Review of working patterns amongst older people and implications for transport

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1

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Acknowledgments

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

3

Contents

Table of Figures

Executive summary

Introduction

This study aimed to understand how the settlement and working patterns of older adults might change in the next 30 years and what the implications of these changes might be on transport demand. This study took the form of a literature review which synthesized 31 studies from the UK, Europe and North America. Evidence was sought to answer four key questions:

1. What is the projection for the number of older people (aged 50+ for the context of this review) and where will they be living?
2. What types of jobs will older people do, and in which sectors?
3. What is the potential for digitally enabled work for extending working lives?
4. What do work travel patterns look like in the UK, and how will they change in the future?

Key findings

Ageing and settlement patterns

- The number and proportion of those aged 50+ are projected to increase steadily. **The number of people aged 65+ is expected to increase by a third (32.5%) by 2039** (from 12.4 million in 2015 to 16.5 million). The fastest growing group will be those aged 85+, from 2% of the overall population in 2016 to 4% by mid-2041.
- In the next 30 years, the number of older people will increase in **all areas of the UK**, although the ratio of older to younger people are projected to increase most in rural areas.
- Absolute and proportional regional differences are set to remain:
  - **Coastal areas, small towns and rural areas** have and will continue to have a larger proportion of older people
  - Specific regions such as the North West, North East and South West are likely to have a higher ratio of older to younger people than other regions.
- Migration of older people may not follow traditional patterns: estimates suggest there will be larger increases in the proportion of 65+ in **inland** areas relative to coastal areas due to changes in the migration patterns of those leaving London (e.g. moving to cities like Oxford and Cambridge).

Labour market projections and distribution

- The growing population of older people is **remaining in work for longer** – the employment rate of those aged 65+ was 11% in 2017, double what it was in 2000.
- The **working patterns of older people tend to be different** from younger age groups:
  - As people get older and remain in work they are more likely to work part-time – 70% of work that takes place after the current retirement age of 65 is **part-time**
  - There is also a growing trend for those aged 65+ to become **self-employed.**

- **Flexibility** in the labour market will therefore be important for keeping older workers in employment.
- There was limited evidence on the current and future occupations of older workers. The available evidence (ONS 2016 data) showed that the sectoral split of older workers is very similar to that of the working age population, the biggest sectors being retail, health and social care, education and manufacturing. The most common occupations amongst all age groups are **professional occupations**, but evidence was inconclusive on whether there were differences in occupation by age.
- Across all age groups, short-term projections to 2022 show that both full-time and part-time jobs are expected to **increase** in **professional and managerial occupations** (i.e. those offering the greatest scope for part-time and flexible work), whereas they are expected to decrease in administrative and secretarial occupations.
- The workforce of the future will be characterised by increasing **project work**, **temporary work**, **freelance work**, people holding **multiple jobs** and **platform-based jobs**, although the extent of these changes was not quantified in the literature.

The potential for digitally enabled work for extending working lives

- **There is scope for digital technology to extend the working lives of older people**. However, the extent to which this will be possible depends upon the type of sector or occupation older people will be employed in
- There was a lack of evidence as to whether older people currently take-up remote working. Based on the available evidence, **remote working is expected to grow**, with the largest uptake in those occupations that are already strongly facilitated by ICT (i.e. professional, associate professional or technical occupations).
- There was evidence that those who are currently of working-age and using digital technology will continue to do so. However, **digital exclusion will not disappear**; the very old might still struggle with the pace of technological advances largely due to cognitive decline.

Commuting travel patterns

- **All generations** have experienced an increase in commute length (in minutes) between 1992 and 2016 and each generation has spent more time commuting at the same age as their predecessors.
- The evidence on the commuting travel patterns of older people was limited. The following findings relate to the general public, rather older people specifically:
  - Commuting patterns differ by **age and gender**, with those over age 30 commuting the longest distances and men commuting longer distances than women.
  - **Peak-time travel has been decreasing** over time; people in professional occupations are more likely to travel at peak time than employees in manual occupations.
  - **Part-time** workers tend to have **shorter commutes** than full-time workers.
  - **Part-time and self-employment** are associated with **smaller numbers of commute journeys**, compared to full-time work.
- Finally, shifts in the composition of the workforce are likely to change travel patterns in the next 30 years – for instance an increase in the share of managerial and professional occupations may result in an increase in peak travel times – given current working patterns. On the other hand, other

occupations that are due to grow in size are those that facilitate remote working, and where part-time work and self-employment are also expected to grow. This might not only decrease the overall levels of transport demand, but also counteract any increase in peak-time travel.

1 Introduction

1.1 Contextual background

The number of older people in the UK is expected to rise significantly over the next decades. By older people we mean people aged 50+. It is projected that the population aged 65+ will increase from 18% of the overall population in 2016 to 24% in 2046 (ONS 2017). This growth of the ageing population is also spread unevenly across regions in the UK. For instance, clear differences exist between urban areas such as London, with a low proportion of older adults, compared to rural areas in the South of England with a high proportion of older people (ONS 2017). There are also regional variations in the percentage of older people in paid employment.

As the population gets older, individuals are more likely to work beyond the state pension age. There is no longer a default retirement age, and the state pension age for men and women will change to 66 by October 2020.[1] Currently, the proportion of workers aged 16-64 and 65+ in the main economic sectors[2] are very similar (ONS 2016). However, with automation and technology evolving, the types of jobs available in different sectors are likely to change for all individuals, including older people (Störmer et al. 2014, Taylor et al. 2017). Technological changes have already facilitated the development of new and growing business models such as the 'gig economy'[3]. Such business models may further extend people's working lives by facilitating an increase in the amount of older people working beyond the pension age. On the other hand, the increasing influence of digital technology on jobs might have negative implications such as leading to a growing 'digital divide'[4] among older cohorts (Friemel 2014).

Alongside changes in the types of jobs, the next decades are likely to witness an increasing trend towards part-time and flexible work. As older adults will likely make up a greater proportion of the workforce, they may demand more flexibility and autonomy.

1.2 Purpose of the review

This review is intended to provide evidence to facilitate planning of a transport system capable of responding to the changing levels and types of travel needs among an ageing workforce. A review of this scope is currently lacking. By targeting the relevant academic and grey literature as well as government reports, this review is intended to provide a better understanding of what settlement and working patterns among the older population mean for transport provision and need.

1.2.1 Study objectives

The overall objective of the review was to find and describe documents to address the questions outlined below.[5]

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[1] The state retirement age is currently 65 for men. For women, it is gradually increasing from 60 to 65.
[2] This includes wholesale and retail; human health and social work activities; manufacturing; education; professional, scientific and technical activities; and construction.
[3] The gig economy refers to individuals using apps to sell their labour. The most common examples of platforms facilitating work in such as way include Uber and Deliveroo (Taylor 2017).
[4] Digital divide refers to the divide between individuals with access to digital technology and those without. The term can also refer to differences in levels of digital skills.
[5] It is important to note that the questions are not addressed in order in the main body of the report. This is to ensure a coherent narrative.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

9

1. **Labour market projections and distribution – what jobs will exist and in which sectors?**
    a. What types of jobs are currently undertaken in the UK, by age, region and sector?
    b. What projections are there for full-time, part-time, and flexible working in the UK over next 30 years?
    c. What jobs will exist and in which sectors?
    d. What will the geographic distribution of jobs and sectors look like?

2. **Ageing and settlement patterns – where will older people be living?**
    a. What is the central projection for ageing over the next 30 years?
    b. What evidence is there regarding projected geographic distribution of older peoples' settlement patterns over the next 30 years?

3. **What is the potential for digitally enabled work for extending working lives?**
    a. What is the theoretical scope of digitally enabled and remote working?
    b. What is the projected uptake of digitally enabled work?
    c. What are the barriers to uptake of digitally enabled work?
    d. Are there any <u>positive</u> implications of a projected uptake of digitally enabled work?
    e. Are there any <u>negative</u> implications of a projected uptake of digitally enabled work?

4. **What do work travel patterns look like in the UK?**
    a. What are the current variations of work travel patterns by age, occupation and location?
    b. What are the work travel pattern projections in the UK for the next 30 years?

Addressing the questions outlined above allowed us to bring together evidence from the review to explore the final overarching question:

5. **What are the implications of changing working patterns and settlement patterns amongst older adults for transport demand and transport requirements over the next 30 years?**

1.2.2 Method

This study takes the form of a literature review. Our criteria and processes for determining study inclusion of evidence, extracting data and synthesising findings are summarised below. For more details on methodology and findings see Appendix A and B.

Inclusion criteria

We included existing studies from the UK, United States and Europe; however, studies from other countries that had relevant evidence were not excluded. Studies had to quantify projected or actual trends.

Search strategy

Several methods were used to draw up a long-list of relevant literature. This included searching relevant websites online (see Appendix C) and targeted searches in Google and Google Scholar. Relevant literature was also identified through forward and backward citation tracking. Topic experts were also consulted and provided some relevant literature. Search terms used can be found in Appendix D.

Screening and study prioritisation and weighting

Studies were screened in two stages, at title and abstract, and at full-text. It was not within the scope of the review to synthesise all evidence from included studies. Instead, we assessed all studies meeting our inclusion criteria at full-text for their relevance to address all research questions and sub-questions. Where there was an abundance of studies addressing a sub-question, studies that quantified trends and projections, and explained drivers behind those projections were prioritised (see Appendix B for a list of prioritisation criteria). Thus, only the 31 most relevant studies were synthesised in this report. A bibliography of all the studies meeting the inclusion criteria that were prioritised for synthesis is provided (see Appendix F) and a bibliography of studies that met the inclusion criteria but were not prioritised for synthesis (see Appendix H).

Data extraction and synthesis

Once documents were screened for final inclusion in the analysis, their key information was entered into an extraction sheet, which organised the data in various categories, including: author(s), year released, methodological approach, information relevant to the research question, and a weight of evidence (WoE) score. Data extraction was undertaken by a single reviewer with key data double-coded by a second reviewer.

We also extracted descriptive data relevant to the review questions for 31 'priority' studies. The extraction was done using the data extraction template in Appendix E.

The review clearly sets out which of the 31 studies have information pertaining to each review question and where that information can be found. A summary can be found in Appendix G, in the form of a set of descriptive tables summarising study details and the research questions that they address. Synthesis was undertaken narratively, with reporting structured by research question.

2 Findings

In the following section, we describe the findings from our 31 prioritised studies narratively. The findings section provides a response to research questions 1, 2, 3 and 4. Question 5 is addressed in the discussion and conclusions. Appendix G provides an overview of the evidence base for each research question.

2.1 Ageing and settlement patterns – where will older people be living?

In exploring ageing and settlement patterns, three aspects require consideration: firstly, the diversity of individuals that constitute the category 'old', e.g. those between ages 50 and 64 and those aged 65+. This distinction is common across the literature and accounts for individuals below and above the previous statutory retirement age of 65; secondly, and related to the previous point, age and experience of ageing are influenced by income inequalities, which in turn increases the likelihood of disability and ill health; thirdly, when examining settlement patterns, differences in the age profile of neighbouring authorities need to be considered. For instance, neighbouring local authorities within the same region (e.g. in the South East) can have significant differences in the make-up of the older population (Randall 2017).

2.1.1 What is the central projection for ageing over the next 30 years?

From the 31 prioritised studies a total of 15 papers provided a response to question 2a. In general, the studies tell a similar story to one-another: the UK population is increasing in size and getting older. However, the included studies assess changes for different age-groups and over different time periods.

The primary drivers for an increasing as well as ageing population are births outnumbering deaths (Business in the Community 2015, Randall 2017); net migration,[6] (Cridland 2017, Randall 2017); and a higher life expectancy, largely driven by better health provision (Randall 2017, Storey 2018).

In line with a rising population, the number and proportion of those aged 50+ is projected to increase steadily. ONS figures estimate that the population aged between 50 and 64 is expected to increase by 6.1% between 2017 and 2022 (DWP 2017). However, the number of individuals aged 65+ is expected to increase at an even faster rate at 9.5% in the same timeframe (ibid.). Using ONS data Cox et al (2014) report that the number of people eligible for a state pension will increase by 31% between 2012 and 2037.

The ONS (2018) estimates that the number of older people will be even higher by 2026, with the number of people aged 65+ in England projected to increase by 19% between 2016 and 2026. By 2039, they estimate that the number of people aged 65+ is projected to increase by 32.5%: from 12.4 million in 2015 to 16.5 million in 2039 (ONS 2016).

The number of people aged 85+ is expected to increase the fastest of any age group (Storey 2018). It is estimated that the number of people aged 85+ will increase from

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[6] Net migration refers to the difference between the number of people moving into and out of an area.

2% in mid-2016, 4% by mid-2041, and to 7% of the overall population by 2066 (Storey 2018).

2.1.2 Older peoples' projected settlement patterns

From the 31 prioritised studies a total of 7 papers addressed this question.

Over the next 30 years there will be an increase in the number of people aged 65+ in all areas of the UK. However, regional differences in the population size and proportion of people aged 65+ are set to remain. The key reasons why some areas will have a higher proportion of older people are low fertility rates; lower levels of net migration; and low mortality rates (Randall 2017).

Coastal areas, small towns and rural areas, which tend to be areas with weaker labour markets, have traditionally comprised a larger proportion of older people in the UK (Pennington 2013). As of 2016, people aged 50+ accounted for around 50% of all small towns and rural areas in the UK, in particular in coastal areas (Government Office for Science 2016, Randall 2017). Furthermore, ONS figures from 2012 show that nearly 90% of people aged 65+ making long-distance moves from London[7] move to coastal or rural areas (Pennington 2013). However, projections indicate that migration will lead to larger increases in the proportion of people aged 65+ in inland areas relative to coastal areas (Randall 2017). In particular, cities like Cambridge and Oxford – areas with traditionally younger demographics – have recently become popular among older people leaving London (Pennington 2013). This suggests that older people's migration patterns do not necessarily follow established patterns. It also indicates that the increasing phenomenon of migration from London will be an important determinant of older peoples' settlement patterns in the South East.

Of all the regions in the UK, the South West of England currently has the highest proportion of people aged 65+. In comparison, London has the youngest population of people aged 65+ (Round 2017). As discussed below, projections indicate that these trends are likely to continue.

Although all regions in the UK are expected to have an increase in the population of individuals aged 65+ by mid-2026, differences will exist in the number and proportion of people aged 65+ per area (ONS 2018). London, the area with the lowest proportion of the population aged 65+ in the country, is projected to grow fastest, with an increase of almost 24.8% from 1.02 million to 1.27 million between mid-2016 and mid-2026 (ONS 2018). However, the impact of this projected rise of the ageing population in London is accompanied by London having the highest projected growth of younger people across the UK (ONS 2018). Therefore, the ratio of older people to younger people is not expected to be as large in London as in other parts of the country, notably the northern English regions. The North East and North West of England are the only UK regions where estimates indicate a decreasing population of those aged 16-64 with a simultaneous projected increase of 18% in the North East and around 17% in the North West of the population aged 65+ (ONS 2018).

Figure 1 shows the projected 65+ population across UK regions, in 2016 and 2039. Looking at projections for urban and rural areas, the population aged 65+ is projected to grow by around 50% in both urban and rural areas between 2016 and 2039 (ONS 2018). Whereas the younger population (16-64 years) is only projected to grow by 8% in urban areas, no increase of the younger population is projected for rural areas. As a

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[7] I.e. not moving within London or surrounding areas.

result, the ratio of older people to younger people will increase most in rural areas (Storey 2018).

Figure 1: Proportion of the population aged 65 years and over, 2016 and 2039 (Storey (2018), contains public sector information licensed under the Open Government Licence v3.0.)
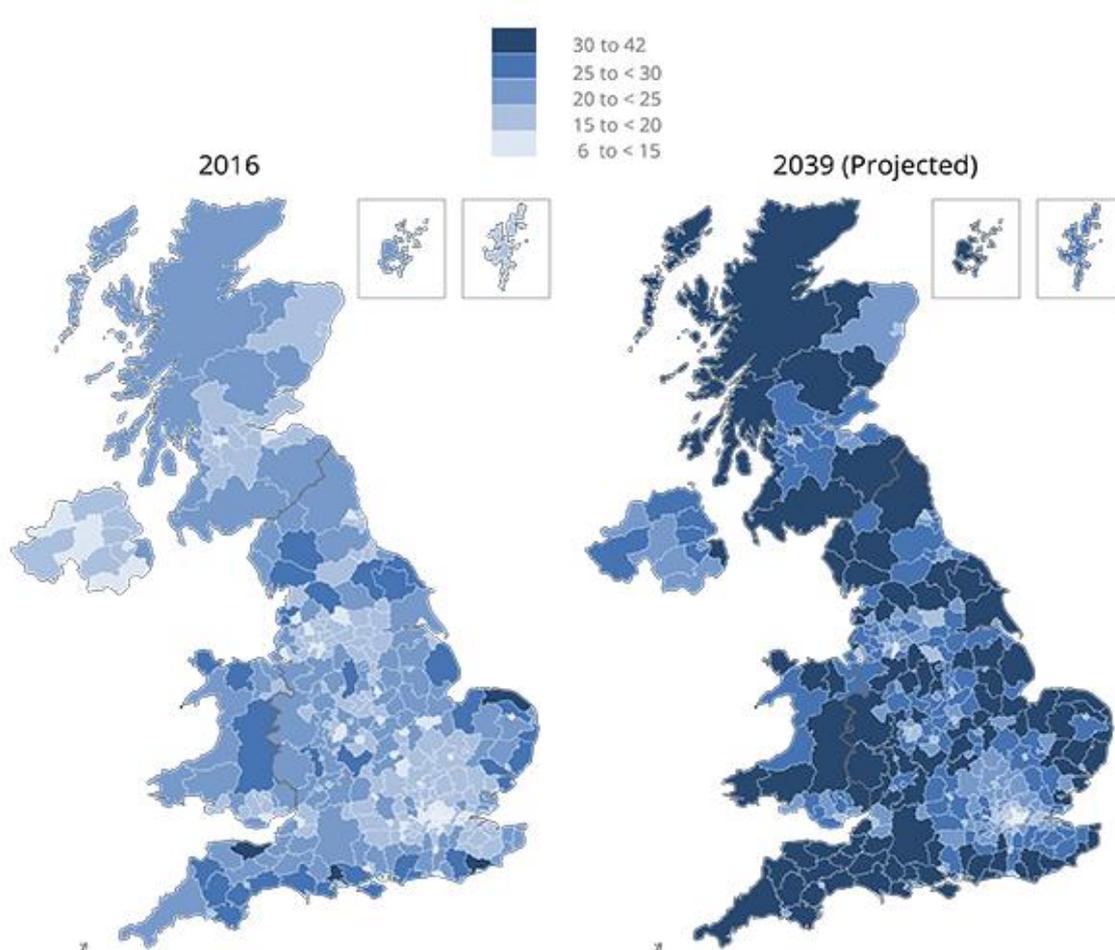
2.2 Labour market projections and distribution – what types of jobs will exist and in which sectors?

This section outlines current trends and future projections in labour market patterns. It outlines the existing evidence on how full-time, part-time; flexible work and self-employment are spread across ages, sectors, occupations and regions – both at present and over the next 30 years. The section addresses these separately, beginning with age and then moving on to sectors, occupations and regions. Overall, the evidence indicates that there has been an upward trend in the number of older people in the workforce.

Before explaining the trends by age, region and sector it is important to note that there is a clear upward trend in the employment rate of older people in the UK. According to

DWP (2017) the employment rate for people aged between 50-64 years old was 70.6%, 13 percentage points higher than it was 20 years ago. For those aged 65+ the employment rate in 2017 was 10.6%, which was more than double what it was in 2000.

Improvements in the health of older people, as well as the improved availability of part-time and flexible work, are factors that have enabled older people to work for longer (Cox et al. 2014; Martin 2018; Storey 2018). Decisions to remain in work are motivated by several factors. According to Annual Population Survey data from 2015, reasons given for working past the state pension age were: not ready to stop work (52%); to pay for essential items (15%); to pay for desirable items (8%); to boost pension pot (7%); employer needs your experience or you are needed in the family business (7%); due to opportunities to work more flexible hours (1%); and other (9%) (Storey 2018). Avoidance of isolation and loneliness are also named as reasons in the literature, but not quantified (Cox et al. 2014; Round 2017).

2.2.1 What types of jobs are currently undertaken in the UK, by age, region and sector?

Out of the 31 prioritised studies, 13 responded to question 1a. The majority of the working age (15-64) population in employment work full-time (Cridland 2017). Fewer than 30% of those aged between 50-64, and just over 20% aged between 25-49 work part-time (DWP 2017). Female employees, however, are significantly more likely to work part-time than their male counterparts – around 40% of women below the age of 40-55 and around 5% of men in the same age group work part-time[8] (Redden 2013). (See 2.4.1 for the transport patterns associated with the types of work discussed here). Figure 2 illustrates the share of part-time, full-time and self-employment for different age groups.

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[8] The literature review found no gender-differentiated data on younger age groups. The reasons why women engage in more part-time work than men is not discussed in the literature, but is likely to relate to caring responsibilities.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

15

Figure 2: Employment type by age (Cridland (2017), contains public sector information licensed under the Open Government Licence v3.0.)
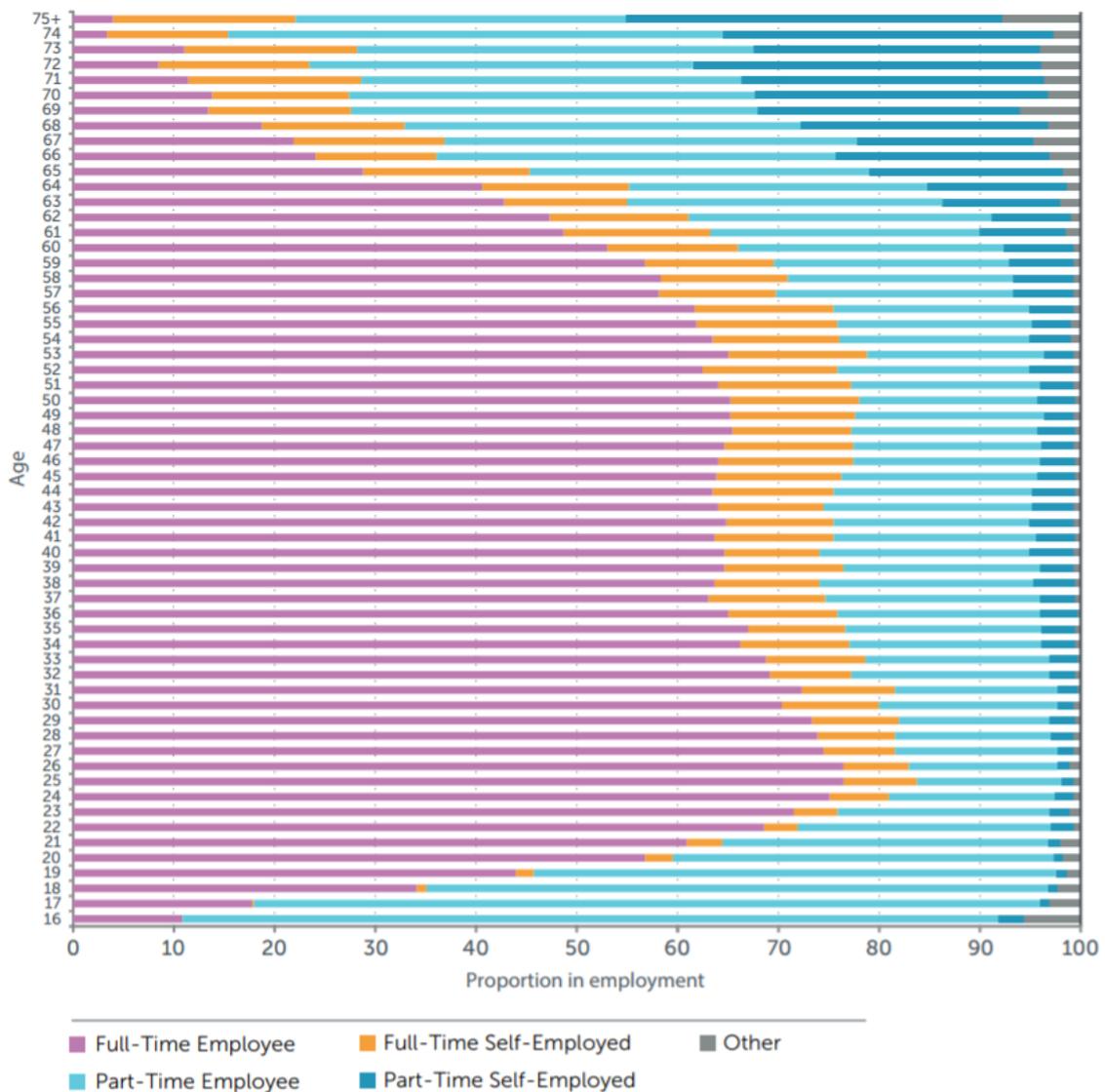
Part-time work

Almost 70% of the work that takes place past the current retirement age of 65 is part-time (Storey 2018). The share of part-time work out of all employment begins to increase from the age of 55 onwards. For men, the share of employed people in part-time work increases incrementally from 5% to 28% for age groups between 55 and 65. It then jumps to 50% for 66 year-olds and increases further to 77% for 70 year-olds. For females, the share increases more gradually with age to 81% for 66 year-olds and 92% for 70 year-olds (Redden 2013).[9] According to the Government Office for Science (2016), part-time work can be important for older workers[10] managing a long-term health problem, and workers often prefer a period of part-time work before retirement over the traditional fixed retirement date. The motivations to work part-time – as well as

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[9] The data is from 2011, when the female retirement age was lower – this might explain the more gradual increase in women's part-time work.
[10] By this we mean people above the age of 50, who are in paid employment or who are self-employed (see Appendix I).

the extent to which part-time work is in fact voluntary and not a form of underemployment – is not discussed more extensively in the literature.

Sectoral analysis of Labour Force Survey (LFS) data shows that full-time work is more common than part-time work among the working age population[11] (Redden 2013). There are, however, clear differences across sectors: manufacturing, construction and transport have the smallest proportion of part-time workers, while education and health and social care have the greatest. These differences may be linked to the gender compositions of these sectors, as the former are sectors with traditionally more male employees, while the latter employ more females. The analysis also finds that the share of part-time work increases with age across all sectors. The literature does not provide a breakdown of full-time and part-time work by occupational status or by region. The Institute for Public Policy Research, however, reports, that contrary to the national trend, older workers in the North East are more likely to be working full-time than part-time, which may be explained by lower levels of wealth among older people in that region (Round 2017).

Self-employment

Self-employment is also more common for people in older age groups. Estimates differ slightly across the literature, but according to the most recent data, almost 40% of those above 65 and in employment are self-employed (DWP 2017), in comparison to 15% of the working population as a whole (Government Office for Science 2016). Self-employment is named as a common form of late-career employment or 'bridge job' between employment and retirement (Round 2017). The reasons for this are the high job control; personal fulfilment; flexibility; and the ability to tailor one's working patterns around health or caring responsibilities (Round 2017; Government Office for Science 2016). Our included studies did not provide any information on the distribution of self-employment by sector or occupation.

The past 10 years have seen an increasing trend in self-employment (DWP 2017), owing to both a growth in self-employment among the 65+ age group (from 390,000 to 496,000 between 2010 and 2014) as well as growth in self-employment among young people without degrees (not quantified in the literature) (Massey 2015; Resolution Foundation 2018). While the former group tends to be in more secure self-employment, the latter group tends to be in low-skilled and insecure self-employment (Resolution Foundation 2018). DfT (2017) reports ONS findings that self-employed workers are concentrated in industries such as construction, taxi-driving and farming. The report goes on to suggest that newly self-employed workers have lower levels of income than the previous pool of self-employed workers, which could be a sign of involuntary underemployment among the self-employed[12] (DfT 2017).

Flexible work

A limited amount of literature was also available on patterns of other forms of flexible working[13], including working from home and phased retirement options. The majority of work (just below 75% of working days in 2013-14) still occurs in the same place, out-of-home, every day, but that share has decreased slightly over the last 30 years, reflecting an increase in work done in different places out-of-home on different days

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[11] In the nine sectors where information was available: Construction, Education, Finance, Health and Social Care, Hospitality, Manufacturing, Public Administration, Retail, Transport, Other services.
[12] It is suggested by the report, that self-employment has been a route out of unemployment for many during and after the financial crisis.
[13] Our understanding of flexible work refers to working from home and phased retirement, as literature on other forms of flexible work (such as compressed hours, job sharing or flexitime) was not available. Part-time work is discussed in its own right.

(i.e. neither at home nor at a single other place of work) to around 15% in 2013-14 (DfT 2017).

Around 5% of working days were done at home in 2013-14, but working from home varies by occupation. Those in professional occupations and employers and managers are the most likely to work from home occasionally, while manual and personal service workers were the least likely to do so (DfT 2017). Moreover, self-employed workers are more likely than employees to work from home or work at different places on different days (ibid.). DfT (2017) also finds that workers now choose to work at home on an "opportunistic basis", rather than working from home on set days of the week. Like working from home, phased retirement options involving flexible working are also often restricted to high-skill and high-value workers (Johnson 2015).

Sectors and occupations[14]

ONS data from 2016 indicates that the sectoral split of older workers is very similar to that of the working age population (ONS 2016). The biggest individual sectors employing people across all age groups are retail (14%), health and social care (13%), education (11%) and, manufacturing (10%) (Redden 2013). The key differences between age groups are:

- The 18-24 age group is considerably more likely to work in the retail sector than other age groups (25% compared to 12-13%) and in hospitality (14% compared to 3-5%) (Redden 3013);

- Workers between 25 and 64 are more likely to work in public administration, education and health (around 30%) than those younger (16%) or older (24%) (Redden 2013);

- The 65+ group is disproportionately represented in agriculture, forestry and fishing, compared to younger age groups (DWP 2017, no exact figures available).

Owen et al. (2013) reports differences in sectors across rural and urban areas. The most prevalent sectors in rural areas are wholesale and retail trade (14% of jobs are in this sector), real estate, renting and business activities (13%) and manufacturing (12%). In urban areas, wholesale and retail trade (17%) and real estate (17%) are also the largest sectors, followed by health and social work (14%). Most of the employment in the agriculture sector (83%) is located in rural areas, while most work in the financial sector takes place in an urban context (95%).

Wilson et al. (2014) present the percentage shares of people working in different occupations in 2012. The most common occupations are professional occupations (19.6%), the least common being process, plant and machine operatives (6.2%). There is limited evidence across the literature on differences in occupation by age. According to Johnson (2015), older workers currently often work in local, low-skilled jobs regardless of former skill levels, perhaps suggesting a trend of downgrading as people reach retirement age. This is not evident, however, in Massey's (2015) analysis of the 50-64 and 65+ groups, which implies a similar occupational split across age groups. The Resolution Foundation (2018), however, points out that workers in lower-paid and highly physical jobs tend to exit the labour market earlier, due to the negative impact of physically demanding work on the worker's health.

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[14] See Appendix J for examples of profession that fall into occupations categories, following the Standard Occupational Classification 2010 used by the literature.

In relation to occupation by region, the most prevalent occupations in rural areas are managers (21%), elementary staff[15] (18%) and administrative/clerical staff (11%). In urban areas, the most common occupations are also managers (18%) and elementary staff (14%), in addition to sales/customer service staff (14%) (Owen 2013).

2.2.2 What projections are there for full-time, part-time, and flexible working in the UK over next 30 years?

From the 31 prioritised studies, 5 addressed question 1b. While the literature does not provide projections of full-time, part-time or flexible work overall or by sector, short-term projections by occupation are available, and are illustrated in Figure 3.

Figure 3: Occupational change by status, 2012-2022, Total Employment (000s). (Wilson et al. 2014, used with permission.)
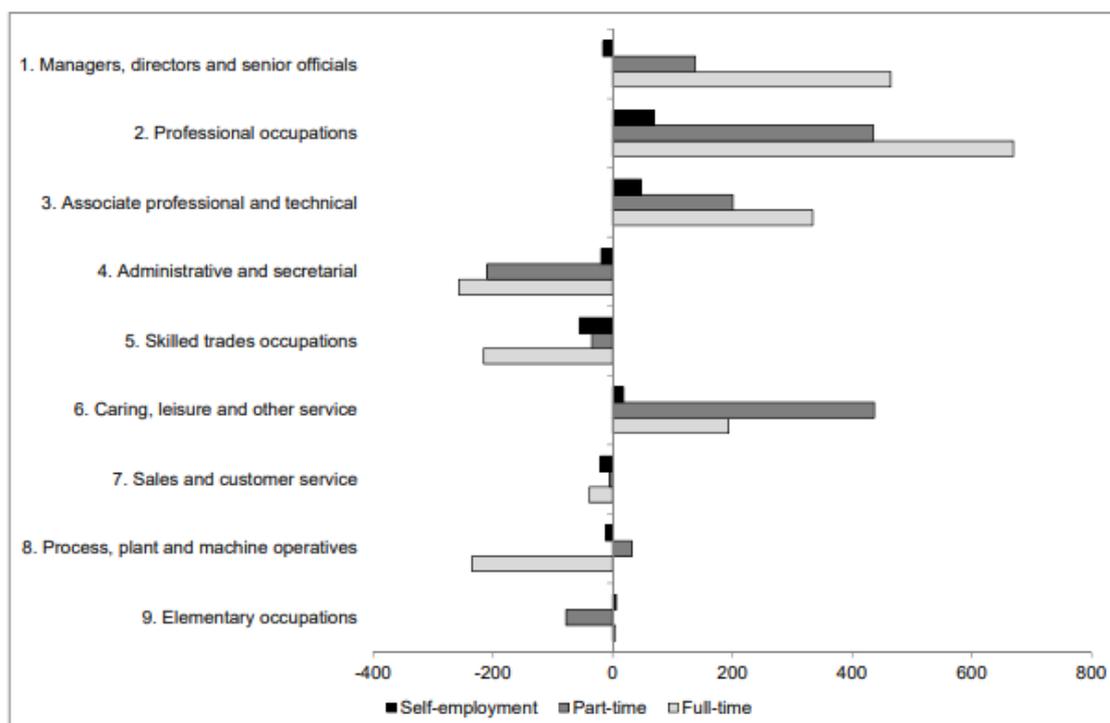
Source: IER estimates, MDM revision 12015.

Looking at changes between 2012 and 2022, Wilson et al. (2014) report that by 2022, the number of both full-time and part-time jobs will have increased in professional; associate professional and technical; managerial; and caring and leisure services occupations. The growth in the number of full-time jobs is greater for all these occupations except for caring and leisure services, where part-time work will have increased more than full-time work.

In contrast, the number of both full-time and part-time jobs is expected to have decreased in administrative and secretarial occupations, skilled trades occupations and sales and customer services. Elementary occupations see a decrease in the number of part-time jobs, but no change in full-time jobs, and process, plant and machine operatives see a decrease in full-time jobs but an increase in part-time jobs (Wilson et

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[15] Elementary occupations include simple and routine tasks which primarily require the use of hand-held tools as well as physical effort.

al. 2014). Age-specific data is not available, but Johnson (2015) forecasts increasing demand for part-time and flexible work among older people.

Wilson et al. (2014) expect the number of self-employed people to grow by 18,000 between 2017 and 2022, but the share of self-employment out of total employment to decrease slightly (from 13% to 12%). Changes in self-employment differ by occupation. The number of self-employed is expected to increase the most in professional occupations and associate professional and technical occupations. Skilled trades occupations, administrative and secretarial occupations, and sales and customer service are likely to a decrease in the number of people who are self-employed (Wilson et al. 2014). There is limited evidence on the drivers for these trends in the literature. Schmidlechner et al. (2018) suggest that the rise of platform-based jobs is likely to boost self-employment, but this type of self-employment is more likely to be low-skilled than professional or technical.

Popularity of part-time work and self-employment suggests that flexibility in the labour market is important for keeping older workers in employment (Cox et al. 2014). Analysing British Social Attitudes data, Cridland (2017) finds that the opportunity to work part-time would encourage 40-50% of people across generations to work longer before retiring. The opportunity to work flexible hours has a similar impact. Interestingly, however, the X and Y Generations (those born 1966-1979 and 1980-2000 respectively) are more likely to value part-time work and flexible hours than the Baby Boomer generation (those born 1945-1965), which may imply that providing these options could have a growing impact on the number of people staying in work for longer.

2.2.3 What jobs will exist and in which sectors?

Out of the 31 prioritised studies, 5 address question 1c. The literature highlights three main drivers of change in the availability of jobs in different sectors and occupations: (1) a downward trend in public spending, (2) globalisation and relocation of production to low-cost countries, and (3) computerisation or automation of tasks (Wilson et al. 2014; Centre for Cities 2018).

According to DWP (2017) sector forecasts, the picture in 2022 looks similar to the present. Greater changes are expected in the occupational distribution (see 2.2.2). Centre for Cities (2018) also forecasts that the jobs likely to experience an increase in demand by 2030 are publicly funded occupations (50%), such as health and welfare; lower-skilled private occupations (26%), such as sport and fitness; and higher skilled private occupations (24%), such as natural science professionals.

The type of work that people do is also changing. Companies are less likely to have a large core workforce but will increasingly draw on a network of workers for project-based work. The workforce in the future will be characterised by increasing project work, temporary work, and freelance work (Schmidlechner et al. 2017). There will also be an increase in the number of people holding multiple jobs (ibid.). A related trend is the expected increase in the number of workers selling their labour on platforms, as platform-based companies are projected to grow rapidly. These changes are difficult to quantify, however, due to definitional issues related to the platform economy (ibid.).

Overall, changes in the type of work available indicate a shift towards work involving people skills and away from heavy manual work. According to Johnson (2015), this protects employment prospects for the older cohort, as the physical impact of the work on their health is lower. As shown in section 2.2.1, the growing sectors and occupations are also ones with the greatest scope for part-time and flexible work,

which may also enable and encourage more people to work until and beyond the state pension age.

2.2.4 What will the geographic distribution of jobs and sectors look like?

The review found limited data on the projected geographical distribution of jobs and sectors – out of the 31 prioritised studies, only one addressed question 1d. In particular, no data was available on the distribution of jobs in rural areas.

Using data on current occupational distributions, a report by Centre for Cities (2018) estimates which UK cities are likely to see job losses and the locations where job creation is likely to take place by 2030. The report finds that cities in the Midlands and Northern England contain the largest shares of jobs in occupations that are likely to shrink. In Mansfield, Sunderland and Wakefield almost 30% of the current workforce is employed in an occupation very likely to shrink. These areas are therefore likely to see more job losses than Southern cities such as Reading, Brighton and Portsmouth, where less than 20% of jobs are at risk. These patterns are illustrated by Figure 4.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

21

Figure 4: Share of occupations likely to shrink across the UK (Centre for Cities (2018), used with permission)

City	Share (%)	City	Share (%)
Mansfield	29.4	Bournemouth	21.9
Sunderland	29.2	Birkenhead	21.8
Wakefield	29.2	Barnsley	21.5
Stoke	28.4	Milton Keynes	21.5
Doncaster	26.5	Preston	21.4
Blackburn	26.3	Liverpool	21.3
Northampton	25.8	Leeds	21.3
Dundee	25.3	Derby	21.3
Huddersfield	25.3	Plymouth	21.0
Telford	24.9	Nottingham	21.0
Leicester	24.9	Norwich	20.7
Coventry	24.8	Slough	20.7
Wigan	24.7	Crawley	20.6
Peterborough	24.6	Ipswich	20.5
Bradford	24.2	Glasgow	20.5
Swindon	23.9	Cardiff	20.4
Hull	23.9	Aldershot	20.3
Basildon	23.9	Luton	20.1
Burnley	23.8	Exeter	19.4
Warrington	23.7	Aberdeen	19.3
Sheffield	23.5	Bristol	19.1
Newport	23.4	Portsmouth	19.1
Newcastle	23.3	York	18.7
Birmingham	23.2	Blackpool	18.6
Gloucester	23.2	Brighton	18.5
Swansea	23.2	Edinburgh	17.5
Southend	22.4	London	16.1
Middlesbrough	22.4	Worthing	16.0
Manchester	22.4	Reading	15.4
Chatham	21.9	Cambridge	12.9
Southampton	21.9	Oxford	12.8

Current jobs in occupations very likely to decline by 2030 (%)
- 12.8 - 16.0
- 16.1 - 19.4
- 19.5 - 22.4
- 22.5 - 26.5
- 26.6 - 29.4

Source: Bakhshi et al. 2017, *Future of Skills: Employment in 2030*, London: Nesta and Pearson; ONS 2017, Business Register of Employment Survey; Census 2011.

In contrast, the occupations likely to grow are more evenly spread across cities. While the jobs likely to grow account for 5-10% of jobs in cities across the UK, there is no geographical pattern to these figures. In Southern cities and the largest Scottish cities, this growth is driven by growth in high-skilled private sector occupations. In Northern cities, the growth is more likely to stem from growth in lower-skilled private sector jobs and publicly funded occupations (Centre for Cities 2018).

2.3 What is the potential for digitally enabled work for extending working lives?

This section explores the potential for digitally enabled work for extending working lives. Two dimensions underpin digitally enabled working (see Appendix I) in the literature: the first dimension describes digital technologies at work (i.e. the workplace), such as the introduction of machines and ICT systems (Peruffo et al. 2017, Schmidlechner et al. 2017). The second dimension refers to the usage of ICT to facilitate remote working (Dudley et al. 2018, Garner et al. 2016, Messenger et al. 2017).[16]

2.3.1 What is the theoretical scope of digitally enabled and remote working?

The section first provides an overview of the current take-up of remote working and moves on to discuss the scope for technology to change sectors.

From the 31 prioritised studies a total of 7 papers provided a response to question 3a.

Remote working

In the UK, around one third of the workforce (approximately 10 million people) works remotely, either occasionally or more regularly (Labour Force Survey in Garner et al. 2016). Differences in take-up of remote work exist in relation to the type of job; the form of employment; and the sector. There is however a lack of evidence as to whether older people take-up remote working.

UK take-up of remote work is concentrated among those in professional occupations, associate professional occupations and technical occupations (Messenger et al. 2017). Looking at the form of employment, take-up of remote working is twice as common among full-time employees compared to part-time employees (Messenger et al. 2017). Remote working is particularly common in results-driven environments such as the financial and real estate sector (Mandl and Biletta 2018). In contrast, remote working is less common within the manufacturing industry (Messenger et al. 2017).

Other digitally enabled work

The potential of technologically-driven change is reflected across sectors. There are some sectors where development in technology is likely to reduce the demand for individuals. For example, in manufacturing, a projected demand for data experts and IT software development workers will necessitate less future demand for individuals operating routine tasks (Peruffo et al. 2017). Another example is innovations in 3D technology producing printed food could make chefs redundant (ibid.).

In other sectors there is scope for digital technology to support the workforce. Peruffo et al. (2017) speculate that the internet of things (IoT)[17] will enable farmers to monitor crops remotely. In healthcare, improvements in information and communication networks could shift consultations between doctors and patients online (Peruffo et al.

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[16] According to Messenger et al. (2017), 94% of individuals working from home in the UK do so with the help of ICT devices. This suggests that remote working is, with very few exceptions, digitally-enabled.
[17] Jeschke et al. (2016) define the internet of things as 'an information network of physical objects (sensors, machines, cars, buildings, and other items) that allows interaction and cooperation of these objects to reach common goal'

2017). It is conceivable that some of these developments can potentially extend working lives since they require less physical exertion, e.g. a GP will not need to travel to their GP practice as they can consult their patients from their home.

Alongside technologically-driven sectoral change, platform-based companies (e.g. Uber, Air BnB) are projected to grow further (Business in the Community 2015). As a result, commentators suggest that the 'gig economy' carries the promise of extending people's working lives as they provide the option of part-time and/or flexible working opportunities– a claim backed up by the fact that 25% of Uber's workforce is aged 50+ (Martin 2018).

2.3.2 What is the projected uptake of digitally enabled work?

From the 31 prioritised studies a total of 3 papers provided a response to question 3b.

The existing evidence allows for three tentative conclusions regarding projected uptake of digitally enabled work. First, it can be expected that the take-up of remote working will increase. A 2015 survey of 503 managers at medium and large UK-based organisations indicates that 70% of managers and organisations will have adopted remote working by 2020 (Garner et al. 2017). Second, remote working will not grow equally across all occupations or sectors. This counters the idea that working lives can be extended by ICT across all sectors. Remote working is predicted to have the largest uptake in those occupations that are already strongly facilitated by ICT (Messenger et al. 2017), which would suggest a more limited role of digital technology in extending working lives for sectors with little ICT usage. Finally, digital exclusion rates in the UK are likely to decline. This is because those currently of working-age and using digital technology are expected to continue doing so in the future once they retire (Storey 2018). However, digital exclusion will not disappear; the very old will potentially struggle with the pace of technological advances and not access certain types of digital technology, largely due to cognitive decline (ibid.).

2.3.3 What are the enablers and barriers to uptake of digitally enabled work?

This section explores enablers and barriers to uptake of digitally enabled work, including remote working, with a focus on organisational as well as age-specific barriers and enablers.

From the 31 prioritised studies, 13 papers provided a response to question 3c.

Organisational enablers and barriers

Lack of opportunities
Some employers are less willing to invest in older employees' digital skillset due to their impending retirement (Martin 2018, Round 2017). To enable uptake of digitally enabled work, organisations need to adopt lifelong learning and professional development regardless of employees' age (Business in the Community 2015). However, evidence suggests that older employees in manual professions less accustomed to formal learning might still be reluctant to take up training opportunities (Round 2017). In contrast, individuals with educational qualifications and the ability to learn quickly are more likely to benefit from the provision of lifelong learning (Peruffo et al. 2017). This

highlights that the potential for digital work to extend working lives has different implications for low-income individuals and those with limited formal education.

Organisational culture
In hierarchical organisations, opportunities for remote working or testing new technology might only be available to senior staff and therefore limit take-up (Dudley et al. 2018). In contrast, organisations with a more collaborative ethos and bottom-up approaches are more likely to encourage take-up of remote working (Dudley et al. 2018).

Senior managers' perceptions also add to a culture of 'presenteeism' (i.e. always needing to be available) that hinders take-up of remote working (Garner et al. 2016; Messenger et al. 2018). Examples of such perceptions include the view that remote working leads to a decline in productivity levels. Presenteeism can be avoided by senior leadership teams leading by example, e.g. working remotely themselves (Garner et al. 2016). To counter employees' fears that remote working requires constant availability, organisations can adopt policies that stipulate organisational expectations (e.g. switching off emails after 6 pm) (Garner et al. 2016). An instructive example comes from France, where Orange promised their employees the right to disconnect from any work-related technology as a way to increase take-up (Peruffo et al. 2017). Such agreements around remote working could possibly play a role in extending individuals' working lives by managing expectations and taking the 'fear factor' away.

Age related enablers and barriers

Perceptions, skills and confidence
Particularly in the manufacturing sector, some older people may be reluctant to make use of training opportunities, viewing digital technology as lacking any relevance to their job (Business in the Community 2015). Others have reservations around using ICT due to privacy and personal security concerns (Government Office for Science 2016).

A (real and perceived) lack of digital skills comprises another barrier to take-up of digitally enabled work among older people (Government Office for Science 2016). No or limited confidence with digital skills leads some to remain in their current job rather than change jobs and potentially encounter digitally enabled tasks (Business in the Community 2015). Such anxieties appear more common among a) the unskilled, often due to lacking opportunities for learning about new technology; and b) Baby-Boomers, whose knowledge of technology tends to be more limited than that of younger generations (Dudley et al. 2018).

Physical barriers
Physical challenges facing older people can prevent take-up of digitally enabled work. For instance, older people are more likely to be affected by glaucoma, i.e. a form of sight loss (Damodaran and Burrows 2017). Motor changes (e.g. strength and fluidity of movement) can also be a barrier to uptake and regular usage of ITC for some older people (ibid.). Even when available, aids to counteract physical barriers are not necessarily effective and can lead to further complications (Damodaran and Burrows 2017).

Technological enablers and barriers

For workers to access relevant information remotely, particularly in more rural areas, technical infrastructure (e.g. cloud-based solutions) are necessary (Mandl and Biletta 2018). A particular barrier to remote working are cybersecurity concerns, e.g. within the NHS, that prevent staff from accessing systems remotely (Dudley et al. 2018). For the

projected growth of digital platforms to materialise, the technological infrastructure, e.g. cloud computing, needs to be in place (Schmidlechner et al. 2017).

Structural barriers

Alongside age, people's take-up of ICT is determined by structural factors such as their socio-economic background. In the UK, nearly every individual earning more than £40,000 a year uses the internet. In contrast, less than 60% earning less than £12,500 do so (Government Office for Science 2016). Similar discrepancies exist with educational levels. Such differences are expected to remain as the working-age population enters into older age (Government Office for Science 2016).

2.3.4 Are there any positive implications of a projected uptake of digitally enabled work?

This section explores positive implications of a projected take-up of digitally enabled work. The section discusses positive implications in relation to finances, health and commuting as well as flexibility and autonomy.

From the 31 prioritised studies a total of 6 papers provided a response to question 3d.

Finances

Organisations that use and invest in information technology display higher levels of productivity (Dudley et al. 2018, Garner et al. 2016). Moreover, granting employees the option of working remotely has the benefit of increasing retention, reducing absenteeism and increasing workers' creativity (Garner et al. 2016). This indicates that there is a business case of using remote working to retain employees.

Health and commuting

Of wider benefit to the public purse are potential health benefits that result from an increase in remote working. Commuting appears to be a barrier to health-related activities (e.g. exercise); for instance, individuals that spend an additional 60 minutes above the average daily commuting time experience a 6% decrease in aggregate health-related activities. This increases the likelihood of obesity (Garner et al. 2016). In light of the correlation between commuting time and obesity levels, a reduction in commuting reduces money spent on health (ibid.). Surveys from France and Germany indicate that a reduction in commuting time is equated with a decline in levels of stress and fatigue (Messenger et al. 2017). A reduction in commuting may also lead to less traffic congestion - a particular area of concern in urban settings (Messenger et al. 2017). This suggests that remote working – where available (see 2.3.1) – has a role to play in extending working lives for health, finance and transport/ the environment: in decreasing workers' stress it extends individuals' working career; allows them to earn an income above their pension pay; and alleviates the environmental effects of traffic congestion.

Flexibility and autonomy

One of the reported benefits of remote working is a perceived increase of workers' autonomy, which may in part explain higher levels of job satisfaction among workers working remotely (Mandl and Biletta 2018). Digital platforms (e.g. Uber, Airbnb) and remote working can offer workers an improved work-life balance (Garner et al. 2016) and caters to individuals' desire for flexibility in relation to tasks, working time, place of work and amount of work (Schmidlechner et al. 2017). Due to its flexibility, remote

working and the 'gig economy' can also include groups into the labour market that would otherwise be excluded, e.g. due to caring responsibilities, health reasons or ageism (Mandl and Biletta 2018).

2.3.5 Are there any negative implications of a projected uptake of digitally enabled work?

This section examines the evidence on negative implications of a projected take-up of digitally enabled work, with a focus on loneliness and isolation, finances and health.

From the 31 prioritised studies a total of 6 papers provided a response to question 3e.

Loneliness and isolation

The effect of digitally-enabled work and remote working on increasing loneliness and isolation is widely documented (Dudley et al. 2018; Messenger et al. 2017; Schmidlechner et al. 2017). 'Gig workers' such as 'turkers'[18] experience high levels of isolation and loneliness as a result of not directly engaging with clients (Schmidlechner et al. 2017). The lack of face-to-face contact can lead to a sense of work as impersonal and dehumanising (Schmidlechner et al. 2017, Mandl and Biletta 2018) and can impact people's mental well-being (Peruffo et al. 2017). Experiences of loneliness and isolation also have implications for the wider organisational context. For instance, virtual communication can increase conflict and misunderstandings due to the absence of regular informal contact and emotional support (Mandl and Biletta 2016; Messenger et al. 2017).

Finances

Lack of productivity and individual pay are among the key concerns around the projected take-up of digitally enabled work and remote working. While an increase in productivity is cited as being a consequence of remote work (see 2.2.3), inadequate implementation of technology can hinder effective communication between team members and therefore decrease productivity (Dudley et al. 2018). A lack of job security as well as low and insecure pay already characterise large sections of the gig economy (Schmidlechner et al. 2017); without regulation, these aspects are likely to continue. The unclear employment status of gig economy workers increases their vulnerability, e.g. with regard to social protection and work-related accidents. In cases of work-related accidents, questions over liability remain.

Health

Individuals working remotely already work longer hours than their counterparts in offices and are more likely to be at risk of developing a stroke and coronary heart disease (Garner et al. 2016). Ergonomic factors, e.g. bad posture due to using devices in unsuitable environments are further risk factors associated with the take-up of remote work (Mandl and Biletta 2017). These are likely to increase in age and limit take-up among older people (see 2.2.3) On a psychological level, 'gig workers' face the pressures of always needing to be available to ensure upcoming tasks are not missed, which can heighten stress levels (Schmidlechner et al. 2017). In general, it appears that individuals working remotely report higher levels of stress, driven by the blurring boundaries between work and private life. The blurring of work and private life as a source of stress appears most common for workers who are highly mobile and nearly

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[18] Turkers is the name of workers operating on Amazon Mechanical Turk, a digital crowdsourcing platform that allows workers to complete a range of 'micro tasks' in exchange for money.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

27

always work remotely (Schmidlechner et al. 2017); however, ICT workers and teleworkers report higher levels of autonomy and better career prospects than non-ICT workers (Peruffo et al. 2017).

2.4 What do work travel patterns look like in the UK?

This section presents the evidence on current and projected work travel patterns[19] in the UK. Work travel patterns are understood to include commuting time, frequency, length, duration, and mode. Where possible, the section considers differences by age, occupation, sector and region. However, it is important to note that there is very limited evidence on the travel patterns of older people.

2.4.1 Current variations in travel patterns

Out of the 31 prioritised studies, 5 provide a response to question 4a.

The number of trips to and from work per person fell by 19% between 1996 and 2015 (DfT 2018). The proportion of adults who travel at peak times (7:00-8:59 and 16:00-18:59) is around 20% and shows a strong downward trend (DfT 2017). Workers in different occupations travel to and from work at different times. Workers in non-manual, professional and employer and manager occupations are most likely to commute at peak times, while workers in manual and personal service occupations are more likely to travel at other times of day (DfT 2017).

Commuting distances differ by age, gender and type of work. Men's commute distances are longer than women's. While women under the age of 30 commute on average very similar distances as women above the age of 30 (around 7 miles), the commute for men above the age of 30 is on average 3 miles longer (around 11 miles) than that of men below the age of 30 (around 8 miles). Average commute length has increased over time, this is driven by increases in commute length for workers over the age of 30, and for young men commuting distances have consistently decreased (DfT 2017). Figure 5 illustrates analysis of different generations by Resolution Foundation (2018). Firstly, all generations have experienced an increase in commute length (in minutes) between 1992 and 2016. Secondly, each generation has spent more time commuting at the same age as their predecessors.

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[19] This is defined as travel for the purposes of work (see Appendix I).

Figure 5: Commute length by generation over time (Resolution Foundation (2018), used with permission)

Mean travel-to-work time in minutes, by age and generation: UK, 1992-2016

Silent gen (1926-45)
Baby boomers (1946-65)
Gen X (1966-80)
Millennials (1981-2000)

Source: RF analysis of ONS, *Labour Force Survey*
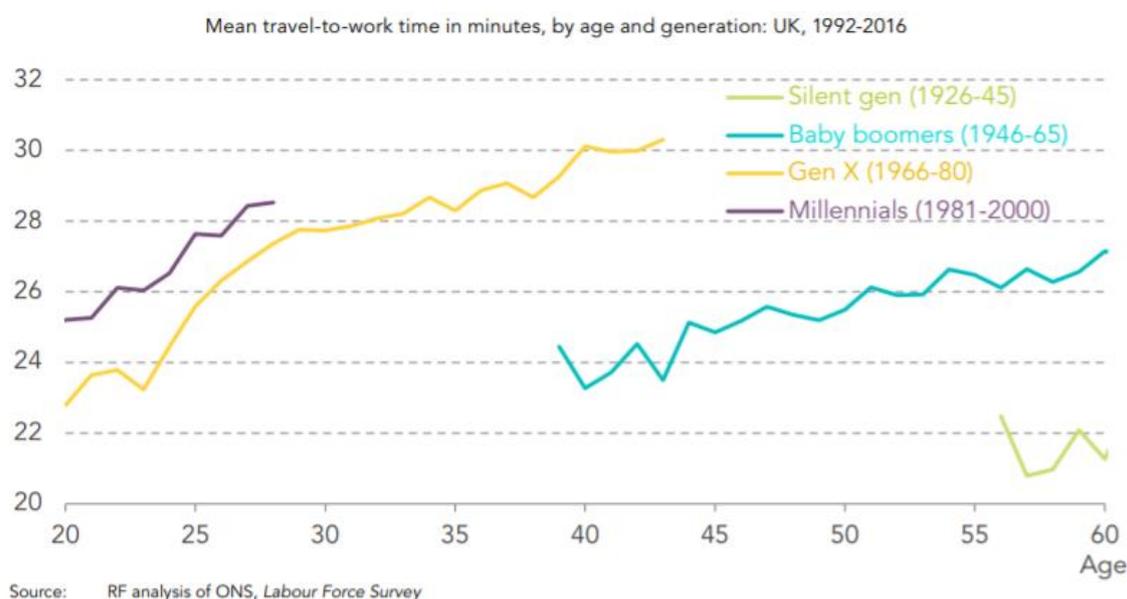
DfT (2017) also indicates that those who work part-time tend to have shorter commute than those who work full-time, although the report provides no evidence on why this is the case.[20] Moreover, both part-time work and self-employment are associated with a smaller number of commute journeys than full-time work. For the self-employed, in particular, the report suggests that this may be due to increased underemployment among the pool of self-employed (see 2.2.1), which manifests as less travel to work, and contributes to the overall reduction in commuting (DfT 2017).

The car is the preferred commuting mode for all age groups, but its popularity increases with age for both men and women. Women in all age groups, however, are more likely than men to be car passengers and less likely to be drivers, and for all age groups, men have greater mileages driven than women (DfT 2017; DfT 2018).

Chatterjee et al. (2018) find a long-standing trend of fewer young adults obtaining driving licences and owning cars than previous generations – since the early 1990s, each cohort of young people has owned and used cars less than the previous. Between 1992-1994 and 2014, the number of driving licenses held fell from 48% to 29% of 17-20-year-olds, and from 75% to 63% for 21-29-year olds (Chatterjee et al. 2018). The number of car driver trips by license holder has fallen since 1996 for men aged below 60, and since 2004 or 2005 for men between 60 and 69, while remaining steady for men above 70. For women aged between 20 and 50, the number of trips has been falling since 2005, while remaining steady for women above 50 (DfT 2018).

These patterns are to some extent explained by settlement patterns: people in the 16-24 and 25-34 age groups tend to live in high population density areas, which decreases car use, as commuting by car is more prevalent in rural than in urban areas (Chatterjee et al. 2018; DfT 2017). However, National Travel Survey Data shows that between

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[20] One possible explanation is that the lower pay and shorter hours associated with part-time work make it less beneficial to travel long distances.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

29

2002-2005 and 2011-2014 car travel has decreased by 9-32% for the 17-34 age group in all area types (rural and urban areas of different sizes), and between 6-23% for the 35-50 age group. In contrast, car driving has increased by 2-18% for the 60+ age group in all areas during that period (DfT 2018). These trends are displayed in Figure 6. Chatterjee et al. (2018) also suggest that the increasing costs of car use, coupled with a decrease in young people's disposable income could in part explain this trend. There may also be a generational shift in attitudes, where younger cohorts consider driving less desirable than older ones.

Figure 6: Percentage change in car driver miles per head per year by age group and area type and size of built-up area: England 2002-5 to 2011-14. (DfT (2018), chart produced by Peter Headicar. Used with permission.)

The use of public transport is higher in urban than rural areas, for instance the usage of National Rail for commuting is highest in London at 18% (DfT 2017). The use of public transport however decreases with age (DfT 2017), which may also reflect settlement patterns and attitudes towards car use. Rand Europe et al. (2016) use National Travel Survey data to derive the expected impact of occupation on commuting by rail. They find that managers, those in professional and associate professional occupations and those in administrative occupations are more likely to commute by rail than those in skilled trade, personal service, sales and customer trade, process, plant and machine and elementary occupations.

There is less of an urban/rural divide in active commuting (cycling or walking), which is most common in inner London and other cities and towns (18%), closely followed by areas that are mainly rural (16%). Out of all areas, active commuting is least popular in outer London (at 9%) (DfT 2017). For men, walking and cycling also decreases with age, while for women active travel is stable across all age groups (ibid.).

2.4.2 Work travel pattern projections over next 30 years

There appears to be limited evidence on work travel pattern projections over the next 30 years. From the 31 prioritised studies, only 2 address question 4b.

DfT (2017) concludes that shifts in the composition of the workforce are likely to change travel patterns in the next 30 years – for instance an increase in the share of managerial and professional employment may show up as an increase in peak-time travel, given current working patterns. On the other hand, as suggested in section (2.2.3), these and other growing occupations are ones most likely to work from home occasionally, and where part-time work and self-employment are also expected to grow. This might not only decrease the overall levels of transport demand (as these forms of work tend to have shorter commutes and smaller number of commute journeys – see 2.4.1), but also counteract the increase in peak-time travel.

In terms of mode of transport, car use is expected to experience further decline. Chatterjee et al. (2018) show that the growth in car use with age happens at a lower rate than before: people who have not obtained a licence or own a car in their youth are increasingly less likely to do so when they are older. This suggests that the low rates of obtaining drivers' licenses among Generation Y and younger members of Generation X are likely to impact their car use in older age as well. The report also expects a rise in shared mobility (such as car clubs and lift sharing through online platforms) across generations.

3 Conclusion and discussion

Overall, the evidence indicates that the population is not only growing, but older people (50+ years old) will begin to make up a higher proportion of the population over the next 30 years. According to ONS (2018) the number of people aged 65+ is projected to increase by 19% between 2016 and 2026. Estimates indicate that the 85+ age group will increase the fastest from 2% in mid-2016 to 7% of the overall population in 2066. It is important to note however that the ageing population is not homogenous and there are clear inequalities influenced by a range of interrelated factors, such as previous/current employment, geographical location and health. These inequalities mean that the implications for transport demand and requirements of older people are likely to be nuanced.

Although all areas of the UK are likely to see an increase in the number of people aged 65+, both absolute and proportional regional differences are set to remain. Coastal and rural areas, as well as small towns will continue to have a large population of older people. Migration of older people may not however follow traditional patterns. For example, the evidence finds that Cambridge and Oxford have become popular among older people leaving London.

The growing population of older people are also remaining in work for longer. Employment rates for those aged between 50-64 and 65+ have increased over time. For example, according to DWP (2017) the employment rate in 2017 for people aged between 50 and 64 was 70.6%, 13 percentage points higher than it was 20 years ago. For older cohorts, such as those who are 65+, the employment rate in 2017 was 10.6%, which is double what it was in 2000. The evidence also shows that as people get older and remain in work they are more likely to work part-time – 70% of work that takes place after the current retirement age is part-time (Storey 2018). There is also a growing trend for those aged 65+ to become self-employed. The most recent data indicates that almost 40% of those above 65 and in employment are self-employed, compared to 15% of the total population (DWP 2017).

While there is limited evidence regarding the current and future occupations of older workers, the evidence base does provide an overview of the types of sectors older workers will work in. Data from ONS shows that the sectoral split of older workers is very similar to that of the working age population (ONS 2016). The 65+ age group, however, is disproportionately represented in agriculture, forestry and fishing compared to younger age groups. This is unsurprising given that these occupations tend to be situated in rural areas, where older cohorts are more likely to reside.

The literature indicates that there is scope for technology to extend the working lives of older people. The evidence shows that remote working is not possible or likely to present itself as an option in all occupations and sectors. For example, the literature shows remote working is concentrated among professional, associate professional or technical occupations. In contrast, sectors, such as manufacturing are going to see advancements in technology that will reduce the number of job opportunities across all age groups but are likely to provide less scope for remote working.

While there is limited evidence on the community travel patterns of older people specifically, it does show that there are some differences by age and gender. Those over the age of 30 commute the longest distances. In terms of gender, women commute similar distances across all ages. Whereas men above the age of 30 commute 3 miles longer (around 11 miles) than men under 30 (DfT 2017). There is also evidence that the car is currently the preferred mode of transport used when commuting across all genders and age groups (DfT 2017; DfT 2018). However, car

use tends to increase in popularity as people get older and the evidence also finds that there is a declining trend in young adults obtaining driving licences. This is likely to have implications for transport requirements and demand in the future.

Finally, shifts in the composition of the workforce are likely to change travel patterns in the next 30 years – for instance an increase in the share of managerial and professional occupations may result in an increase in peak travel times – given current working patterns. On the other hand, other occupations that are due to grow in size are those that facilitate remote working, and where part-time roles and self-employment are expected to grow.

3.1.1 Limitations in the review process

This research project adopted a literature review methodology that was designed to efficiently locate and synthesise a body of relevant literature. The methodology included undertaking targeted searches, citation tracking and relying on responses from academics to send relevant papers. Searching academic databases was out of scope which means that some academic studies may have been missed. Due to the need for an efficient review process we only reviewed the 31 most relevant studies. The findings section and review conclusions are therefore based on a proportion of all includable studies and do not comprehensively summarise all relevant evidence. Studies were prioritised for synthesis based on relevance (see section 1.2.2). A full list of studies meeting inclusion criteria but not synthesised is provided in Appendix H.

Overall, it is difficult to predict the demand for transport and requirements just by looking at the current literature. This is owing to aggregate level breakdowns and inconsistent definitions of geographical areas which do not provide a full enough picture to be able to draw clear implications on settlement and work patterns and what implications this has on demands for transport.

3.2 Implications for transport demand and requirements

The final section of this report provides a response to the fifth question set out in the Research Objectives on page 7.

Although there will be a high proportion of older people in all areas of the UK, the evidence indicates that rural and coastal areas are going to continue to have a high proportion of older people living in them. Northern regions are also likely to see a higher proportion of older people compared to other age groups. The literature shows that these are the areas that are going to have fewer jobs that meet the needs of older people – i.e. part-time, flexible roles and the ability to work remotely. Rural areas in particular are also where elementary occupations, which more often than not involve physical work, prevail. This could have implications for transport demand in these areas, as people are likely to need to travel to find appropriate work, although potentially not always on a regular basis, if they are in part-time work.

In contrast there could be less transport demand from older workers in urban areas. This is owing to cities and towns predicted to experience a rising number of part-time roles in professional, associate professional and technical occupations, which provide most scope for remote working, thus reducing the number of people using public and private transport every day. Although the evidence indicates that overall the number of people commuting each day may decrease, it does also show that when employees in

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

33

these types of occupations do commute, they do so at peak commuting hours and commute short distances.

Other changes to the forms of employment older people take on, such as the rise in self-employment and the use of digital platforms such as Uber to facilitate this type of work, are likely to have implications on transport demand. These changes are likely to give people more autonomy over when and where they work. Older workers in these forms of work may not be travelling during traditional commuting hours, or may not be travelling at all, as more autonomous work and technological advancements means travel is not required. A further implication of this is that older workers in urban and rural areas may need more flexible transport modes such as cars and demand responsive transport or shared taxi services to facilitate this type of work.

Technological advancements may not always help to extend working lives. Physical challenges that older people are more likely to be affected by such as sight loss and motor changes, may pose a barrier to taking up digitally enabled work and are likely to have implications on transport demand and requirements. For instance, if these groups are excluded from remote working, they may be more likely to travel to work and are likely to have specific travel needs which may need to be met by providing more accessible transport systems.

The literature highlights that organisational investment in digital technology to facilitate remote working can lead to higher rates of productivity among employees. The business case to increase remote working means that there will be less reliance on public transport and car usage to get to work. On the other hand, the evidence also suggests that remote working can increase feelings of loneliness and isolation, especially for those that always work remotely. A consequence of this could be that the decrease in transport demand for work is offset by older people's need to use transport for non-work related activities, for instance to socialise.

When considering the key transport requirements for older people in the future, the literature shows that the current most popular mode of commuting, the car, is declining. Although driving has increased among older people in recent years, it is predicted that car use will become less common as the current millennial generation gets older. Making use of cars to commute to work in both urban and rural contexts may therefore also become less common.

References in introduction chapter

The following is a list of the references cited in the introduction chapter. See Appendices F and H for lists of studies included in the literature review

Daniel, E., Di Domenico, M. and Nunan, D., (2018) 'Virtual Mobility and the Lonely Cloud: Theorizing the Mobility-Isolation Paradox for Self-Employed Knowledge-Workers in the Online Home-Based Business Context'. *Journal of Management Studies*, 55(1): pp.174-203.

Friemel, T.N. (2014) 'The digital divide has grown old: Determinants of a digital divide among seniors'. *New Media & Society*, 18(2): pp.313-331.

Gough D (2007) 'Weight of evidence: a framework for the appraisal of the quality and relevance of evidence'. *Research papers in education*, 22(2): 213-228.

Office for National Statistics (2016) *Five facts about…older people at work*. Office for National Statistics: London.

Office for National Statistics (2017) *Overview of the UK population. July 2017*. Office for National Statistics: London.

Störmer, E., Patscha, C., Prendergast, J., Daheim, C., Rhisiart, M., Glover, P., and Beck, H. (2014) *The Future of Work jobs and skills in 2030, and accompanying reports*. The UK Commission for Employment and Skills: London.

Taylor, M., Marsh, G., Nicol, D., and Broadbent, P. (2018) *Good Work: The Taylor Review of Modern Working Practices*. Department for Business, Energy and Industrial Strategy: London.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

35

Appendix A. Results

The PRISMA flowchart (Figure 1.1) below summarises the screening and inclusion processes of the literature review.

Figure 1.1 PRISMA flow chart: literature review screening and inclusion process

```
                    ┌─────────────────────────┐
                    │ Title and abstract       │
                    │ screening in databases   │
                    └───────────┬─────────────┘
                                │
                                ▼
        ┌─────────────────────────┐         ┌─────────────────────────┐
        │ Records after title and  │────────▶│ Screened out based       │
        │ abstract screening       │         │ on geographic scope      │
        │ (n=104)                  │         │ and time (n=22)          │
        └───────────┬─────────────┘         └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐         ┌─────────────────────────┐
        │ Records screened at      │────────▶│ Excluded based on        │
        │ full text (n=82)         │         │ relevance and            │
        │                          │         │ duplicates (n=31)        │
        └───────────┬─────────────┘         └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │ Studies suitable for     │
        │ review inclusion (n=51)  │
        └───┬─────────────────┬───┘
            │                 │
            ▼                 ▼
   ┌────────────────┐   ┌────────────────┐
   │ Studies        │   │ Studies carried│
   │ included in    │   │ forward for    │
   │ bibliography   │   │ data           │
   │ for longlist   │   │ extraction     │
   │ (n=20)         │   │ (n=31)         │
   └────────────────┘   └────────────────┘
```
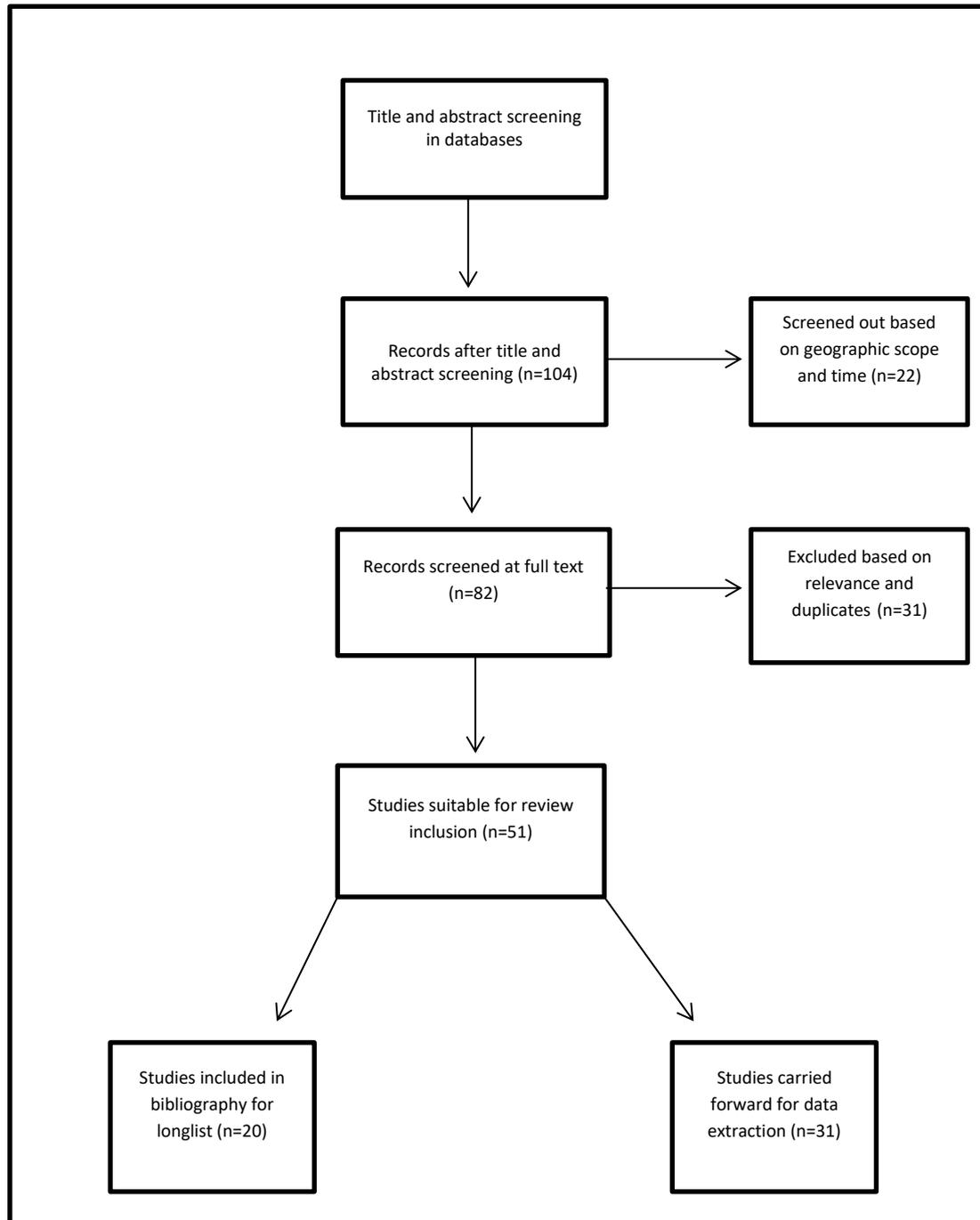
Our search strategy returned several hundred 'hits' for us to screen at title and abstract. Following screening at title and abstract 104 articles were retained for screening at full-text.

22 of which were then screened out as they were either out of geographic scope or did not meet the changed inclusion criteria, i.e. were published prior to 2013. A total of 82

studies were then retained and screened at full text; 31 of these were removed due to being duplicates or lacking relevance to the research question. After this stage, 51 studies were left that met the inclusion criteria.

31 studies were then prioritised for inclusion in the shortlist (see Appendix F). The remaining 20 studies were included in the long list bibliography, but were not taken forward for data extraction or analysis (see Appendix H).

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

37

Appendix B. Methodology

Screening and prioritisation

Studies were screened at title and abstract, and at full-text. The criteria set out in order of most importance below were used to prioritise the 31 papers for inclusion:

- Publication date. Only studies published after 2013 were included due to the high volume of studies.

- Trends and projections for ageing, working, digitally enabled work, or work travel patterns;

- An explanation as to what is driving these trends and projections; and

- A breakdown of trends and projections by generational groups of interest i.e. Baby Boomers, Generation X and Millennials.

Weighting

We used a Weight of Evidence (WoE) criteria (Gough, 2007) to rate their quality and relevance with respect to the reviews' questions (for a study-by-study assessment see Appendix G).

The WoE analysis used the approach first developed by the Evidence for Policy and Practice Information and Coordinating Centre (EPPI-Centre), which has been applied when analysing both quantitative- and qualitative-based research (Gough 2007). Each study was assessed by three broad criteria:

- quality assessment

- appropriateness of design and analysis

- relevance of particular focus of study for current research

Using these criteria each piece of literature was scored as having low, medium or high relevance. The *quality assessment* score for each source was based on the clarity of its research questions, and the findings and coherence of the results in responding to its stated aims. The *appropriateness of design and analysis* score dealt with an assessment of the rigour of the methodology and whether the research methods used mapped onto the stated aims and objectives of the respective study. The relevance of particular focus of study for current research assessment was based on the researcher's interpretation of the extent to which the question addressed the research questions set out in the review.

Each question was given a rating – low, medium or high. The overall score was arrived at by combining the rating for each question, making sure each one had an equal weighting.

Appendix C. Online repositories searched

Name	Link
Age UK	https://www.ageuk.org.uk/
Centre for Ageing Better	https://www.ageing-better.org.uk/
Centre for Cities	http://www.centreforcities.org/reader/cities-outlook-2018/future-work-cities/
Centre for Population Change	http://www.cpc.ac.uk/
MRC unit of Lifelong Health and Well-being at UCL	http://www.nshd.mrc.ac.uk/
Department for Transport	https://www.gov.uk/government/organisations/department-for-transport
Department for Work and Pensions	https://www.gov.uk/government/organisations/department-for-work-pensions
Eurofound	https://www.eurofound.europa.eu/about-eurofound
International Labour Organisation	https://www.ilo.org/global/publications/world-of-work-magazine/articles/WCMS_170533/lang--en/index.htm
Institute for Employment Studies	https://www.ifs.org.uk/
Institute for Fiscal Studies	https://www.ifs.org.uk/
Institute for Public Policy Research	https://www.ippr.org/
International Longevity Centre	http://www.ilcuk.org.uk/
National Institute for Economic and Social Research	https://www.niesr.ac.uk/
Nesta	https://www.nesta.org.uk/
Office for National Statistics	https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/ukperspectives2016thechangingukpopulation/2016-05-26
Oxford Institute for Population Ageing	https://www.ageing.ox.ac.uk/
Resolution Foundation	https://www.resolutionfoundation.org/
Warwick Institute of Employment Research	https://warwick.ac.uk/fac/soc/ier/
The Work Foundation	http://www.theworkfoundation.com/
The World Bank	https://www.worldbank.org/en/research
UK Commission for Employment and Skills (publication page)	https://www.gov.uk/government/publications?departments%5B%5D=uk-commission-for-employment-and-skill
UK Government	https://www.gov.uk/government/collections/future-of-ageing
Rand Europe Transport Research website	https://www.rand.org/randeurope/research/transport.html

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

39

Appendix D. Search terms

We used combinations of the following search terms when conducting a search of online websites and repositories.

Population	Employment	Types of work	Transport
Age	Work / working	Digital*	Travel pattern*
Ageing	Employment	Remote working	Transport*
Aging	Job*	Smart working	Walking
Older	Roles	Teleworking	Cycling
Elderly	Sector*	Flexible work	Public transport
Seniors	Labour market	Part-time or part time	Transit
Population projection*	Workforce	Full-time or full time	
Ageing projection*	Employment status	Home working	Commut*
Baby boomer*	Longer working life	Self-employment	
Generation X		Work from Home	
Millennial*		Free lancing	
Population distribution			
Internal migration			

Appendix E. Data extraction template

Broad category	Category	Further guidance
Descriptive information	*ID*	Paste record ID from full text screening record
	Coder	Initials of person completing data extraction
	Title	Publication title as it appears in document. Take from screening record.
	Full citation	Full citation in Harvard reference format.
Question 1 - Labour market projections and distribution	*Types of jobs are currently undertaken by age, region and sector*	Briefly summarise the types of jobs by different variables. Please do not paste text from publication. Cite page number(s) in bold. If no data provided for one or more of the variables, write 'not available'
	Projections for full-time, part-time, and flexible working	Briefly summarise projections for different types of work. Please do not paste text from publication. Cite page number(s) in bold. If no projections are provided, write 'not available'
	Projection of geographic distribution of number of jobs and sectors	Briefly summarise projections of number of jobs by area (i.e. region) and by sector. Please do not paste text from publication. Cite page number(s) in bold. If no projections are provided, write 'not available'
	Projection of jobs in urban and rural areas	Briefly summarise projections of number of jobs in rural and urban areas. Please do not paste text from publication. Cite page number(s) in bold. If no projections are provided, write 'not available'
Question 2 – ageing settlements and patterns	*Projection number of people aged 50+ and over next 5, 10, 15, 20 and 30 years*	Briefly summarise trend in ageing. Please do not paste text from publication. Cite page number(s) in bold. If no projections provided discussed, write 'not available'

	Geographic distribution of older peoples' settlement patterns over the next 5, 10, 15, 20 and 30 years	Briefly summarise the geographic distribution Please do not paste text from publication. Cite page number(s) in bold. If no methods of data collection provided, write 'not available'
Questions 3 – Scope for digitally enabled work for extending working lives	Evidence of scope for digitally enabled remote working	Briefly summarise whether there is scope for remote working, what the enablers are and what this might look like If no evidence, write 'not available'.
	Evidence of projected uptake of digitally enabled work in the population	Briefly summarise reasons for measuring crowding and capacity. Include any generational differences in uptake by baby boomers, generation x and millennials. Please do not paste text from publication. Cite page number(s) in bold.
	Barriers to uptake of digitally enabled work	Briefly summarise barriers to uptake of digitally enabled work. Include any generational differences in uptake by baby boomers, generation x and millennials. Please do not paste text from publication. Cite page number(s) in bold. If no specific users discussed, write 'not applicable.
	Evidence of positive implications of projected uptake of digitally enabled work	Briefly summarise positive or negative implications of uptake of digitally enabled work. Include any generational differences in uptake by baby boomers, generation x and millennials. Specifically include implications for transport, loneliness and finances. Please do not paste text from publication. Cite page number(s) in bold. If no specific users discussed, write 'not applicable.
	Evidence of negative implications of projected uptake of digitally enabled work	Briefly summarise positive or negative implications of uptake of digitally enabled work.

		Include any generational differences in uptake by baby boomers, generation x and millennials.
		Specifically include implications for transport, loneliness and finances.
		Please do not paste text from publication.
		Cite page number(s) in bold.
		If no specific users discussed, write 'not applicable.
Question 4 – Travel patterns	*Variations in travel patterns*	Briefly summarise evidence of patterns of travel for work by trends related to age, occupation and location (i.e. region)
		Cite page number(s) in bold.
		If no specific mention of work travel patterns, write 'not applicable.
	Work travel pattern projections	Briefly summarise any projections of travel patterns over next 5, 10, 15, 20 and 30 years.
		Cite page number(s) in bold.
		If no specific work travel pattern projections, write 'not applicable.
Reviewer comments	*Reviewer comments*	Other notes by reviewer.

Appendix F. Studies included in the review and prioritised for synthesis

Buckle, P. (2015) 'Workplace Infrastructure' in *Future of ageing: evidence review*. Foresight report. Government Office for Science: London.

Business in the Community (2015) *An ageing workforce in the digital era: older workers, technology and skills*. Tata Consultancy Services: London.

Centre for Cities (2018) *Cities Outlook 2018*. Centre for Cities: London.

Chatterjee, K., Goodwin, P., Schwaren, T., Clarke, B., Jain, J., Melia, S., Middleton, J., Plyvshteva, A., and Ricci, M (2018) *Young people's travel – what's changed and why?* The Centre for Transport & Society at the University of the West of England: Bristol.

Cox, E., Henderson, G. and Baker, R. (2014) *Silver cities: Realising the potential of our growing older population*. Institute for Public Policy Research North: Newcastle and Manchester.

Cridland, J. (2017) *Independent Review of the State Pension Age: Smoothing the Transition* (Presented to Parliament pursuant to Section 27 of the Pensions Act 2014). Department for Work and Pensions: London.

Damodaran, L. and Burrows, H. (2017) 'Digital skills across the lifetime: existing provisions and future challenges' in *Future of Skills & Lifelong Learning*. Foresight report. Government Office for Science: London.

Department for Transport (2018) *Analyses from the National Travel Survey*. Department for Transport: London.

Department for Transport (2017) *Commuting trends in England 1988 - 2015*. Department for Transport: London.

Department for Work and Pensions (2017) *Fuller Working Lives Evidence Base – 2017*. DWP ad hoc research report no 46. Department for Work and Pensions: London.

Dudley, C., Giles, L., Sheldon, H. and Shoesmith, D. (2018) *Productivity, Technology & Working Anywhere*. The Work Foundation: London.

Garner, C., Forves, P., Sheldon, H., Shoesmith, D. and Ternouth, P. (2016) *Working Anywhere - A Winning Formula for Good Work?* The Work Foundation: London.

Government Office for Science (2016) *Future of an Ageing Population*. Foresight report. Government Office for Science: London.

Johnson, S. (2015) 'How are work requirements and environments evolving and what will be the impact of this on individuals who will reach 65 in 2025 and 2040?' in Future of an ageing population: evidence review. Foresight report. Government Office for Science: London

Mandl, I. and Biletta, I. (2018) *Overview of new forms of employment – 2018 update*. Publications Office of the European Union: Luxembourg.

Martin, J P. (2018) *Live Longer, Work Longer. The Changing Nature of the Labour Market for Older Workers in OECD Countries*. Institute of Labor Economics: Bonn.

Massey, F. (2015) *Participation rates in the UK labour market - 2014*. Office for National Statistics: London.

Messenger, J., Vargas Llave, O., Gschwind, L., Boehmer, S., Vermeylen, G. and Wilkens, M. (2017) *Working anytime, anywhere - The effects on the world of work*. Eurofound and the International Labour Office. Publications Office of the European Union and Geneva, the International Labour Office: Geneva.

Office for National Statistics (2016) *Five facts about…older people at work*. Office for National Statistics: London.

Office for National Statistics (2018) *Subnational population projections for England - 2016-based.* Office for National Statistics: London.

Owen, D., Li, Y., Green, A. and Manson, K (2013) *Secondary analysis of employer surveys: urban and rural differences in jobs, training and skills*. Evidence Report 75. The UK Commission for Employment and Skills: London.

Pennington, J (2013) *Moving on: Migration trends in later life*. Institute for Public Policy Research: London.

Peruffo, E., Rodriguez Contreras, R., Molinuevo, D. and Schmidlechner, L. (2017) *Digitisation of processes - Literature review*. European Foundation for the Improvement of Living and Working Conditions. Loughlinstown.

Rand Europe, ITS, Leigh Fisher and Systra (2016) *Rail Demand Forecasting Estimation - Prepared for Department for Transport*. Rand Europe: Cambridge.

Randall, M. (2017) *Overview of the UK population July 2017.* Office for National Statistics: London.

Redden, S. (2013) *Extending Working Life, Sector Initiative Analysis*. Department for Work and Pensions: London.

Resolution Foundation (2018) *A New Generational Contract - The final report of the Intergenerational Commission*. Resolution Foundation: London.

Round, A. (2017) *Extending working lives: A devolved, life course approach to enabling work beyond state pension age*. Institute for Public Policy Research North: Newcastle and Manchester.

Schmidlechner, L., Peruffo, E., Rodriguez Contreras, R. & Molinuevo, D. (2017) *Coordination by platforms - Literature review*. European Foundation for the Improvement of Living and Working Conditions: Loughlinstown.

Storey, A. (2018) *Living longer - how our population is changing and why it matters*. Office for National Statistics: London.

Wilson, R., Beaven, R., May-Gillings, M., Hay, G. and Stevens, J. (2014) *Working Futures 2012-2022*. The UK Commission for Employment and Skills: London.

Appendix G. Descriptive tables for included articles

Author and Year	Q1				Q2		Q3					Q4		WoE	Quality Assessment	Methodology	Relevance	Total
	a	b	c	d	a	b	a	b	c	d	e	a	b					
Buckle 2015	✓		✓				✓								Low	Medium	Low	Low
Business in the Community 2015	✓		✓		✓		✓		✓						Medium	Medium	High	Medium
Centre for Cities 2018			✓	✓											High	Medium	Medium	Medium
Chatterjee et al. 2018												✓	✓		High	High	Medium	High
Cox et al. 2014	✓				✓	✓									High	High	High	High
Cridland 2017	✓														High	Low	Medium	Medium
Damodaran and Burrows 2017									✓						Low	Low	Medium	Low
Department for Transport 2018												✓			High	High	High	High
Department for Transport 2017												✓			High	High	High	High
Department for Work and Pensions 2017	✓				✓										High	High	High	High
Dudley et al. 2018							✓		✓	✓	✓				High	Medium	High	High
Garner et al. 2016							✓	✓	✓	✓	✓				Medium	Low	High	Medium
Government Office for Science 2016	✓		✓		✓	✓			✓						High	Medium	High	High

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

47

Study	1	2	3	4	5	6	7	8	9	10	11	12				
Johnson 2015	✓	✓	✓	✓	✓								Low	Medium	Low	Low
Mandl and Biletta 2018							✓		✓	✓	✓		Medium	Low	High	Medium
Martin 2018	✓						✓		✓				Medium	Low	Low	Low
Massey 2015	✓												High	High	High	High
Messenger et al. 2017							✓	✓	✓	✓	✓		High	High	High	High
ONS 2016	✓				✓								Medium	High	Medium	Medium
ONS 2018					✓	✓							High	High	High	High
Owen et al. 2013	✓						✓		✓				High	High	Medium	High
Pennington 2013						✓							Medium	High	Low	Medium
Peruffo 2017			✓				✓		✓	✓	✓		Medium	Medium	High	Medium
Rand Europe et al. 2016												✓	High	High	Low	Medium
Randall 2017					✓	✓							High	High	High	High
Redden 2013	✓												High	High	Medium	High
Resolution Foundation 2018	✓					✓						✓	Medium	Low	Medium	Medium
Round 2017	✓				✓	✓			✓				Medium	Low	High	Medium
Schmidlechner et al. 2017			✓				✓		✓	✓	✓		Medium	Medium	High	Medium
Storey 2018	✓				✓	✓		✓	✓				High	High	High	High
Wilson et al. 2014	✓	✓	✓										High	High	Medium	High

Note: This information is based on the results of the full-text screening and does not necessarily reflect the papers referenced in the findings sections of the report.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

Appendix H. Studies meeting the inclusion but not prioritised for synthesis

Age UK (2018) *Later Life in the United Kingdom*. Age UK: London.

Banks, J., Batty, D., Nazroo, J. and Steptoe, A. (2016) *Evidence from Longitudinal Study of Ageing.* Wave 7 report. Institute for Fiscal Studies: London.

Bakhshi, H., Downing, J., Osborne, M. and Schneider, P. (2017) *The Future of Skills Employment in 2030.* Pearson and Nesta: London.

Clegg, R. (2018) *UK Labour Market - August 2018.* Office for National Statistics: London.

Connors, C., Kenrick, M. and Bloch, A. (2013) *2013 Rural Ageing Research Summary Report of Findings.* International Longevity Centre (ILC): London.

Department for Transport (2016) *Local area walking and cycling in England 2014-15.* Sport England.

Department for Transport (2018) *Future of mobility - call for evidence.* Department for Transport: London.

Department for Work and Pensions (2013) *Employing older workers - An employer's guide to today's multi-generational workforce.* Department for Work and Pensions: London.

Department for Work and Pensions (2017) *Fuller Working Lives - a Partnership Approach.* Department for Work and Pensions: London.

Emerson, C., Heald, K., and Hood, A. (2014) *The Changing Face of Retirement.* Report R95. Institute for Fiscal Studies: London.

Eurofound (2018) *Game changing technologies - Exploring the impact on production processes and work.* Publications Office of the European Union: Luxembourg.

Ipsos Mori (2016) *Findings from Ipsos MORI and Centre for Ageing Better deliberative workshop.* Ipsos Mori: London.

Marvell, R. and Cox, A. (2017) *Fulfilling work: What do older workers value about work and why?* Centre for Ageing: London.

Office for National Statistics (2013) *What does the 2011 Census tell us about older people?* Office for National Statistics: London.

Park, N. (2018) *Population estimates for the UK, England and Wales, Scotland and Northern Ireland mid-2017.* Office for National Statistics: London.

Peruffo, E., Schmidlechner, L., Rodriguez, R. and Molinuevo, D. (2017) *Automation of Work - Literature Review* (concept paper). Eurofound: Loughlinstown.

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

49

Prothero, R. (2016) *Travel to work area analysis in Great Britain 2016*. Office for National Statistics: London.

Rohr, C., Ecola, L., Zmud, J., Dunkerley, F., Black, J., and Baker, E. (2010) *Travel in Britain in 2035 - Future scenarios and their implications for technology innovation*. Rand Europe. Cambridge.

Sinclair, D. and Berry, C. (2016) *The Economic Value of Healthy Ageing and Working Longer*. International Longevity Centre (ILC): London.

Störmer, E., Patscha, C., Prendergast, J., Daheim, C., Rhisiart, M., Glover, P., and Beck, H. (2014) *The Future of Work jobs and skills in 2030, and accompanying reports*. The UK Commission for Employment and Skills: London.

Thompson, P. (2018) *A silver lining for the UK economy. The intergenerational case for supporting longer working lives*. Centre for Ageing Better: London.

White, N. J. (2016) *Internal migration, England and Wales: Year ending June 2015*. Office for National Statistics: London.

Appendix I. Glossary

To ensure a consistent understanding of the topics in focus, we use the following definitions:

Digitally enabled work – by this we mean digital technologies at work, such as the introduction of machines and ICT system. Digitally enabled work also extends to remote working, as working away from the physical workplace is usually facilitated by digital technology.

Flexible work – we restrict our discussion of flexible work to working from home and phased retirement, as literature on other forms of flexible work (such as compressed hours, job sharing or flexitime) was not available. Part-time work is discussed in its own right.

Older people – by this we mean people aged 50+. We distinguish where appropriate between people aged 50 and 64 and those 65+.

Older workers – by this we mean people above the age of 50, who are in paid employment or who are self-employed.

Work travel patterns – this is defined as travel for the purposes of work.
To ensure a consistent understanding of the topics in focus, we use the following definitions:

The National Centre for Social Research | Review of working patterns amongst older people and implications for transport

51

Appendix J. Standard Occupational Classification 2010

SOC Major Group*	SOC Minor Group Examples	Example Professions
Managers, Directors and Senior Officials	• Chief Executives and Senior Officials • Functional Managers and Directors • Managers and Proprietors in Hospitality and Leisure Services	• Chief Executives and Senior Officials • Human Resource Managers and Directors • Restaurant and Catering Establishment Managers and Directors
Professional Occupations	• Health Professionals • Teaching and Education Professionals • Legal Professionals	• Medical Practitioners • Primary and Nursery Education Teaching Professionals • Solicitors
Associate Professional and Technical Occupations	• Science, Engineering and Production Technicians • Health Associate Professionals • Design Occupations	• Engineering Technicians • Paramedics • Graphic Designers
Administrative and Secretarial Occupations	• Administrative Occupations: Finance • Secretarial and Related Occupations	• Book-keepers, Payroll Managers and Wage Clerks • School Secretaries • Receptionists
Skilled Trade Occupations	• Agricultural and Related Trades • Construction and Building Trades • Food Preparation and Hospitality Trades	• Farmers • Bricklayers and Masons • Butchers
Caring, Leisure and Service Occupations	• Childcare and Related Personal Services • Leisure and Travel Services • Hairdressers and Related Services	• Nursery Nurses and Assistants • Travel Agents • Hairdressers and Barbers
Sales and Customer Service Occupations	• Sales Assistants and Retail Cashiers • Sales Related Occupations	• Retail Cashiers and Check-out Operators • Debt, Rent and Other Cash Collectors

	• Customer Service Occupations	• Call and Contact Centre Occupations
Process, Plant and Machine Operatives	• Plant and Machine Operatives • Construction Operatives • Road Transport Drivers	• Coal Mine Operatives • Scaffolders, Stagers and Riggers • Taxi and Cab Drivers and Chauffeurs
Elementary Occupations	• Elementary Agricultural Occupations • Elementary Security Occupations • Elementary Cleaning Occupations	• Forestry Workers • Security Guards and Related Occupations • Window Cleaners

*Source: Office for National Statistics (2010) *ONS Standard Industrial Classifications Hierarchy*. Available at: https://onsdigital.github.io/dp-classification-tools/standard-occupational-classification/ONS_SOC_hierarchy_view.html

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53