for sleep confirmed by the odds ratios which indicate that those who have moderate levels of physical activity are more than one and a half times as likely to report no more than mild sleep difficulties, and those with high levels of physical activity are nearly two and a half times more likely to report no more than mild sleep problems, compared to those with minimal activity levels. The pattern shown for reported moving problems is more variable (Figure 2c) with noticeable differences in physical activity between those who have no more than mild problems with moving and those who have more severe problems. This pattern is confirmed by the odds ratios which found those who reached moderate levels of physical activity were six times more likely to report no more than mild movement problems than those getting minimal levels of physical activity. For those who were highly active, the likelihood of indicating no more than mild problems was more than ten times what it was for those with minimal physical activity.

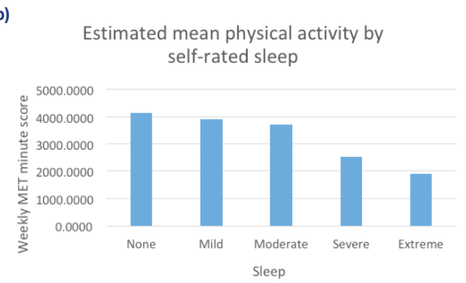
However, given the associations of demographic variables with physical activity and likely associations with general and specific health outcomes, it is possible that the impact of physical activity on outcomes is confounded by the demographic characteristics of respondents. However, although conducted in the unweighted data, the hierarchical logistic regression controlling age sex and social deprivation gives odds ratios very similar to the uncontrolled weighted data (Table 2). This provides support for an independent effect of physical activity on general and specific health outcomes.

Figure 2: Relationship of physical activity by a) pain, b) sleep and c) mobility (estimated mean)

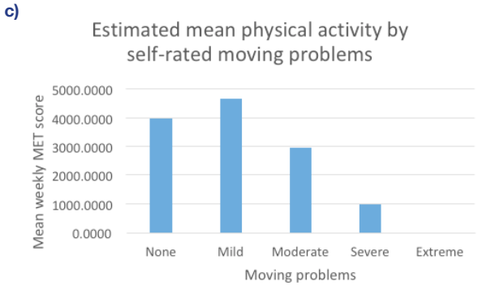
a)



b)



c)



Discussion

The HAGIS data show a clear association between physical activity and general and physical health. These associations remain in multivariate analyses controlling for the impact of demographic variables associated with physical activity.

A number of findings are particularly pertinent to efforts to improve the health of older adults in Scotland. A recent report found that men in Scotland had lower life expectancy than in England and Wales, with the greatest difference in those from the most socially deprived areas (Kenway et al., 2015). Social deprivation tends to be associated with high rates of morbidity and mortality from preventable diseases and this has been associated with lower engagement in more healthy behaviours (Adler & Snibbe, 2003). The current results show that physical activity is substantially lower in those who live in the most deprived quartile of neighbourhoods with a significant difference to any of the three less deprived quartiles. Further the observed decline in physical activity around the age of retirement is unlikely to be associated solely with increasing age. Existing evidence indicates that while physical activity in those who are more socially deprived goes down at retirement, in those who are less socially deprived physical activity tends to increase (Chung et al. 2009). These findings suggests that attempts to improve the health of older Scottish adults would usefully focus on what hinders physical activity among people living in more socially deprived neighbourhoods and in the development of effective strategies to maintain and increase physical activity around retirement age.

The impact of physical activity on the maintenance of the ability to move easily is particularly marked. While movement is a form of physical activity the absence of a linear relationships between the two variables, and sharp drops in physical activity in those who indicated mild and moderate problems with movement indicates that mobility is measuring something that differs from physical activity. Given the importance of good mobility in delaying the onset of disability and loss of independence (Stewart et al., 2014) this finding underlines the importance of physical activity in improving the health of older Scots. A major cause of physical disability, and associated reductions in independence and of life in this group is falls (Viera et al. 2016). Maintaining mobility reduces the risk of falls and associated disability (Boyd & Stevens 200, Reelick et al., 2009).

However while these results are in line with previous research indicating the importance of physical activity on health and well-being in older adults there is one caveat to be made in the interpretation of the results. The data are cross-sectional and therefore we cannot say that physical activity causes better health. It is possible, and likely to some extent, that having poorer health and greater disability lead to reduced physical activity. Subsequent waves of HAGIS data will allow us to explore the longitudinal relationship between engaging in physical activity and health outcomes during ageing. Regardless of the limitations of these cross-sectional data, they provide support for further research into physical activity in promoting well-being in older adults in Scotland.

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13. Subjective Life Expectancy in HAGIS

13. Subjective Life Expectancy in HAGIS

David Bell, University of Stirling

Introduction

- After correcting for individual characteristics such as gender, area of multiple deprivation and health, SLE and objective life expectancy grow at almost identical rates.
- Males tend to be over optimistic. Objectively, they are likely to live 4 years less than women, but the gap in SLE in our more extensive model is only 1.5 years.
- The gap in SLE between those living in deprived areas and those living in affluent areas is much less than that in observed life expectancy. The objective difference in life expectancies between the most and least deprived quartiles is around 12 years, but the SLE estimates are only 2.4 years.
- Having poor health and having smoked at any time tend to reduce individuals' expectations of longevity. The difference in SLE between those in "excellent" health and those in "poor" health is 7.2 years, while having smoked reduces it by a further year.

Individuals regularly make decisions that will affect their future lives. Some of these decisions, such as whether and how much to set aside for a pension will affect their consumption and savings for the remainder of their lives. Yet individuals generally do not know the precise length of the remainder of their lives. Nevertheless, their expectations of how long they will live are implicit in the many decisions that they make which relate to their future.

Many of the longitudinal studies of ageing ask individuals to estimate how long they expect to live, thus making explicit what is usually implicit. This estimate of individuals' "subjective life expectancy" (SLE) provides useful information that may help explain choices that individuals make, not only in relation to finance, but also across a range of health and social behaviours. HAGIS has also asked individuals for an estimate of SLE. In the self-completion questionnaire, it firstly primes individuals to think about their life expectancy by asking: *"thinking about other people of the same age and sex as yourself, to what age would you expect them to live on average?"*

The next question asks for an assessment of SLE: *"and what age would you expect yourself to live?"*

This section of the report analyses the responses of the 666 individuals who answered this question. Its contribution is that it compares individuals' subjective expectation of life with objective measures which take account not only of age and gender, but also of the level of deprivation in the area in which the respondent lives.

Providing estimates of life expectancy is a key duty of any government statistical agency. These estimates are normally calculated by age and gender and published in the form of a life-table. This is a device which is also an essential tool for actuaries working in the life assurance industry. A life-table provides estimates of the expected remainder of life for an individual of a certain age and gender. It is based on the previous mortality experience of the population.

13. Subjective Life Expectancy in HAGIS

Scotland has been producing life tables for its population since 1930. More recently, it has produced life tables for areas within the country that experience different levels of deprivation. This is largely a response to the substantial health inequalities that exist within Scotland. These are exemplified most starkly and objectively by differences in life expectancies. Thus, males living in the most deprived 10% of Scotland's datazones had a life expectancy of 70.1 years at birth according to the 2013-2015 life-table is produced by the National Records of Scotland (NRS): in contrast, those living in the most affluent 10% of data zones has a life expectancy of 82.3 years at birth. Since we know the level of deprivation of the areas in which HAGIS respondents reside, we can assess whether individuals in the more deprived areas have lower subjective life expectancies than those in the more affluent areas, as would be consistent with the objective life expectancy data.

Literature review

Before analysing the HAGIS data, it is worth briefly reviewing some findings from the existing literature on SLE. These tend to fall into two categories: those that seek to explain differences between actuarial estimates of life expectancy and SLE and those that investigate how SLE affects individual behaviours.

The initial comparison of subjective and objective measures of life expectancy was made by Hamermesh (1985). He found that individuals were implicitly taking account of objective trends in increased life expectancy when assessing their own life expectancy. However, the subjective distribution had higher variance than the actuarial measures, although this variance declined with age. Mirowsky (1999), using a sample of 2000 US citizens aged 18-95 showed that, in general, subjective life expectancies correspond broadly with the objective actuarial estimates. However, the expectations of both males (3 years) and blacks (6 years) are somewhat more optimistic than the objective data on life expectancy suggests. He finds no evidence that younger individuals adjust their expectations upwards in the light of increasing life expectancy. Hamermesh and Hamermesh (1985) present evidence on the relationship between SLE and "health knowledge". While smokers estimate of their own SLE compared with non-smokers is close to the actuarial difference, those with long-lived parents and grandparents tend to overestimate the additional lifespan that they can expect. Similarly, those who are overweight tend to overestimate the negative effect that this will have on their life expectancy. Van Solinge and Henkens (2017) using a panel dataset from the Netherlands for the period 2001-2011, show that psychological variables play a role in the formation of SLE. They also find that SLE predicts actual mortality after correcting for demographic, medical and social controls. They also show that education had an important influence on actual mortality that was not fully captured in SLE.

Much of the literature which examines how SLE affects individual behaviours focuses on the retirement decision. Thus, Van Solinge and Henkens (2009) show that SLE affects retirement intentions. Those who expect to live longer plan for a later retirement. However, there is no evidence that these intentions are realised: rather, actual age at retirement is not influenced by SLE.

Results

Figures 1 and 2 show some simple statistics on SLE derived from the HAGIS respondents. Figure 1 shows how subjective life expectancy varies by age group and gender. There is a steady decline from the youngest age group in the HAGIS sample, those aged 50-54, whose SLE averages 27.5 years to those aged 90+ who expect to live for another 4.5 years on average. There is very little difference between male and female SLE at each age group, even though the 2013-2015 life-table for Scotland indicates that female life expectancy is almost exactly 4 years longer than that for males.

Figure 1: Subjective Life Expectancy by Age Group and Gender

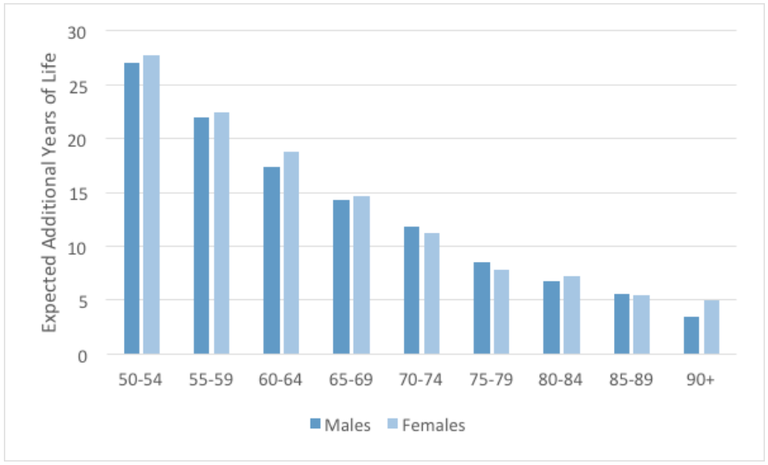

Figure 2 shows how SLE varies with subjective health status. Those who describe their health status as excellent expect to live for a further 21 years, while those who think that their health status that is poor expect only to live 11.5 years more.

Figure 2: Subjective Life Expectancy and Health

Table 1 shows how SLE varies by quartiles of the Scottish Index of Multiple Deprivation (SIMD). Those who live in the most affluent areas expect to live for a further 14.8 years, while those in the most deprived areas expect to live for 12.7 years. The main difference lies between those in the poorest quartile and the rest. There is a slight drop in SLE from the second most deprived quartile to the least deprived.

Table 1: Expected additional years of life by deprivation quartile

Deprivation quartile	Most deprived	2nd	3rd	Least deprived
Expected additional years of life	12.7	16.8	15.3	14.8

These findings in the preceding figures and table do not account for the interaction of these various characteristics. For example, subjective health and deprivation are likely to be strongly correlated. To address this issue, “model1” in the first column of Table 2 below shows the results from a regression model which seeks to explain the variation in expected further years of life (i.e. SLE – actual age) with a number of controls. The first of these is the objective expectation of life for an individual of that age and gender who is resident in that quartile of the SIMD distribution. If individuals accurately assess their life expectancy in relation to their age and gender group living at similar levels of deprivation or affluence, one would expect that a one-year increase in actuarial life expectancy would result in a one-year increase in SLE (i.e. the coefficient on objective life expectancy in a regression should be 1).

Further controls for sex and SIMD quartile will reveal systematic biases associated with gender and levels of deprivation. Table 2 shows that the coefficient on objective life expectancy is 0.93. Thus a one-year increase in actual life expectancy results in a 0.96 year increase in SLE. The estimate is significantly less than 1, implying that there is a tendency, albeit slight, to underestimate objective life expectancy although the bias is relatively small. The coefficient on gender implies that, relative to males, females underestimate their life expectancy. This is consistent with the evidence from Figure 1 and also with Mirowsky’s (1999) findings for the US.

The differences, or more accurately the lack of difference, between coefficients on the SIMD quartiles is striking. It shows that, compared with those living in the most deprived quartile, those living in the most affluent quartile underestimate their life expectancy by 1.4 years. However, the objective data drawn from the NRS life tables show that the actual difference in life expectancy between the most deprived and least deprived SIMD quintiles is around 8.8 years. It appears that those living in Scotland’s more affluent areas underestimate their life expectancy relative to those living in the most deprived areas.

Perhaps these differences in SLE can be explained by differences in health status. It may be, for example, that the compression in SLE across deprivation quartiles can be explained by the poorer health of those living in affluent areas compared with those in deprived areas. To investigate this argument, we added indicators of health status to our initial regression model. These comprised an indicator of subjective health along with an indicator of whether individuals had ever smoked, which may well influence individuals' views on their longevity. Results are shown in "model2", the second column of Table 2.

Coefficients on objective life expectancy and gender hardly change following the inclusion of these health-related variates. However, the effects of deprivation are strengthened, with the gap in SLE between the most deprived and least deprived SIMD quartiles increasing from 1.4 years to 2.4 years. This reflects the strong interaction of health status and deprivation: for example, 32.2% of those living in the least deprived SIMD quartile describe themselves as being in excellent health, while only 10.7% of those living in the most deprived SIMD quartile consider their health to be excellent.

Table 2: Association between subjective life expectancy, objective life expectancy, gender, deprivation and health indicators

Variable	model1	model2
Objective Life Expectancy	0.962***	0.939***
Female	-1.335**	-1.456***
simd16 quartile		
2nd quartile	-0.896	-1.337*
3rd quartile	-1.225*	-2.168***
Least deprived quartile	-1.388*	-2.389***
Ever Smoked		0.976*
Subjective Health		
Very Good		-1.750*
Good		-2.755***
Fair		-4.599***
Poor		-7.178***
Constant	0.905	3.735**
r^2	0.616	0.666
bic	3897.315	3819.143
N	625	621

Legend: * = p<.05, ** = p<.01 and *** = p<.001

The subjective health variable is a powerful predictor of SLE. Those that describe their health as poor expect to live, on average, 7.2 years less than those whose self-rated health is excellent. This is only slightly less than the 9.6 year gap evident from the simple cross tabulation of SLE and subjective health shown in Figure 2. Ever having smoked reduces SLE by around one year.

Note that the constant term in model2 is 3.7 years and significantly different from zero: this means that, irrespective of their characteristics, individuals are unlikely to predict their imminent demise. This may explain the reduction in the estimated coefficient on objective life expectancy in model2 compared with model1. Estimating the same model without a constant results in this coefficient being insignificantly different 1, which would imply that SLE grows exactly in line with objective life expectancy estimates.

Conclusions and further work

This chapter has shown that the evidence on SLE drawn from HAGIS suggests some interesting associations between the characteristics of respondents, how long they expect to live, and how long, on average, they are likely to live. Our main conclusions are:

1. After correcting for individual characteristics such as gender, area of multiple deprivation and health, SLE and objective life expectancy grow at almost identical rates.
2. Males tend to be over optimistic. Objectively, they are likely to live 4 years less than women, but the gap in SLE in our more extensive model is only 1.5 years.
3. The gap in SLE between those living in deprived areas and those living in affluent areas is much less than that in observed life expectancy. The objective difference in life expectancies between the most and least deprived quartiles is around 12 years, but the SLE estimates are only 2.4 years.
4. Having poor health and having smoked at any time tend to reduce individuals' expectations of longevity. The difference in SLE between those in "excellent" health and those in "poor" health is 7.2 years, while having smoked reduces it by a further year.

This analysis is very preliminary. A number of further lines of enquiry present themselves. For example, to what extent does personality influence SLE? To what extent, if at all, is SLE affected by expected future increases in longevity? Further enquiries might also explore the extent to which behaviours such as retirement, pension planning, health behaviours and physical activity interact with SLE.

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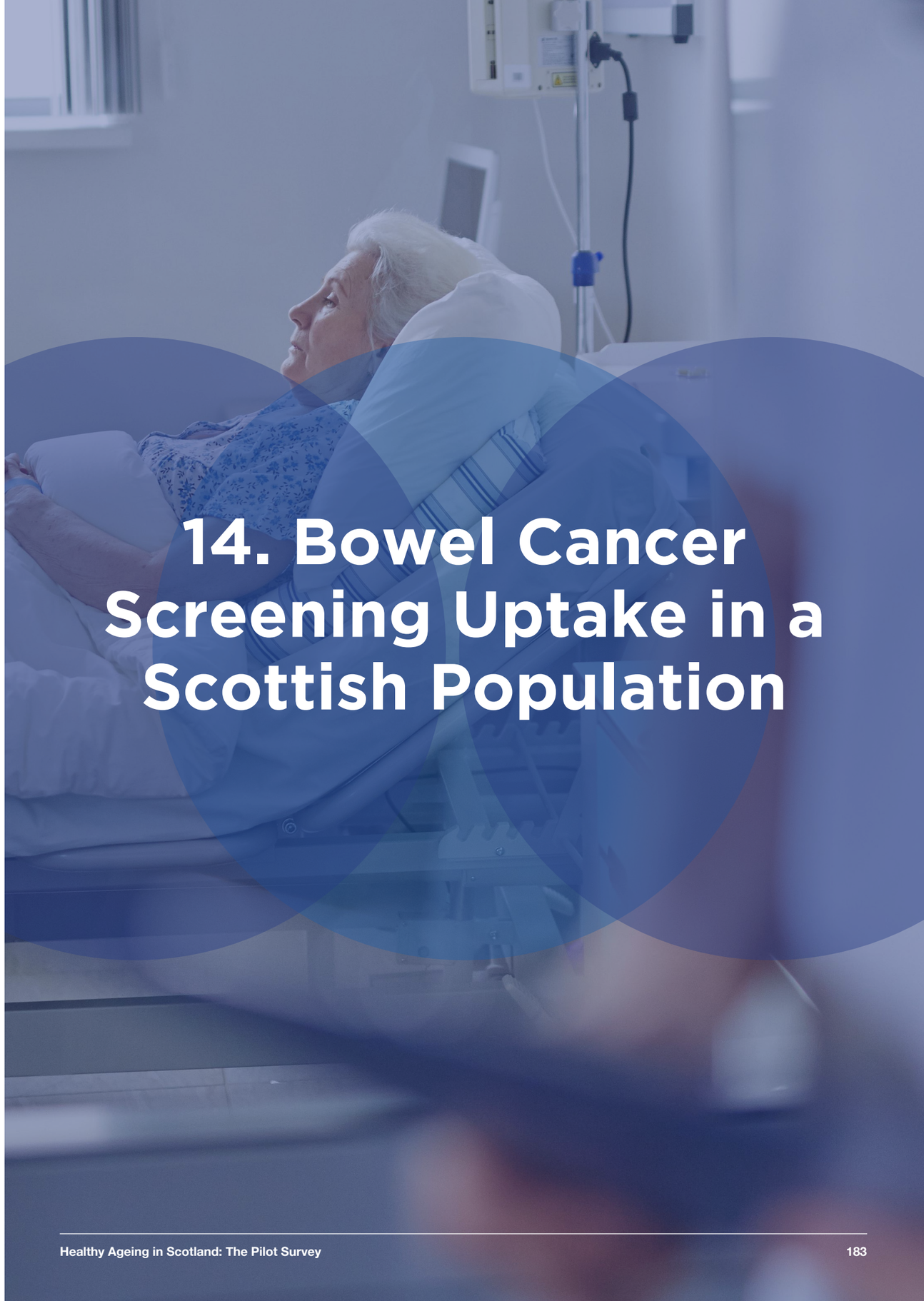

14. Bowel Cancer Screening Uptake in a Scottish Population

14. Bowel Cancer Screening Uptake in a Scottish Population

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- HAGIS asked respondents whether they participate in one of Scotland's major public health interventions – Scottish Bowel Screening Programme for those aged 50+
- Participation in bowel screening is lower than that for other forms of screening such as breast and cervical cancer.
- The HAGIS data suggest that single males are significantly less likely to participate in bowel screening tests. There are no significant differences in participation rates between men living with a partner and women living either alone or with a partner.
- Increasing the participation rate of single males to the Scottish average would save around 3.2 lives per year, based on Scottish Government estimates of the effectiveness of the screening programme
- Uptake is also lower in deprived communities. Raising participation rates in the most deprived quartile of Scottish households to the average for Scotland as a whole would save around the same number of lives as raising the participation rates of single men.
- Whether those eligible for screening live in cities or rural areas does not seem to affect response rates. This is not surprising given that bowel screening is conducted by post. Screening that requires attendance at NHS premises may be less attractive to rural dwellers.

Introduction

Since 2009, people living in Scotland aged 50+ have been offered a free bowel screening test as part of the Scottish Bowel Screening Programme. For a discussion of the merits of this intervention see Steele (2013). Screening is offered to those aged 50 to 74 every two years, while those aged 75+ are still offered a free screening test every two years, but only on request. The test involves sending 3 samples of faeces collected over a 10 day period to a local NHS laboratory.

NHS Scotland estimates that around 150 lives per year are saved by this public health intervention (NHS Inform 2017). It is clearly desirable that as many of the "at risk" population as possible take up this test. However, uptake of the test varies across the population, resulting in differences in detection rates of bowel cancer.

The main HAGIS questionnaire includes questions on bowel screening. This chapter of the HAGIS report focuses on responses to these questions, examining how they are linked to individual characteristics. Specifically, the questions included in the HAGIS questionnaire are:

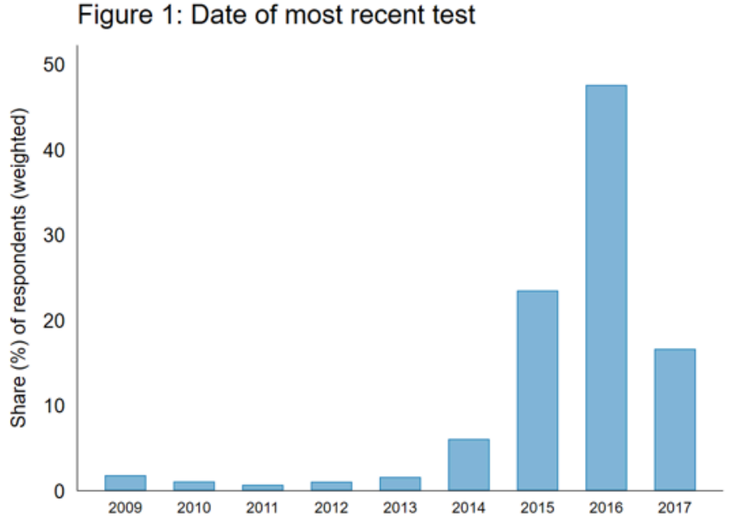
1. Have you ever completed a home testing kit for screening bowel cancer?
2. How long ago was your most recent test?
3. Was this test part of the NHS Bowel Cancer Screening Programme?

The HAGIS dataset includes 761 usable responses from individuals aged 50-79. Of these, after the application of weights, 78% indicated that they had taken the test at some time, while the remaining 22% had not.

The Information Services Division (ISD) of NHS Scotland collects information on the uptake of screening tests from administrative records. For the period November 2014 to October 2016, ISD estimated that 56.4% of those approached took part in bowel screening. To reconcile this low level of actual uptake with the estimates from HAGIS, the following points can be made:

1. HAGIS captures those who have ever completed a screening test, whereas the ISD data covers the two-year period from November 2014 to October 2016. The HAGIS question, therefore, picks up those whose most recent test happened between 2007, when the measure was introduced by some health boards, and 2014. A further group took their most recent test in 2017 after the end of the ISD data collection. Figure 1 shows the time distribution of the most recent test taken by respondents. While the bulk of the tests occurred in 2015 and 2016, broadly coinciding with the ISD data, a significant proportion occurred in 2017 and during the period before 2015.

Figure 1: Date of most recent test



2. A small proportion of the sample (3%) appears to have taken a test, but not as part of the NHS Screening Programme. They will therefore not be included in the ISD estimates of uptake.

3. Some respondents may have claimed incorrectly to have participated in bowel screening. Some may wish to be seen as complying with beneficial public health initiatives, even though they had not done so (see Vernon et al (2004) for a discussion of these issues). Some may have genuinely forgotten. The interviewers could not check whether they had actually participated. Administrative data are not subject to such respondent error.

Note also that uptake of screening for bowel cancer is lower than for other forms of cancer. The most recent ISD estimates for screening participation in Scotland are 71.9% for breast cancer, 73.4% for cervical cancer and 56.4% for bowel cancer. Reasons for low participation rates in bowel cancer screening compared with other forms of cancer screening are explored in Lo et al (2013).

The HAGIS data potentially provide new insights into factors affecting rates of screening uptake. For example, personality type and cognitive ability may be associated with willingness to participate in screening exercises. For this chapter, we focus on a small number of characteristics that provide some insight into the types of individual most likely to participate. We principally focus on age, type of household and whether the respondent's address is located in an area of multiple deprivation. We also examine whether there are significant differences in participation across health boards, which might indicate differences in their ability to stimulate participation. We also consider whether there are differences between rural and urban locations. Given that the bowel screening test is administered by post, there is no obvious reason for such differences.

First, we focus on age. Table 1 below shows the proportion of HAGIS respondents that have ever completed a home test screen for bowel cancer. The participation rate of the youngest age group, those aged 50-54, is 58.7%, quite close to the ISD overall uptake rate of 56.4%. This group are likely to have been approached only once and therefore one would expect their participation rate to be more closely aligned to the ISD estimate than older age groups. Those aged 55+ will have been invited to participate on at least two occasions. The chance of them having ever participated is likely to be higher than those who have only been approached once. Thus, the probability of having taken at least one test will tend to increase with age. The HAGIS data broadly follows this pattern.

Table 1: Proportion of age group that has ever taken a bowel screening test

Age Group	Proportion of Participants
50-54	58.7%
55-59	67.5%
60-64	77.0%
65-69	81.9%
70-74	77.8%
75-79	79.5%
Total	74.7%

Next, we consider gender and living arrangements. ISD statistics suggest that response rates to the screening invitation are higher among women than among men. The HAGIS data does not reveal significant differences between the sexes in relation to ever having participated in bowel screening. Aside from the relatively small sample size in HAGIS and therefore lower rates of precision, another explanation of this finding is that men are less consistent than women in responding to the invitation to participate. Men's participation may be more irregular than women's. Thus, men may be able to respond positively to the HAGIS question as to whether they have ever participated, but the administrative data from ISD shows much lower participation rates for men in the most recent screening round.

Living arrangements seem to matter: those living together, either married or cohabiting, have higher rates of participation than those living alone. It may be the case that partners encourage each other to respond. Or uptake is increased because if health literacy is randomly assigned and knowledge of how to carry out the test is transferable within households, the probability that a two-person household will be able to complete the test(s) successfully is greater than that for a single person household.

However, the HAGIS evidence cannot support - or contradict - these arguments about the cause of greater participation among couples. This is because the data cannot distinguish between hypotheses that depend on the interaction of individuals living together from alternatives which suggest, for example, that individual characteristics such as personality predispose individuals both to live alone and not to participate in cancer screening.

There is a further twist to this argument because, among those living alone, there is a clear difference by gender in screening participation. This is shown in Table 2, which gives participation rates by gender and living arrangement. While participation rates by gender are almost identical for those living together, single males are much less likely to participate than single females. One can speculate on potential explanations: single males may have lower levels of health literacy, be less risk averse or perhaps be more fatalistic than single females or those living as a couple. This finding is consonant with those of Solmi at al (2015) who showed, using data from the English Longitudinal Study of Ageing, that a partner having undergone screening was a strong predictor of uptake.

Table 2: Screening Participation by Living Arrangements and Gender

	Single	Couples
Male	57.6%	79.5%
Female	73.3%	77.8%

Nevertheless, whatever the causal associations between bowel screening, living arrangements, and gender, they are robust to the addition of conditioning variables. That is, when we control for other characteristics such as age, deprivation, health board and size of locality, it is still the case that single men are significantly less likely to participate in bowel screening. And while causal mechanisms are obviously of interest, policymakers do not need to identify these in order to select those groups where additional encouragement to participate may yield the greatest return.

Now consider how screening uptake varies by deprivation quartile. Deprivation is measured by the Scottish Index of Multiple Deprivation (SIMD) which uses 38 indicators to rank Scotland's 6976 datazones by relative levels of deprivation. Table 3 shows weighted estimates of the proportion of the HAGIS sample that has ever participated in bowel screening by SIMD quartile. There is a clear gradation in participation rates from those living in the most deprived quartile of Scotland's datazones to those in the more affluent third and fourth deprivation quartiles.

Table 3: Bowel Screening Uptake by Scottish Index of Multiple Deprivation Quartile

Deprivation Quartile	
Most deprived	68.7%
2nd	73.9%
3rd	79.0%
Least deprived	84.0%
Total	76.8%

Lower rates of screening uptake among more deprived households will reinforce health inequalities in Scotland by reducing life expectancy in poorer areas. The uptake of screening in the most deprived quartile of Scottish households is 8.1% below the Scottish average.

Given NHS Scotland's estimate that the Scottish Bowel Screening Programme saves around 150 lives per year, if the participation rate in the most deprived quartile was raised to the Scottish average, then a further 3.1 lives would be saved on average per year[14]. If instead, the uptake rate of bowel screening of men living alone increased to the Scottish average, an additional 3.2 lives would be saved using similar calculations. Increased uptake of bowel screening will have a beneficial, but not dramatic, effect in increasing longevity among low participation groups.

Now consider the joint relationship of the individual characteristics that we have discussed to the propensity to participate in screening. To evaluate this, we estimate a weighted probit regression of the form:

$$\text{Part}_i^* = \beta_0 + \beta_1 \text{SingMale}_i + \beta_2 \text{SingFem}_i + \beta_3 \text{CohabMale}_i + \sum_{j=1}^{3} \beta_{4j} \text{SIMD}_{ji}$$
$$+ \sum_{j=1}^{10} \beta_{5j} \text{HealthBoard}_{ji} + \sum_{j=1}^{5} \beta_{6j} \text{RuralUrban}_{ji} + \varepsilon_i \quad \varepsilon_i \sim N\left(0, \sigma^2\right)$$

where:

SingMale_i = 1 where individual *i* is male and lives alone
SingFem_i = 1 where individual *i* is female and lives alone
CohabMale_i = 1 where individual *i* is male and cohabits
SIMD_{ji} = 1 where individual *i* lives in SIMD quartile *j*
HealthBoard_{ji} = 1 where individual *i* lives in Health Board *j*
RuralUrban_{ji} = 1 where individual *i* lives in urban/rural classification *j*

and

$$Part_i = 0 \; if \; Part_i^* \leq 0$$
$$= 1 if \; Part_i^* > 0$$

[14]An increase of 14.1% in the screening rate applied to the 25.7 per cent of the 50+ population living in the most deprived quartile of Scotland's would result in a 3.6% increase in the number of lives saved = 5.4.

The weights are explained in the Methodology chapter. Results are shown in Table 4. The excluded (reference) categories are cohabiting females, the most deprived SIMD quartile, age group 50-54, Ayrshire and Arran health board and large urban settlements.

The coefficients give the marginal effects of a unit change in the explanatory variables, holding other regressors at their mean value. Thus, for example, the coefficient of -0.19 alongside Single_Male in the df(x)/dx column implies that Single males are 19% less likely to participate in screening than cohabiting females (the excluded category). Similarly, those in the least deprived SIMD quartile are 11% more likely to participate than those in the most deprived quartile. The second and third columns in Table 4 capture the standard errors and z scores associated with these marginal effects.

Thus, after controlling for age, SIMD etc., our results indicate that females have a 3% higher probability than males of participating in screening. However, although this aligns more closely with the ISD findings, the result is not significant and therefore the null hypothesis that there is no difference in screening uptake between men and women cannot be rejected. Once again, it is important to bear in mind that our sample is relatively small and that our analysis is based on the probability of ever participating in screening, rather than participating in the last round, as reported by ISD.

The importance of living with someone else for screening is virtually undiminished by the regression analysis compared with the univariate analysis, with cohabiting respondents 13 percent more likely to participate. This association is also significant with a z-score of 3.4. There are also significant differences between the likelihood of participation by different age groups with those in the 60-69 and 70-79 age groups being 11 percent more likely to participate than those aged 50-59, while those age 80+ are less likely to have participated for the reasons explained earlier.

The understanding of the relationship between deprivation and screening is modified after controlling for age, gender etc. Table 3 shows that screening participation is lowest among the most deprived household and highest among the least deprived. However, this difference of 15.3% in Table 3 falls to 11% in Table 4 when other factors that might explain participation are taken into account. The reduction is likely due to the correlation between cohabiting and SIMD. In the HAGIS dataset, 52% of respondents from the most deprived SIMD quartile live alone, compared with only 31% in the least deprived quartile. We would, therefore, expect that some part of the reduction of the participation gap between the most and least deprived SIMD quartiles is being captured by differences in cohabitation patterns between SIMD quartiles.

The differences in screening rates between the most deprived SIMD quartile and the second and third deprivation quartiles are not significant after controlling for the other covariates, while the difference between the most and least deprived quartile does remain significant. Given that the z score increases with increasing levels of affluence, this finding may partly reflect our relatively small sample and consequent lack of statistical power. Indeed the data do not reject the hypothesis that all of the SIMD coefficients are jointly zero (chi2(3) = 6.66, p= 0.08). The only groups of variables which are jointly significant are those relating to gender and living arrangements (chi2(3) = 14.68, p= 0.0021). As one would expect, given the postal nature of the test, the HAGIS data support the hypothesis of no difference in participation rates between types of settlement (chi2(5) = 6.23, p= 0.2843). Finally, a similar hypothesis holds for health boards, namely one of no difference between rates of participation by health board, though this test comes close to failing at the 5% level of significance (chi2(10) = 17.83, p= 0.0579). Examination of Table 4 perhaps explains why this outcome has occurred. After accounting for age, living arrangements, gender and deprivation there are still quite large variations between health boards in participation rates. Nevertheless, none of these effects is individually significant, which is not surprising given the numbers of observations in the HAGIS sample, particularly in the smaller health boards.

Table 4: Correlates of Bowel Screening Participation

	df(x)/dx	St. Err.	z
Single_Male	-0.19	0.06	-3.50
Cohabiting_Male	0.00	0.04	0.10
Single_Female	-0.03	0.04	-0.64
Age Bands			
55-59	0.07	0.05	1.40
60-64	0.14	0.04	3.12
65-69	0.18	0.04	4.00
70-74	0.15	0.04	3.36
75-79	0.17	0.04	3.77
SIMD_Quartile			
2	0.04	0.04	0.89
3	0.07	0.04	1.54
Least deprived	0.11	0.04	2.52
Health Board			
Borders	-0.03	0.12	-0.23
Dumfries and Galloway	-0.17	0.12	-1.61
Fife	0.03	0.08	0.34
Forth Valley	0.00	0.08	-0.04
Grampian	-0.08	0.08	-1.06
Greater Glasgow and Clyde	-0.09	0.08	-1.27
Highland	0.06	0.07	0.86
Lanarkshire	-0.07	0.07	-1.04
Lothian	0.09	0.06	1.25
Tayside	0.01	0.07	0.13
Urban/rural			
Other urban	0.01	0.05	0.14
Accessible small town	0.01	0.06	0.09
Remote small towns	0.00	0.07	0.00
Accessible rural	0.08	0.06	1.16
Remote rural	-0.13	0.09	-1.43

Number of obs	=	893
Wald $chi^2(8)$	=	83.67
Prob > chi^2	=	0
Pseudo R^2	=	0.0828

14. Bowel Cancer Screening Uptake in a Scottish Population

These included health board and rural/urban indicators in addition to the variables already listed in Table 3 . In neither case were any of the health board or rural/urban indicators significant. This would imply that, given the composition of their populations, health boards are making roughly similar efforts to encourage uptake of bowel screening within the relevant populations. Further, the absence of significance among the rural/urban indicators is in line with expectations: a rural location is not a disadvantage when the screening programme does not involve face-to-face contact but rather can be conducted at home at a convenient time.

Conclusions

This chapter has focused on the uptake of bowel screening based on questions included in the main HAGIS questionnaire. Although the results have to be treated with some caution given that the overall sample size is relatively small, a number of findings have emerged. These include the relatively low uptake by level of deprivation, an outcome that already known to NHS Scotland. However, our analysis has identified those living alone as another important group where participation rates are relatively low. Thus, other things being equal, in the allocation of resources towards screening there may be greater returns in focusing on males living alone in deprived areas. Given an estimate of returns in terms of lives saved, such a targeted intervention can be assessed against alternative uses of scarce resources.

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[15]Results available on request to the author

15. Psychological Factors and Cancer Screening Uptake in Scotland

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Introduction

Two cancer screening questions are asked in the main interview. The first asks participants if they have previously used a home testing kit screening for bowel cancer. The second asks whether or not females have undergone breast cancer screening. In this report, we primarily looked to extend this initial analysis to further explore whether or not personality factors (including Extroversion, Agreeableness, Conscientiousness, Emotional stability, and Intellect/Imagination) contribute to the uptake of both bowl and breast cancer screening in Scottish adults aged 50+. Second, we look to discover whether or not other quality of life, wellbeing and life satisfaction factors contribute to cancer screening uptake.

Specifically:

1. Do five factor personality factors contribute to bowel and breast cancer screening uptake and;
2. Do other wellbeing outcomes contribute to bowel and breast cancer screening uptake?

Methods

Grouping Variables

Importantly, HAGIS captures data on whether or not participants have ever completed bowel and breast (if female only) cancer screening. Therefore, grouping binary variables (either completed or not) were formed for participants for each both bowel and breast (female only) screening. These data were captured through structured interview assessment as part of the main HAGIS questionnaire and were assigned from the following two specific questions:

1. Screening for bowel cancer:
- "Have you ever completed a home testing kit for screening bowel cancer?" (Yes/No)
2. Screening for breast cancer (females only):
- "Have you ever had a mammogram (x-ray of your breasts)/ breast cancer screening?" (Yes/No)

Primary outcome variables

The following five-factor personality outcome variables were ascertained from the 50-item International Personality Item Pool (IPIP) - Five Factor Questionnaire captured within the HAGIS self-report paper questionnaire (Lewis R Goldberg, 1992; L. R. Goldberg et al., 2006). Five personality factors were scored summed (International Personality Item Pool, 2017) and include:

Extroversion - is sometimes given other names, such as Surgency or Positive Emotionality. Individuals who score high on extroversion are outgoing and social. Individuals who score low tend to be more reserved and enjoy solitary activities.

Agreeableness - A person high in agreeableness is friendly and optimistic. Low scorers are critical and aggressive.

Conscientiousness - Individuals who score high on this factor are careful and diligent. Low scorers are impulsive and disorganised.

Emotional Stability - is often referred to by other names, such as Neuroticism or Negative Emotionality (in these two cases interpretations are inverted, as Neuroticism and Negative Emotionality can be thought of as the opposite of Emotional Stability). Lower scores suggest one is more emotionally stable.

Intellect/Imagination -This factor is also often called Openness to Experience. People who score low tend to be traditional and conventional.

Other wellbeing outcome variables

The following outcomes were also captured with validated instruments within HAGIS and assessed:

Quality of life in old age was assessed through the CASP-19 captured by self-reported paper questionnaire. Four domains can be obtained surrounding control, autonomy, pleasure, and self-realization. Domains, however, are not usually scored separately and in this report, an overall summary score was coded from the 19-items on a 0-57 scale. Higher scores correspond to a better of greater quality of life (Howel, 2012; Hyde, Wiggins, Higgs, & Blane, 2003).

The Satisfaction With Life Scale (SWLS) was also captured in the self-reported questionnaire assessment. This scale is scored by summing the five items to give a total life satisfaction score. The possible range of scores is 5-35, with a score of 20 representing a neutral point on the scale. Scores between 5-9 indicate the respondent is extremely dissatisfied with life, whereas scores between 31-35 indicate the respondent is extremely satisfied:

- 31 - 35 Extremely satisfied
- 26 - 30 Satisfied
- 21 - 25 Slightly satisfied
- 20 Neutral
- 15 - 19 Slightly dissatisfied
- 10 - 14 Dissatisfied
- 5 - 9 Extremely dissatisfied

For a detailed psychometric description of the SWLS see Pavot and Diener (2008).

Standardised questions of subjective wellbeing were also obtained by the following four questions:

- Overall, how satisfied are you with your life nowadays?
- Overall, how worthwhile are the things that you do in your life?
- Overall, how happy did you feel yesterday?
- Overall, how anxious did you feel yesterday?

All items are rated individually on a scale ranging from “Not at all satisfied” to 10 “Extremely”. Here individual scores are presented however an overall aggregate score may also be used (Dolan, Layard, & Metcalfe, 2011; Dolan & Metcalfe, 2012).

Results

Overall there were 1,057 respondents to the main HAGIS, survey and 705 returned the self-completed paper survey. Tables 1 and 2 show the patient demographic information between those who did and did not undergo cancer screening assessment for bowel (Table 1) and breast (Table 2) cancers. Tables 3 & 4 evaluate differences in the 5-personality factors between those who underwent cancer screening assessments and those who did not. Tables 5 & 6 explore differences in other wellbeing outcomes between cancer screening completers and non-completers. Tables S3 & S4 explore defences in frequencies of single item reports of health and disability status between groups (with weights).

Table 1: Patient demographics between participants who underwent home bowel cancer screening compared to those who did not.

Characteristics	Screening for bowel cancer *n*= 730	No screening for bowel cancer *n*= 317
	N (%)	*N (%)*
Age (band)		
50-59	165 (23%)	92 (29%)
60-69	275 (38%)	71 (22%)
70-79	228 (31%)	65 (21%)
80+	62 (9%)	89 (59%)
Sex (band)		
Female	347 (58%)	162 (60%)
Male	247 (42%)	105 (39%)
Marital status		
Married	459 (63%)	144 (45%)
Living as married	37 (5%)	17 (5%)
Single	50 (7%)	36 (11%)
Separated	18 (3%)	10 (3%)
Divorced	52 (7%)	31 (10%)
Widowed	113 (16%)	79 (25%)
Employment		
Retired	468 (64%)	183 (58%)
Employed	171 (23%)	68 (22%)
Self-employed	34 (5%)	18 (6%)
Unemployed	10 (1%)	5 (2%)
Sick or disabled	31 (4%)	28 (9%)
Looking after home or family	8 (1%)	12 (4%)

Note: Weights are not applied here (see Table S1 for these data).

Table 2: Patient demographics between participants who underwent breast cancer screening compared to those who did not.

Characteristics	Screening for breast cancer *n*= 517	No screening for breast cancer *n*= 73
	N (%)	*N (%)*
Age (band)		
50-59	124 (43%)	31 (43%)
60-69	173 (34%)	10 (14%)
70-79	148 (29%)	11 (15%)
80+	72 (14%)	21 (29%)
Sex (band)		
Female	444 (100%)	64 (100%)
Male	1 (0%)	0 (0%)
Marital status		
Married	270 (52%)	23 (32%)
Living as married	22 (4%)	4 (6%)
Single	41 (8%)	8 (11%)
Separated	11 (2%)	5 (7%)
Divorced	48 (9%)	14 (19%)
Widowed	125 (24%)	79 (26%)
Employment		
Retired	327 (63%)	34 (47%)
Employed	118 (23%)	17 (23%)
Self-employed	15 (3%)	4 (6%)
Unemployed	8 (2%)	1 (1%)
Sick or disabled	31 (6%)	9 (12%)
Looking after home or family	13 (3%)	5 (7%)

Note: Weights are not applied here (see Table S2 for these data).

Table 3: Five-factor personality outcomes and bowel cancer screening

	Screening for bowel cancer *n*= 474~ *Mean (SD)*	No screening for bowel cancer *n*= 176~ *Mean (SD)*	*p*	Effect size (*d*) [95% CI]
Extraversion	30.9 (3.7)	31.3 (3.7)	.245	-0.11 [-0.28 - 0.07]
Agreeableness	**30.8 (3.4)**	**31.5 (3.8)**	**.044**	**-0.20 [-0.37 - -0.02]**
Conscientiousness	30.5 (3.5)	30.5 (3.7)	.987	0.00 [-0.18 - 0.18]
Emotional stability	27.9 (5.4)	28.3 (6.1)	.436	-0.07 [-0.25 - 0.10]
Intellect imagination	31.6 (3.7)	31.8 (3.8)	.643	-0.05 [-0.23 - 0.12]

Table 4: Five-factor personality outcomes and bowel cancer screening

	Screening for breast cancer *n*= 322~ *Mean (SD)*	No screening for breast cancer *n*= 38~ *Mean (SD)*	*p*	Effect size (*d*) [95% CI]
Extraversion	31.0 (3.6)	31.0 (3.8)	1.000	0.00 [-0.34 - 0.34]
Agreeableness	**31.3 (3.7)**	**32.9 (3.6)**	**.015**	**-0.43 [-0.78 - -0.08]**
Conscientiousness	**30.3 (3.6)**	**31.7 (4.3)**	**.036**	**-0.38 [-0.72 - -0.04]**
Emotional stability	**27.7 (5.5)**	**29.7 (6.9)**	**.042**	**-0.35 [-0.69 - 0.02]**
Intellect imagination	31.7 (3.8)	31.4 (3.5)	.622	0.08 [-0.26 - 0.42]

Table 5: Other wellbeing outcomes and bowel cancer screening

	Screening for bowel cancer *n*= 480~ *Mean (SD)*	No screening for bowel cancer *n*= 171~ *Mean (SD)*	*p*	Effect size (*d*) [95% CI]
CASP 19 Total score ^	38.9 (5.0)	39.7 (5.6)	.092	-0.15 [-0.33 - 0.02]
Wellbeing Satisfied Life Now	7.1 (2.1)	6.9 (2.1)	.282	0.10 [-0.08 - 0.27]
Wellbeing Worthwhile	7.2 (2.0)	7.1 (2.0)	.497	0.05 [-0.12 - 0.22]
Wellbeing Happy	7.1 (2.0)	6.9 (2.3)	.244	0.10 [-0.08 - 0.27]
Wellbeing Anxious ^	1.9 (2.5)	2.2 (2.9)	.302	-0.11 [-0.29 - 0.06]
The Satisfaction With Life Scale Total Score	**11.0 (3.0)**	**11.5 (2.9)**	**.048**	**-0.17 [-0.34 - 0.00]**
What age would you expect to live to? ^	83.0 (6.7)	83.4 (8.9)	.579	-0.05 [-0.23 - 0.12]

Note: ^ Welch correction.

Table 6: Other wellbeing outcomes and breast cancer screening

	Screening for breast cancer *n*= 322~ *Mean (SD)*	No screening for breast cancer *n*= 38~ *Mean (SD)*	*P*	Effect size (*d*) [95% CI]
CASP 19 Total score	**38.7 (5.3)**	**41.2 (6.1)**	**.008**	**-0.46 [-0.81 - 0.12]**
Wellbeing Satisfied Life Now	7.1 (2.1)	6.8 (2.1)	.283	0.14 [-0.20 - -0.48]
Wellbeing Worthwhile	7.2 (2.0)	6.8 (2.0)	.335	0.20 [-0.15 - 0.55]
Wellbeing Happy ^	**7.2 (2.0)**	**6.3 (2.7)**	**.049**	**0.43 [0.10 - 0.76]**
Wellbeing Anxious ^	**1.9 (2.6)**	**3.1 (3.3)**	**.027**	**-0.45 [-0.78 - 0.12]**
The Satisfaction With Life Scale Total Score	11.0 (2.9)	11.8 (2.7)	.131	-0.09 [-0.43 - 0.25]
What age would you expect to live to? ^	82.9 (6.0)	83.8 (11.4)	.665	-0.13 [-0.47 - 0.20]

Note: ^ Welch correction.

Discussion

The five-factor personality outcomes (extraversion, conscientiousness, emotional stability, and intellect imagination) do not appear to differ markedly between HAGIS participants aged 50+ who completed home screening for bowel cancer (n=474) compared to those who did not (n=176). Only agreeableness demonstrated a between-group difference with those not completing home bowel cancer screening scoring slightly higher than those who did (mean difference = 0.7, d = 0.2). Higher scores are suggestive of individuals being more friendly and optimistic as opposed to being critical and aggressive. This statistical difference, however, is small and may not be clinically meaningful.

Assessment of other wellbeing, quality of life, and life satisfaction outcomes suggested no differences between bowel cancer screening groups. Indeed, only a small but significant effect size difference was detected for overall life satisfaction scores which were slightly higher (mean difference = 0.5 d = 0.17) in those who did not participate in bowel cancer screening. Both groups fell into the 'dissatisfied' score grouping description.

Evaluation of five-factor personality outcomes amongst those who previously underwent breast cancer screening (n=322) compared to those who did not (n=38) suggested differences between groups. Scores of agreeableness (mean difference = 1.6, d = 0.43), conscientiousness (mean difference = 1.4, d = 0.38), and emotional stability (mean difference = 2, d = 0.35) were all higher in those who have not yet underwent screening with medium effect size score differences. Extraversion and intellect imagination scores were similar between groups. It is important to note that the "no screening group" is also considerably smaller compared to those who did undergo screening but there did not appear to be issues with homogeneity of variances (Levene's test).

Other psychological outcomes indicated that quality of life (CASP 19) was higher in those who had not participated in cancer screening suggesting a better overall quality of life with a medium effect size (mean difference = 2.5, d = 0.46). In contrast, those who had participated in screening had higher (better) wellbeing scores for happiness (mean difference = 0.9, d = 0.43), and lower (better) wellbeing scores for anxiety (mean difference = 1.2, d = 0.45) than those who had not participated in screening. This remained statistically significant after correction for unequal variances due to the small number of participants in the no breast cancer screening group.

Limitations of these data include self-reported interview and questionnaire captured outcomes and a relatively small sample size that may not be representative of over 50 year olds in Scotland. Results should, therefore, be treated with caution as the sample size is small, especially in the no breast cancer screening group. Lastly, cancer screening was captured by participant interview only and was not verified against a medical health record.

Conclusion

This report focused on differences in personality, wellbeing and life satisfaction outcomes from the self-reported HAGIS questionnaire for uptake of bowel and breast cancer screening of adults aged 50+ in Scotland. Those who are slightly more agreeable may not uptake bowel and breast cancer screening but this effect size was small for bowel and medium for breast cancer screening. Those who did not participate in breast cancer screening reported being slightly more conscientiousness and emotional stability, with a higher overall quality of life, less happiness, and more anxiety. Results may provide insight to individuals who may be targeted for future campaigns to increase cancer screening.

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Supplementary Tables

Table S1: Patient demographics between participants who underwent home bowel cancer screening compared to those who did not with iHAGIS Weight applied.

Characteristics	Screening for bowel cancer	No screening for bowel cancer
Age (band)		
50-59	34%	44%
60-69	36%	19%
70-79	23%	14%
80+	6%	24%
Sex (band)		
Female	50%	51%
Male	50%	50%
Marital status		
Married	64%	45%
Living as married	5%	9%
Single	7%	13%
Separated	3%	4%
Divorced	8%	8%
Widowed	12%	22%
Employment		
Retired	54%	48%
Employed	30%	27%
Self-employed	6%	7%
Unemployed	2%	4%
Sick or disabled	5%	9%
Looking after home or family	1%	4%

Table S2: Patient demographics between participants who underwent breast cancer screening compared to those who did not with iHAGIS Weight applied.

Characteristics	Screening for breast cancer	No screening for breast cancer
Age (band)		
50-59	36%	61%
60-69	30%	7%
70-79	21%	6%
80+	12%	26%
Sex (band)		
Female	100%	100%
Male	0%	0%
Marital status		
Married	52%	32%
Living as married	4%	11%
Single	9%	9%
Separated	3%	9%
Divorced	10%	19%
Widowed	21%	20%
Employment		
Retired	55%	36%
Employed	29%	30%
Self-employed	3%	4%
Unemployed	2%	4%
Sick or disabled	7%	14%
Looking after home or family	4%	6%

15. Psychological Factors and Cancer Screening Uptake in Scotland

Table S3: Patient demographics between participants who underwent home bowel cancer screening compared to those who did not with iHAGIS Weight applied.

Characteristics	Screening for bowel cancer	No screening for bowel cancer
Long term health problem		
Yes	50%	51%
No	50%	49%
Health status		
Excellent	10%	7%
Very good	29%	22%
Good	34%	37%
Fair	18%	20%
Poor	10%	15%

Table S4: Patient demographics between participants who underwent breast cancer screening compared to those who did not with iHAGIS Weight applied.

Characteristics	Screening for breast cancer	No screening for breast cancer
Long term health problem		
Yes	53%	47%
No	47%	53%
Health status		
Excellent	10%	11%
Very good	28%	24%
Good	31%	37%
Fair	19%	12%
Poor	12%	16%

16. Wellbeing

16. Wellbeing

Chris Boyce, Elaine Douglas & David Bell, University of Stirling

- HAGIS collects a number of measures of individual well-being in its self-report questionnaire. These cover life satisfaction, whether individuals feel their life is worthwhile, their happiness and their level of anxiety.
- The distributions derived from the HAGIS data are quite similar to the distribution of well-being among older Scots drawn from other sources
- The different measures of well-being are positively correlated, though not always that highly, implying that they capture different aspects of individuals' feelings of latent well-being.
- Typically, life satisfaction increases with age and is higher for those living as a couple than those living alone.
- Health has a very significant impact on well-being: compared with someone in excellent health, poor health reduces life satisfaction by 2.5 points on a 10 point scale.
- There are no clear patterns in well-being that depend on the type of area in which HAGIS respondents reside. Thus, there are no significant differences in life satisfaction between those living in the most deprived 25% of Scotland's data zones and those living in the most affluent 25% of Scotland's data zones.
- Using life satisfaction questions that have been validated in other surveys enables comparisons with other datasets. The ONS Annual Population Survey (APS) asks the same life satisfaction question as HAGIS. Estimating the same model of life satisfaction in HAGIS and APS shows that individual characteristics typically influence life satisfaction in the same direction. However, the much larger APS sample means that estimates from the APS model are likely to be much more precise.

Introduction

Researchers and policymakers are increasingly interested in a society's subjective life experience – in addition to traditional objective measures of life conditions, such as financial resources or employment status. Self-report measures of well-being have become an important interdisciplinary research tool used to explore well-being (Dolan, Peasgood and White, 2008). Such research is of value to inform individuals, companies, governments, and policy makers (O'Donnell et al., 2014). Thus it has been common to collect self-reported indicators of well-being in nationally representative surveys. For example, since 2011, the Office for National Statistics has routinely included indicators of well-being in the Annual Population Survey (ONS, 2011). Well-being measures are also incorporated in the longitudinal surveys of ageing lodged with the Gateway to Global Aging platform (CESR, 2015).

In the HAGIS pilot, we have included the same four questions relating to well-being which are used in the UK Annual Population Survey (APS). These involve affective (or emotional) components of well-being, such as how happy (positive affect) and how anxious (negative affect) an individual felt on the previous day. They also incorporate both the instantaneous (hedonic) and the reflective (eudemonic) aspects of well-being by asking individuals how they feel about their life now and how far they believe that the things they do are worthwhile.

In this chapter, we consider how the measures of individual well-being that have been included in the HAGIS pilot study vary with individual-level characteristics such as age, employment status, marital status and subjective health, as well as with area-level measures of deprivation. We examine whether the HAGIS pilot fails to refute some of the empirical regularities that have been found in similar surveys. We briefly review some of these associations in the following section.

Literature

The purpose of this section is to review the associations between well-being and individual characteristics that have been revealed by previous studies of well-being.

Age

There is a well-documented "U-shaped" relationship between age and well-being in some societies (Cheng, Powdthavee & Oswald, 2017). In early adulthood, well-being falls, reaching a minimum at around age 50, when it starts to increase again. This pattern is fairly consistent in high-income English-speaking countries but differs in other regions, including Eastern Europe, sub-Saharan Africa and Latin America (Steptoe, Deaton, & Stone, 2015). Given that those included in HAGIS are almost all age 50+, one would expect to observe life satisfaction increasing with age in the dataset.

Employment status

Unemployment is associated with substantially reduced well-being (see e.g., McKee-Ryan, Song, Wanberg, & Kinicki, 2005) (Blanchflower, Bell, Montagnoli and Moro, 2014). One explanation for improvements in well-being in later life is that individuals enter retirement. However, this important transition may also be associated with psychological distress as enhanced well-being. Research on the well-being effects of retirement has not led to strong conclusions (Kim and Moen, 2001).

Gender

Women tend to report higher well-being than men, but this effect is difficult to isolate from other covariates. While some studies report strong gender effects, others do not.

Marital Status

There is some unanimity among researchers that living alone is worse for well-being than being part of a partnership. Those who are divorced, widowed or separated experience significantly lower subjective well-being than those that are part of a couple.

Health

Negative associations between both physical and psychological ill-health and subjective well-being are well documented (Diener & Chan, 2011). These vary by type of impairment. Thus, for example, Oswald and Powdthavee (2006) find that individuals adjust over time to disability, though not completely.

Deprivation

We are able to associate measures of deprivation with individual respondents. These comprise a set of indicators covering issues such as income, crime, benefit dependency and health in the small area (average population 767) within which the respondent resides. Thus we are able to investigate the relationship between individual well-being and the social and economic characteristics of the area within which the individual resides.

Some associations observed in the data may derive from individual characteristics that are not included. We do not include measures of personality in this exercise. However, for example, personality traits may lead to individuals responding pessimistically to questions both about their well-being and about their health. To the extent that these excluded characteristics are fixed, their effects can be removed using longitudinal data. Further waves of the HAGIS study would make such analysis possible.

Methods

Sample

The well-being questions considered in this chapter were included in the HAGIS self-completion questionnaire. The HAGIS pilot main interview comprised 1,057 respondents, of whom 705 returned a self-completion questionnaire. Approximately 86% (n = 609) of respondents who returned the self-completion questionnaire answered the following well-being questions:

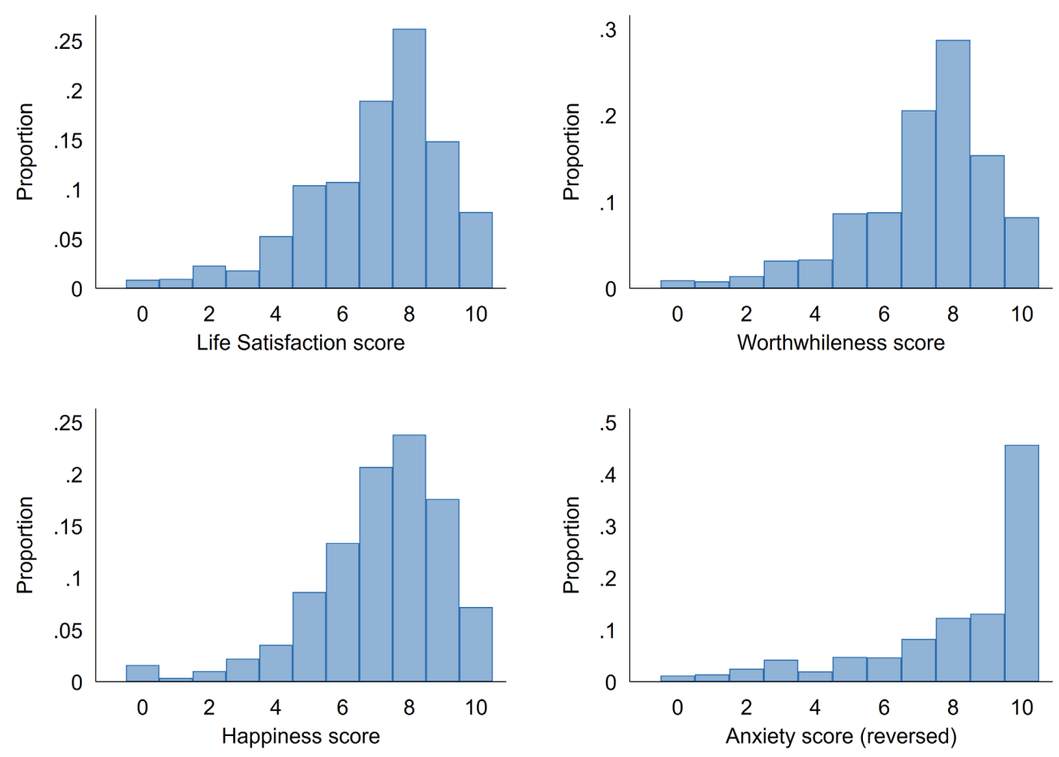
1. Life Satisfaction: “Overall, how satisfied are you with your life nowadays?” (evaluative question)
2. Worthwhile: “Overall, to what extent do you feel the things you do in your life are worthwhile?” (meaning)
3. Happiness: “Overall, how happy did you feel yesterday?” (Hedonic – positive)
4. Anxiety: “Overall, how anxious did you feel yesterday?” (Hedonic – negative)

Responses to these questions range from 0 (not at all) to 10 (extremely). Responses of Don’t Know or Refused have been excluded. The anxiety responses were reverse coded prior to analysis so that for all questions, positive values are linked with “happier” outcomes.

Analyses

Figure 1 shows the distributions of each of the four well-being indicators. Life satisfaction, worthwhileness and happiness are each skewed to the right and in each case the modal score is 8. The (reversed) anxiety score has a mode of 10, with almost half of the respondents reporting that they do not suffer from any anxieties.

Figure 1: Distributions of well-being scores



Next we formed a correlation matrix to identify associations between the well-being measures. Associations between the well-being indicators are shown by the correlation matrix in Table 1. We present both parametric and nonparametric measures of association though all are positive and significant. However, none of the correlations exceed 0.7 and some, such as the correlation between the anxiety and worthwhile life scores, are relatively small (0.23). This suggests that the questions are picking up different aspects of well-being.

Table 1: Correlation matrix of well-being measures in HAGIS

	Life Satisfaction	Worthwhile Life	Happiness	Anxious (reversed)
	(evaluative)	(eudemonic)	(+ve affect)	(-ve affect)
Satisfied		0.696***	0.567***	0.339***
Worthwhile	0.725***		0.552***	0.303***
Happy	0.569***	0.529***		0.371***
Anxious (reversed)	0.289***	0.229***	0.353***	

Lower-triangular cells report Pearson's correlation coefficients, upper-triangular cells are Spearman's rank correlation

**** p<0.01, ** p<0.05, * p<0.1*

Individual Characteristics and Well-being Measures

Over half (approx. 57%) of those responding to the well-being measures were aged under 70 years, although around 67% respondents were retired (see Table 2). The sample comprised slightly more women (approx. 56%) than men, and approximately 62% were married. Most respondents rated their health as either 'Very Good' (approx. 28%) or 'Good' (approx. 34%). Around 9% reported 'Excellent' health and similarly, around 10% reported 'Poor' health. Over half of the respondents (approx. 58%) lived in areas with lower levels of deprivation (Quartiles 3 and 4).

Table 2. Sample Characteristics and Well-being Measures

	Satisfied n (%)	Worthwhile n (%)	Happy n (%)	Anxious n (%)
Age				
50-59	143 (21.5)	139 (21.4)	142 (21.7)	145 (21.3)
60-69	235 (35.3)	233 (35.9)	237 (36.1)	240 (35.2)
70-79	197 (29.6)	189 (29.1)	193 (29.4)	202 (29.6)
80+	90 (13.5)	88 (13.6)	84 (12.8)	95 (13.9)
Employment Status				
Retired	441 (67.0)	429 (66.8)	433 (66.7)	454 (67.3)
Working	176 (26.8)	173 (27.0)	173 (26.7)	176 (26.1)
Other	41 (6.2)	40 (6.2)	43 (6.6)	45 (6.6)
Sex				
Men	291 (43.8)	289 (44.5)	293 (44.7)	304 (44.6)
Women	374 (56.2)	360 (55.5)	363 (55.3)	378 (55.4)
Marital Status				
Married	411 (61.8)	403 (62.1)	405 (61.7)	417 (61.1)
Living with Partner	32 (4.8)	31 (4.78)	31 (4.7)	32 (4.7)
Single (never married)	53 (8.0)	52 (8.0)	53 (8.1)	55 (8.1)
Separated	17 (2.6)	17 (2.6)	16 (2.4)	18 (2.6)
Divorced	41 (6.2)	39 (6.0)	41 (6.3)	43 (6.3)
Widowed	111 (16.7)	107 (16.5)	110 (16.8)	117 (17.2)
Subjective Health				
Excellent	56 (8.5)	56 (8.9)	56 (8.6)	56 (8.3)
Very good	184 (27.8)	180 (27.9)	189 (29.0)	191 (28.2)
Good	228 (34.5)	223 (34.6)	221 (33.9)	230 (33.9)
Fair	128 (19.36)	127 (19.7)	123 (18.9)	131 (19.3)
Poor	65 (9.8)	59 (9.2)	63 (9.7)	70 (10.3)
SIMD Quartiles				
Most Deprived	147 (22.1)	146 (22.5)	144 (22.0)	152 (22.3)
2	132 (19.9)	129 (19.9)	134 (20.4)	135 (19.8)
3	196 (29.5)	185 (28.5)	196 (29.9)	202 (29.6)
Least Deprived	190 (28.6)	189 (29.1)	182 (27.7)	193 (28.3)

16. Wellbeing

Regression models of the associations between well-being measures and individual characteristics are reported in Table 3. The anxiety measure is reverse coded so that highest levels of reported anxiety = 0 and lowest levels of anxiety = 10. The second column in Table 3 gives the results from a model of life satisfaction derived from APS data for Scotland. Hence it provides a comparison with equivalent results from HAGIS shown in column 1, but with a sample of 21,823 rather than 654.

Column one shows that respondents to the HAGIS survey aged 70-79 years ($p<0.001$) and 80+ years ($p<0.05$) reported significantly higher levels of life satisfaction than those aged 50-59 years. Those aged 70-79 years ($p<0.05$) also reported higher levels of happiness than 50-59 years. These suggest an increase in life satisfaction with age, a finding that is consistent with the “U shaped” association between age and life satisfaction found in other studies. Age effects in the equations seeking to explain worthwhileness, happiness and anxiety were much weaker, with the only significant effect suggesting higher levels of happiness among those aged 70-79 compared with those aged 50-59.

Women in the HAGIS sample generally reported higher levels of well-being but also higher levels of anxiety though the effects were not significant. In comparison with being married, those who were widowed reported significantly lower levels of life satisfaction, worthwhileness and happiness. Those who were divorced reported lower levels of life satisfaction and those who were single (never married) also reported significantly lower scores on the worthwhileness measure.

Self-assessed health has a major influence on life satisfaction and other measures of well-being. Those who describe their health as poor have a life satisfaction score 2.55 points lower on a 10 point scale than those who describe their health has excellent. This is a larger effect on well-being than any other individual characteristic. Similar effects were found with the worthwhileness measure and though the effects onhappiness and anxiety are less significant, they also suggest lower scores for those who give their subjective health a poor rating.

In general, we did not find significant differences in well-being associated with deprivation in the area in which respondents lived after correcting for other individual characteristics. With the most deprived quartile as the excluded category, the only significant effects came in the Anxiety equation, where those living in the second most deprived quartile were significantly less likely to be anxious than those in the most deprived quartile. In addition, those in the most affluent quartile appeared to be less happy than those in the most deprived quartile, conditional on there are other characteristics. These results may simply be the result of random variation. Clearly, a larger sample would enable us to identify these associations with greater precision.

16. Wellbeing

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The comparison of the results from HAGIS with those from the APS is shown in columns 1 and 2 of Table 3. In general, the direction of the effects of individual characteristics is similar in both surveys. Thus, as with HAGIS, the APS life satisfaction score increases with age, is higher for women than men, declines for those living alone or who are in poorer health. In contrast to HAGIS, it suggests higher life satisfaction among the retired than those who are working, but agrees that other forms of activity (such as unemployment), are associated with lower life satisfaction than either of the alternatives.

The other main lesson from the comparison of columns 1 and 2 in Table 3 is the increased precision that a larger sample permits. Although HAGIS and the APS typically agree on the sign of individual characteristics on life satisfaction and on occasion quite closely match on magnitude, the sample size available from the APS provides much more precise estimates of their effects. Note however that such apparent precision may be spurious if the model is mis-specified. HAGIS offers the opportunity to include other possible individual characteristics that may affect well-being and also to track the evolution of well-being through its longitudinal aspect, which is not possible with the APS.

Table 3: Individual Characteristics and Wellbeing

Dependent Variable	Satisfied	Satisfied (APS)	Worthwhile	Happy	Anxious
Age					
50-59 yrs (Ref)	0.254	0.390***	0.105	0.178	1.996
70-79	0.786**	0.518***	0.438	0.630*	0.636
80+	0.715*	0.650***	0.374	0.579	-4.563
Female	0.254	0.097***	0.117	0.166	0.243
Marital Status					
Married (Ref)					
Single, never married	-0.533	-0.532***	-0.707	-0.017	-2.812
Separated	-0.921	-0.821***	-0.820	0.067	-7.407
Divorced	-0.901**	-0.591***	-0.557	-0.561	-1.521
Widowed	-0.589*	-0.733***	-0.581*	-0.734**	-1.194
Subjective Health					
Excellent (Ref)					
Very good	-0.647**	-0.400***	-0.755***	-0.439	-0.872
Good	-1.292***	-0.979***	-1.272***	-0.674*	-3.425
Fair	-1.589***	-1.956***	-1.266***	-1.318***	-5.618
Poor	-2.554***	-2.765***	-2.024***	-1.309**	-7.764*
Employment Status					
Retired (Ref)					
Working	0.016	-0.199***	0.304	0.139	1.412
Other	-0.790	-0.575***	-0.608	-0.840*	3.283
Deprivation Quartile					
Most (Ref)					
2nd	0.601*		0.325	0.192	1.786
3rd	0.324		0.110	-0.092	-0.558
Least	0.266		-0.082	-0.483*	-1.882
Constant	7.382***	8.284***	7.918***	7.517***	7.001*
r^2	0.193	0.204	0.119	0.095	0.040
bic	2781.324	85152.059	2737.281	2806.940	5993.536
N	654	21823	638	645	671

* p<0.05; ** p<0.01; *** p<0.001. Robust standard errors applied

Conclusion

To better understand well-being in later life, high quality datasets are needed that incorporate measures of well-being that have been informed by the latest research in this area. HAGIS contains measures of well-being that are comparable with other datasets as well as questions that go beyond what other datasets contain. As the panel element of HAGIS develops and the same individuals are observed over time, the evolution of their well-being and its relationship to events in their lives can be analysed. Thus, for example, it is not possible to measure the effects of bereavement using a cross-sectional study such as APS, but with HAGIS, its effect on individuals can be followed. Similarly, how do decisions and behaviours pre-retirement affect individual's transition to, and experience of, retirement?

Not only will HAGIS permit tracking individual circumstances over time, it will also facilitate comparisons between Scotland and those other countries whose data is deposited at the Gateway to Global Aging.

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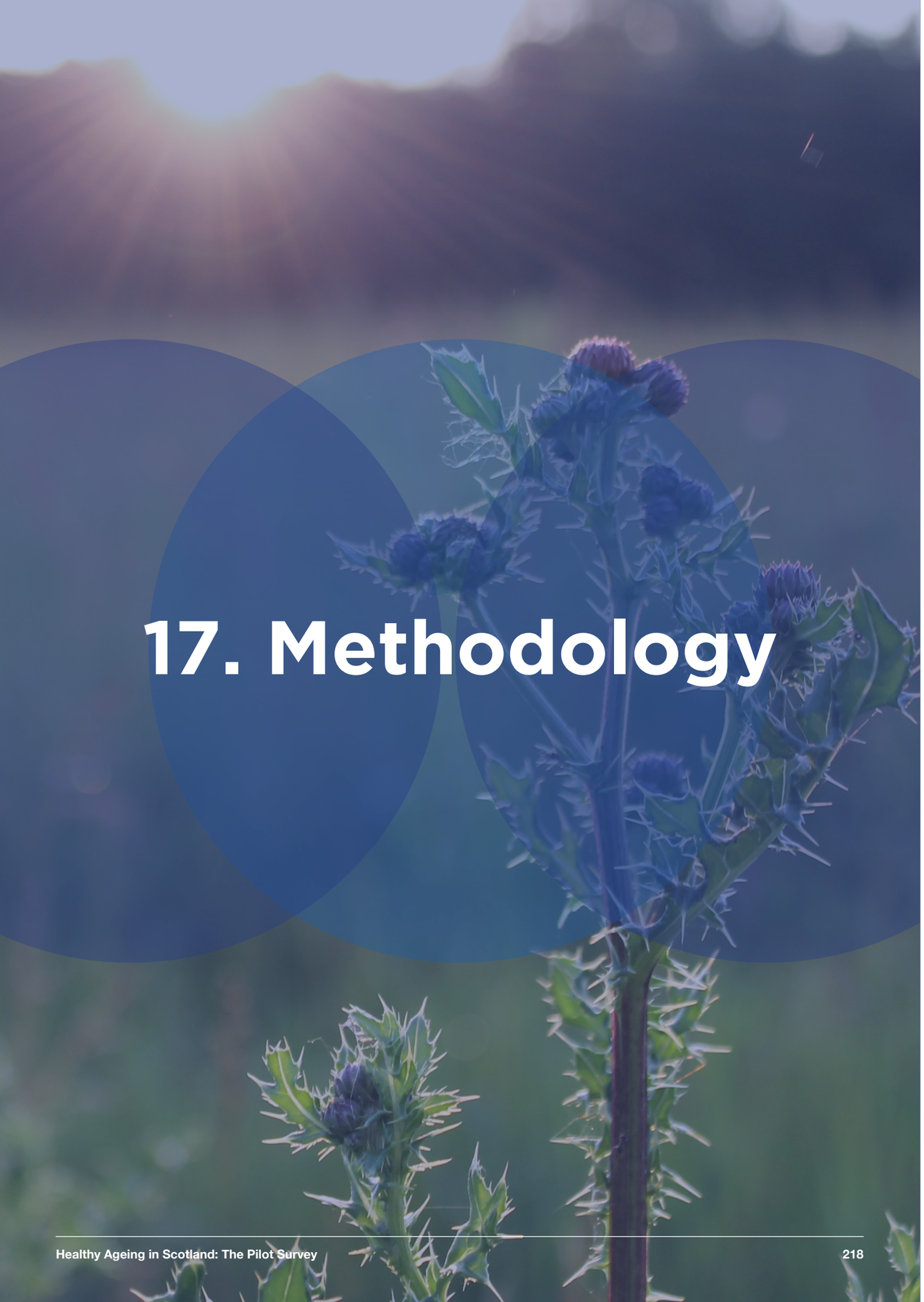

17. Methodology

17. Methodology

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This chapter presents a summary of the survey methodology for the pilot wave (2016-17) of the Healthy Ageing In Scotland study. It includes a brief overview of the sample design, topics and validated instruments included in the interviews and the approach to fieldwork. Survey response rates and weighting are also discussed.

A summary of the key points relating to the pilot is given below:

- HAGIS used an innovative sample frame designed to produce a random sample of eligible households across mainland Scotland
- The HAGIS pilot main questionnaire was administered as part of a household interview
- All participants who responded to the main interview were asked to complete a self-completion questionnaire
- A total of 1,057 main interviews were completed in the pilot wave and 67% of respondents completed a self-completion questionnaire
- 88% of all respondents agreed to link their survey to at least one source of administrative data

Sample Design

The sample design included two methods. The main sample design was based on a proportionally stratified and clustered sampling approach with a subsequent phase of screening by the National Records of Scotland (NRS). During fieldwork the sample frame was extended to include contacting neighbouring households of those identified in the main sample design – the neighbour approach.

HAGIS Main Sample Design

The main sample design consisted of a two-step process of random probability sampling, followed by a screening of the random sample by the National Records of Scotland/NHS Central Records for eligibility, with each household screened for eligibility, i.e. at least one household member is aged 50 years or over. This latter stage required the approval of the Public Benefits and Privacy Panel and is discussed in the Administrative Data Linkage section.

The first step of random probability sampling utilised a two-stage probability cluster approach to identify a random sample of addresses from the Postcode Address File (PAF). The two stages of this approach were: stratification by region; and the random selection of sample addresses within each region. This work was conducted by FACTS International working in partnership with UK Geographics[16]. To ensure an accurate geographical spread, the first stage in the sampling involved proportionately stratifying Scotland and all eligible data zones by the 11 mainland Scottish Health Boards[17]. Then, a systematic random selection of 17 addresses with a further 10 backup addresses was then performed. This was to ensure enough addresses were returned for fieldwork. The Postcode Address file (PAF) release from May 2016 formed the sampling unit for this second stage.

National Records of Scotland screening

The National Records of Scotland then screened the random sample of addresses to identify households with at least one eligible resident. Upon completion of this process, 59% of the initial random sample of addresses were considered eligible. This screening process almost halved the redundancy associated with pure random sampling of households without prior knowledge of eligibility. Without the consequent cost savings, the household survey would not have been feasible within the available budget.

Neighbour Approach

A sample design amendment was permitted to enable interviewers to recruit from alternative addresses from the original sample. This was a pragmatic decision to support recruitment to the study. However, to minimise deviations from the original sample this approach was only to be applied to certain households under specific criteria. Neighbour households were considered appropriate as the householders would reside in the same data zone. Neighbour households could only be approached where the original sampled and screened household:

- refused to take part (opt out or doorstep refusal)
- did not have any residents aged 50 or over
- was not contactable after the third attempt where the 1st, 2nd and 3rd contact visits have occurred at different times of the day/week; (daytime/evening/weekdays/weekend)

[16]http://www.ukgeographics.co.uk/
[17]http://www.scot.nhs.uk/organisations/

Development of Questionnaire and Study Materials

Main questionnaire – household interview

The content of the questionnaire was developed by the University of Stirling team with support for other ageing studies, in particular, the Northern Ireland Cohort for Longitudinal study of Ageing (NICOLA) and the English Longitudinal Study of Ageing (ELSA). The HAGIS questionnaire is considered to be harmonised with other ageing studies as it comprises a common subset of questions. This enables a cross-country comparison of data across ageing studies. Additionally, new questions relevant to the Scottish context have been added to the HAGIS questionnaire. The main HAGIS questionnaire covered fourteen topics (see Table 1).

Table 1. Topics Covered in the Main Questionnaire (household interview)

Topics Covered in the Main Questionnaire (household interview)
1. Initial Contact
2. Household Information
3. Demographics
4. Social Circumstances
5. Employment
6. Income & Assets
7. Expectations and Retirement
8. Financial Literacy
9. Cognitive Health
10. Physical Health
11. Health Behaviour
12. Activities of Daily Life and Helpers
13. Social Participation
14. Contact Information

Cognitive Health

A number of tasks to assess cognitive health were included in the main questionnaire (see Table 2). Show materials for the cognitive testing sections were either programmed within the main questionnaire Computer Aided Personal Interviewing (CAPI) script or printed on colour show cards. The CAPI software was able to automatically calculate the score for each task. This score was then stored alongside the respondents answer.

Table 2. Cognitive Health Tasks

Domain	Test
Subjective memory	Self-rated memory
Global cognition	Orientation in time
Verbal declarative memory	Word list learning short-term recall
Executive function	Verbal fluency (animal fluency)
Processing speed	Letter digit substitution test
Crystallised ability	Vocabulary
Verbal declarative memory	Word list learning long-term recall
Non-verbal fluid reasoning (fluid ability)	Matrices
Health literacy/arithmetic	Newest vital sign

Financial Literacy Measure

Ten questions in the Financial Literacy section could be scored as either correct (1) or incorrect (0). This will provide an index score to measure financial literacy. The correct pre-determined answers were uploaded into the CAPI script with a point allocated automatically for each correct answer. The final score (out of 10) was then calculated and stored within the CAPI.

Self-completion questionnaire

The HAGIS self-completion questionnaire consisted of 98 questions covering topics such as Internet and TV usage; Transport; Social Activities; Health; Support; Loneliness and Personality. Testing and sign off of the self-completion questionnaire in terms of survey logic mirrored the same process as used for the main questionnaire.

To maximise the response rates for the self-completion questionnaire and to offer flexible options for its return, respondents could choose to complete the self-completion questionnaire in one of the following 3 methods:

- **CAPI** – on the CAPI tablet at the end of the main household interview
- **CAWI (Computer Assisted Web Interviewing)** - via a secure, personalised web link to be completed online at a later time.
- **Pen and Paper** – via a paper copy of the questionnaire. Respondents were encouraged to fill in the questionnaire during the interviewers' visit, or interviewers offered to come back to collect them at another time when they were in the area. In case neither of these options were possible, a pre-paid envelope was given in order that the questionnaire could be posted back for processing.

All respondents who took part in the main questionnaire were asked to complete the self-completion part of the research, however those who did not were still included within the main dataset.

Fieldwork

The main questionnaire was completed, as part of the household interview, using a Computer Aided Personal Interviewing (CAPI) approach.

Interview Duration

The average interview duration for the main questionnaire was 82 minutes. The cognitive health section had the longest duration. Overall, interview duration decreased over the period of fieldwork as the interviewers became more familiar and experienced with the survey.

Response Rates

Pre-selected addresses

Following the sampling process 3,088 eligible household addresses were provided across the 11 Scottish health boards included in the sample (see Table 3).

Table 3. Eligible households by health board

Health Board	Available addresses after NRS screening
Ayrshire and Arran	260
Borders	81
Dumfries and Galloway	114
Fife	215
Forth Valley	182
Grampian	342
Greater Glasgow and Clyde	599
Highland	198
Lanarkshire	362
Lothian	445
Tayside	290
TOTAL	**3088**

Of the 3,088 pre-selected addresses, 169 reported that there were no eligible residents and 441 were not approached. In addition, 441 addresses were not approached due to the pilot study having met its target number of recruits. Therefore, the remaining 2,478 households were used in the calculation of response rates (see Table 3).

Table 4. Response and Non-Response Rates by Health Board

Health Board	Response Rates	Non-Response Rates			
	Consent	Refused	Opted Out	Refusal & Opt-out	Not Contactable
Ayrshire and Arran	40%	24%	13%	37%	24%
Borders	34%	23%	6%	29%	38%
Dumfries and Galloway	28%	36%	7%	43%	29%
Fife	46%	31%	3%	34%	20%
Forth Valley	45%	27%	5%	32%	23%
Grampian	50%	21%	13%	34%	16%
Greater Glasgow and Clyde	38%	29%	8%	37%	25%
Highland	54%	15%	9%	24%	22%
Lanarkshire	49%	12%	11%	23%	28%
Lothian	41%	26%	7%	33%	26%
Tayside	38%	27%	7%	34%	28%
Total	**43%**	**24%**	**8%**	**32%**	**25%**

N.B. Numbers may not add to 100% due to rounding

The overall household response rate was 43%. Response rate by health board ranged from 54% in Highland to 28% in Dumfries and Galloway. Across all health boards, non-response was similarly due to doorstep refusals (24%) or non-contact (25%). However, when refusals and opt-outs are combined, they become the dominant mode of non-response (mean 32%, range 23-43%). As expected, there was variation in non-response rates between health boards. Doorstep refusals ranged from 12-36%, opt-outs 3-13% and non-contact from 16-38%.

The rates of non-consent may be due to the random sampling of households, many of whom may not be familiar with or have the motivation to take part in this type of study. Response rates in future waves would be expected to increase since these would include a base of respondents who have already been willing to take part in this type of study and a clear track record from the pilot. Higher response rates in other established ageing studies may be attributed to this reason.

Reasons for Refusal

Reasons for refusal were noted by interviewers on the doorstep. The most common reasons for refusal was reported as a lack of interest or motivation in the study. This reason was more commonly cited in areas with greater deprivation. The length of the survey and the time it would take was also a factor, particularly in the younger age range of the target respondent type.

Table 5. Reasons for Refusal

Reason for Refusal	% (frequency)
Not interested/ no motivation	51% (314)
Bad time/too busy/Survey too long	19% (114)
Other refusal reason (Please specify)	13% (80)
Respondent too frail or elderly	5% (31)
Unable to answer due to ill health, physical or mental disability	4% (26)
Mistrust/ never answers surveys	3% (19)
Worried about confidentiality	1% (6)
Aggressive/abusive respondent	1% (6)
Language Barrier (does not speak language)	0.8% (5)
Respondent not available during survey period	0.3% (2)
Too difficult	0.2% (1)
Grand Total	**604**

Neighbour Recruitment

Of the 1057 interviews, 58% (615) were completed from the pre-selected sample. The remaining 442 participants lived in a neighbouring household. The neighbour recruitment rates varied by health board (see Table 5), mean 42%, range 10%-64%. The lowest level of neighbour recruitment were in Tayside where fieldwork had neared completion prior to the introduction of the neighbour approach.

Table 6. Neighbour recruitment rates by Health Board

Health Board	Interviews from sampled addresses	Interviews from neighbouring households	% Neighbour recruitment
Ayrshire and Arran	38	53	58%
Borders	18	8	31%
Dumfries and Galloway	27	8	23%
Fife	52	23	31%
Forth Valley	27	30	53%
Grampian	39	68	64%
Greater Glasgow and Clyde	106	101	49%
Highland	41	34	45%
Lanarkshire	89	59	40%
Lothian	96	49	34%
Tayside	82	9	10%
Total	**615**	**442**	**42%**

Self-completion questionnaire – Response rate

All respondents to the main household interview were further asked to fill out a self-completion questionnaire. Of the 1057 completed interviews, 67% (705) respondents completed the self-completion questionnaire.

- Three methods of collecting the self-completion questionnaire were developed
- Paper copy of the self-completion questionnaire
- Personalised web link to complete the questionnaire online
- The interviewer could pass the CAPI computer to the respondent to complete themselves at the end of the main interview

The first method, a traditional paper copy of the questionnaire, was by far the most common method of completion. 98% of respondents chose to complete the self-completion questionnaire on paper. Respondents were encouraged to return the self-completion questionnaire in the reply-paid envelope. In some cases, the interviewer agreed to return at a later date to collect it in person.

The personalised web link provided an alternative method of self-completion data collection. This had been anticipated to offer a flexible alternative to some respondents, yet only nine respondents chose this method.

Respondents were also offered the opportunity to complete the self-completion part of the questionnaire using the CAPI. The interviewer would hand the CAPI to the respondent and they would then read and respond in privacy. However, only six respondents chose this method.

Reminders

When a self-completion questionnaire was not returned, respondents were contacted via telephone (if a number was available), as a reminder.

Weighting

Although this is a pilot version of the HAGIS study, we have tried to replicate as far as possible the processes that would be involved in implementing a first full wave of the study. This includes sample weighting. Even though the process of weighting may reduce bias in our estimates, standard errors will be significantly larger than in a full wave, given that our sample size is only approximately 1000.

The sample is stratified by mainland health board. This limited stratification was driven by the small sample. The island health boards were excluded from the study due to survey costs. This does not imply that there were no island-dwellers sampled: some “mainland” health boards include inhabited islands. One advantage of a full wave would be the opportunity to implement more complex stratification. All of the quotas set for the selected health boards were achieved: some were marginally exceeded. The slight oversampling in some health boards explains why our completed sample size is 1057, rather than the original target of 1000.

Our approach has been firstly to account for the design weights in the survey (which are given by the population aged 50+ in the mainland health boards). Secondly, we have implemented calibration weighting to derive individual weights. This technique has been developed to adjust probability-sampling weights to increase precision, account for unit nonresponse and to force sample-derived estimates to be consistent with known population totals. It is consistent with the approach which the Scottish Government recently discussed in its review of the weighting strategy to be applied to in-house surveys in the future. This weighting method is known as calibration. For a detailed explanation of this technique, see Deville and Sarndal (1992), who derive a family of “generalised raking procedures” which generate sample weights that are consistent with a set of external control totals, and which minimise some measure of distance to the original design weights.

We have implemented generalised raking using the package “icarus”, which is available as an R library. It mimics the SAS package “CALMAR” which was developed to implement Deville and Sarndal’s methodology.

Choosing which external controls to apply to the sample is a matter of judgement. There are numerous possible ways in which the sample may not be representative of the population as a whole. Attempting to apply several controls simultaneously to offset biases reduces the likelihood that the raking algorithm will converge. For our pilot study, we have only imposed controls using populations of 10-year age group and gender cells, and the populations of Scottish Index of Multiple Deprivation (SIMD) quartiles. Both sets of controls are drawn from National Records of Scotland population estimates for 2016.

Administrative Data Linkage

Consent to administrative data linkage consisted of three key stages:

1. Respondent consent to link their survey to administrative data
2. Approval from the Administrative Data Research Network (ADRN)
3. Approval from the administrative data controller

Respondent Consent to link survey data to administrative datasets

All of those who consented to take part in the HAGIS survey were asked within the interview if they were willing to give further consent to link their survey responses to a range of administrative data records. These included NHS health records, dental treatment, social care census, education, Department of Work & Pensions (DWP) and HM Revenue & Customs (HMRC) data. Respondents could give consent to some, none or all administrative data. These were signed and recorded discretely for each administrative data set.

ADRN Approval

The study applied to the Administrative Data Research Network's centre in Scotland, the Administrative Research Centre (ADRC) Scotland, for approval to access de-identified administrative data in their secure environment. This proposal was based upon feasibility, academic merit, public benefit and privacy impact. The study was approved by the ADRC-Scotland in January 2016.

Approval from the Data Controller

The third stage of consent consists of approval from the data controller of the administrative data source. In Scotland, the Public Benefits and Privacy Panel perform information governance security of requests for access to NHS Scotland Health and Social Care data. For the pilot study, permission was sought to i) screen the sampled households for eligibility using administrative data, and ii) to approve linkage of respondents surveys to their health and social care records. This was approved in May 2016.

HAGIS has also sought and received approval for education data linkage from the Scottish Qualifications Authority.

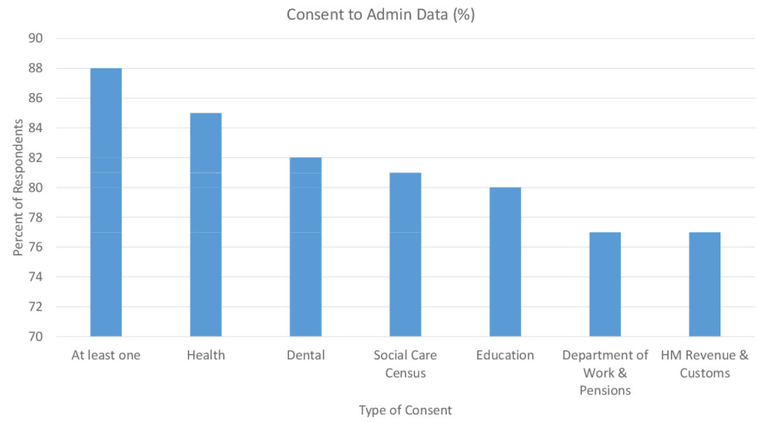
Ongoing work will include seeking approval to access dental, DWP and HMRC data.

Respondent Consent Rates for Administrative Data Linkage

Consent to administrative data linkage varied (see Figure 1). However, 88% of all respondents agreed to link their survey responses to at least one administrative data source. Most respondents agreed health records linkage (85%), followed by dental (82%), social care census (81%), education (80%) and DWP and HMRC (77%).

Linkage to health records was the most prevalent in terms of agreement (85%), with linkage to DWP/HMRC being the least, although this was still a healthy figure, being 77%. Consent rates for other administrative datasets were 82% to dental records, 81% for social care, and 80% for education.

Figure 1. Respondent Consent to Administrative Data Linkage



Conclusions

This chapter aimed to provide an overview of the survey methodology for the HAGIS pilot survey. The main topics included the sample design, development of questionnaire and study materials, fieldwork and response rates.

The HAGIS study interview comprised of consent to three distinct sections of the study: main interview; self-completion questionnaire; and linkage to administrative data. Consent to administrative data linkage also comprised three forms of consent: respondent consent to link their survey to administrative data, ADRN project approval to access administrative data in their secure setting; and permission to use the administration data by the appropriate data controller.

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Published by

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The design and collection of the Healthy Ageing in Scotland was carried out as a collaboration between the Division of Economics, Stirling Management School, the Centre for Cognitive Ageing and Cognitive Epidemiology, University of Edinburgh and FACTS International, Ashford, Kent

This report is dedicated to the memory of

Richard M. Suzman

Director, Division of Behavioral and Social Research

National Institute on Aging

9 August 1942 – 16 April 2015