



National Research and Development Centre
for adult literacy and numeracy

Literacy, Numeracy and Disadvantage Among Older Adults in England

**Final report
for Nuffield Foundation**

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Executive Summary

This report sets findings from new research on the relationships between the literacy and numeracy levels of older adults and the extent of disadvantage in later life. The research consisted of a review of the literature and secondary analysis of a quantitative data source on older adults.

Literature Review

The review of the literature revealed the thinness of the evidence base on the literacy and numeracy of older adults. Among the major gaps were:

- A lack of survey evidence on the literacy and numeracy proficiencies of adults aged over 65.
- Very little information on how basic skills proficiencies change as people grow older.
- No research on the associations between the levels of literacy and numeracy skills and labour market outcomes in later life.
- Although some evidence on effective practice in teaching literacy and numeracy was found, it was unclear whether the most effective approaches applied readily across all age groups or whether they need to be adjusted or altered when teaching older adults.

Quantitative Evidence

Quantitative analysis was carried out using the English Longitudinal Study of Ageing (ELSA). This is a large-scale survey of adults aged 50 and above. It began in 2002, and the dataset includes the results of short literacy and

numeracy tests which were conducted with each respondent. The ELSA data also contain data on many aspects of the lives of older adults, principally work and retirement, health, wealth and well-being. Respondents have been followed up on several occasions since the initial survey. ELSA data can therefore be used as both a cross-sectional and a longitudinal data source. In a recent wave of the survey, respondents also completed a retrospective life history questionnaire covering many aspects of their lives from childhood. All of these sources of information were used in the analyses in this report.

Each respondent was allocated to one of three broad literacy levels (low, medium, high) and to one of four numeracy groups, according to the questions answered correctly on the tests. Differences in literacy level by age were noticeable. Nearly three-quarters of people in their fifties were in the high literacy group but this fell steadily with age to less than half among people aged 80 and above. Conversely, only 8 per cent of those in their fifties were in the low literacy group, rising to 12 per cent among people in their 60s, 17 per cent for people in their seventies and nearly 27 per cent for those aged 80 plus. Proficiency in numeracy varied by gender, with some 18 per cent of women in the lowest numeracy group compared to only 9 per cent of men, and over 18 per cent of men were in the highest numeracy group while only 6 per cent of women were in this group. Numeracy also varied by age, with older adults tending to do less well on the numeracy test.

Work in later life was one of the major topics in this research project. In analyses conducted on cross-sectional data (that is data at a single point in time) there was no evidence that either literacy or numeracy were related to the likelihood that an older adult was in work, once allowance had been made for other factors, such as health, gender and education level. Longitudinal analyses, following respondents over time, including movement between being in work and being out of work, or post-work, were also conducted. A key finding here was that there was little evidence that moving out of work and into retirement was associated

with literacy or numeracy levels as such, once controls for other factors were included in statistical models. After controlling for other factors, those with low levels of literacy or numeracy were *not* less likely to be in work at later waves of the survey. Nor, based on an analysis of the work histories, and again after allowance was made for other factors, did it appear that either literacy or numeracy were related to the age at which people completed their last job and moved into retirement.

Among older adults with jobs, pay was less for those with low numeracy (although not significantly so for those with low literacy). Neither literacy or numeracy were found to be significant determinants of whether someone was working full- or part-time, again after controlling for other factors which might influence the number of hours in employment. Analysis of work histories as a whole revealed that low numeracy, for both males and females, was related to the proportion of time spent out of work. In other words, people with low numeracy were more prone to spells not in work.

The report also considered aspects of disadvantage beyond the world of work and explored their relationships with low literacy and/or low numeracy. The topics covered here included a range of measures of physical and mental health and the overall well-being of respondents. Those in the lower literacy and numeracy groups tended to give lower evaluations of their own health, that is they were more likely to state that their own health was poor, and less likely to regard it as good or very good. They tended to score relatively highly on a measure of the presence of depressive symptoms, and this persisted even after allowing for many other factors which might play a role here. They were more likely to be current smokers, too. In fact, across a broad set of health indicators low literacy and low numeracy were associated with poorer health outcomes. Those with lower literacy also tended to have lower levels of subjective wellbeing even after allowing for other factors.

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1. Introduction

This research is concerned with relationships between the literacy and numeracy levels of adults and the extent of disadvantage in later life. After the Moser Report (1999), literacy and numeracy assumed a high priority in educational policy making and the evidence base on the topic has been greatly strengthened over the past decade. Policy has focused on improving the skills of adults as the key to employability, with much emphasis on tackling the low levels of adult literacy and numeracy which have been identified as a significant problem in Britain. While research on older adults supports the view that those in their 50s and 60s are generally both able and eager to work (Meadows, 2004; McNair, 2006), the role of low skills in reducing employability among older adults, and, specifically, whether those with relatively poor levels of literacy and numeracy are disadvantaged, remains unclear. Most analysis of these questions has actually focused on much younger adults. A number of major research studies have looked at adults in their 20s and 30s from the 1970 British Cohort Study (BCS70) for instance (de Coulon et al, 2007; Parsons and Bynner, 2005). Moreover, existing studies of employment tend to be cross-sectional, considering the factors associated with the likelihood of being in employment at a single point in time (Grinyer, 2006; de Coulon et al, 2007). It is widely accepted that low literacy and numeracy skills play a role in reducing the probability of being in employment at certain points in time, but evidence from small-scale and qualitative studies has shown that those with poor basic skills can have quite successful records of employment, particularly in the many less skilled jobs which remain prevalent in the British economy (Barton et al, 2008). So, while some authors have maintained that literacy and numeracy difficulties play 'a distinctive role in restricting opportunities throughout the lifecourse' (Gross, 2009) there is a lack of the longitudinal evidence following individual employment paths over the lifecourse which might confirm this.

In addition, there is evidence that poor literacy and numeracy skills are associated with other aspects of economic and social disadvantage. This includes poor health, possible increased risk of involvement in criminal activities, living in deprived neighbourhoods and disadvantaged housing conditions (Grinyer, 2006; Gross, 2009). Again, however, there is a lack of evidence on whether these wider aspects of disadvantage, going beyond financial circumstances and employment outcomes, also apply specifically to older adults.

Policies such as the Skills for Life strategy - aimed at improving levels of adult literacy, language and numeracy – have been geared very much towards younger adults, whilst older people have seen subsidised education provision cut in favour of younger learners. This in spite of evidence such as the Skills for Life survey (DfES, 2003), which surveyed those aged between 16 and 65 and found that those in the 55-65 age range were most likely to have low levels of literacy and numeracy.

In general, the evidence base on the effects of basic skills deficiencies is much stronger than it was a decade ago, but very significant gaps remain with regard to the experiences of older adults. It is this fact which provides the rationale for the research presented here. The new findings in this report are based on quantitative analysis of a large-scale data source, the English Longitudinal Study of Ageing (ELSA). This survey, which began in 2002, contains information on many aspects of older adults' lives including work and retirement, health, wealth and well-being. ELSA contains tests of literacy and numeracy which can be related to a set of outcomes. Respondents have been followed up on several occasions since the initial survey. ELSA data can therefore be used as both a cross-sectional and a longitudinal data source.

Chapter 2 is a review of literature on older adults' basic skills and how differences in these proficiencies may impact on the lives of older adults. It assesses the adequacy of evidence in this field and highlights key gaps in our knowledge. The

measures of literacy and numeracy available in ELSA are described in Chapter 3 which provides details on how they have been used to create different groups of literacy and numeracy attainment levels among the sample. The chapter outlines the proportions with low and high levels of literacy and numeracy. Literacy and numeracy skill levels among the older adults are also broken down and analysed by gender, age band and education attainment. Whether those with low literacy and numeracy were less likely to be in work and the amount of pay received by those who do work are among the topics addressed in Chapter 4. The chapter also considers full-time and part-time working and the types of work done by those with different levels of literacy and numeracy. While Chapter 4 is concerned with a detailed snapshot of working at a single point in time, in Chapter 5 patterns of change in work over time are analysed. The chapter contains the findings on whether those with poor basic skills are more likely to leave the labour force at an early stage, and also whether they have fragmented or interrupted career paths. The remaining chapters move from the world of work to look at other forms of disadvantage and to explore their relationships with low literacy and/or low numeracy. Chapter 6 focuses on a range of measures of physical and mental health and their prevalence among different groups in the ELSA sample. The overall well-being of respondents in ELSA forms the subject matter of Chapter 7. Do those with low literacy or numeracy have lower well-being and quality of life than people with better basic skills proficiency? Finally Chapter 8 draws together the main findings and concludes the analysis.

2. Literature Review

2.1 Overview

The first stage of the research project was a review of the existing evidence on the literacy and numeracy of older adults. The core questions which this literature review aimed to address were:-

- What do we know about the literacy and numeracy proficiency of older adults?
- How do literacy and numeracy proficiency change over the lifecourse?
- How do literacy and numeracy levels affect the likelihood of older adults remaining in the labour force?
- What are the best ways to encourage participation of older adults in basic skills provision?
- What types of provision and teaching methods work best with older adults?

Below we briefly set out some definitional matters and a note on how the review was conducted before addressing each of these questions in turn. The chapter concludes by highlighting the areas where there are serious and substantial evidence gaps.

Defining Terms

At what age does a person become an older adult? There is scope for debate on that, but the age of 50 is a widely-used and convenient dividing line. We have tended to think of the process of becoming an older adult as starting about there but have not enforced this too rigorously. Sometimes it is useful to think of a Third Age from around age 50 at which people begin to re-assess their commitment to paid work and to consider seriously planning for future retirement. This will eventually be followed by a Fourth Age, perhaps on average from around age 75. While in practice many people remain active in this stage,

participation in the labour force will usually have been completed and the stage is also defined by rising risk of poor health and possible dependency. Learning and skills are relevant in both these stages, although in different ways.

Note on Method for the Literature Review

The aim was to locate and summarize relevant research on older adults and basic skills. The main focus was on England, but we also looked at literature on other European countries and the United States. Literature was located using databases such as SSCI, British Education Index, ERIC, Psycinfo and IBSS. Various search terms were used such as ‘older adults’, ‘literacy’, ‘numeracy’, ‘adult literacy’, ‘adult education’ and so on. We also searched potentially relevant websites including NIACE, Help the Aged, IZA, Netspar amongst others and academic journals in the field of adult education, literacy and numeracy. When relevant journal articles were located we looked at their reference lists to identify further relevant sources in an iterative process. For the most part we considered research published in the last 10 years, but also cite some influential research from further back. Especially for topics where there was a paucity of material specifically on older adults, consideration was given to information on adults more generally. In this way we build up a picture of the field, both strong areas of research and places where there are evidence gaps needing to be filled.

2.2 Data on Proficiency

A first step towards establishing a robust evidence base on the basic skills of older adults would be to have good data on their proficiency and how that compared to younger adults. Unfortunately, there is only limited information on the literacy and numeracy proficiency of older adults in England, especially those aged over 65. The main source in this field, the Skills for Life Survey commissioned by DfES has a survey population consisting of adults aged

between 16 and 65. This was the case both for the first survey which took place in 2002/03, and was repeated for the 2010 SfL survey (the results of which have not yet been released).

The 2002/03 SfL data show that, for literacy, the proportions achieving Level 2 or above varied between 43 and 47 per cent except among the 55 to 65 years age group where it was only 38 per cent. It was also the case that respondents in the oldest age group were more likely to be classified at Entry Level 3 or below. The oldest age group also tended to score among the lowest on numeracy, although 16-24 year olds also did relatively poorly. In short, the oldest age group in the survey tended to have among the lowest scores on both literacy and numeracy, on average. The breakdown by sex showed no significant difference between men and women on the literacy test overall – 45 per cent of men and 44 per cent of women achieved Level 2 or above and 16 per cent were at Entry Level 3 or below. But there were large differences between the genders on numeracy. Some 53 per cent of women, but only 40 per cent of men, were at Entry Level 3 or below. Men were also much more likely to be at Level 2 and above.

Given the restricted age range of the Skills for Life Survey, we must turn elsewhere to find out about the literacy/numeracy proficiency of those beyond their mid-60s. The English Longitudinal Study of Ageing (ELSA) goes some way to filling the gap as it has contained short tests of literacy and numeracy. The ELSA data will form the basis of the analysis in later chapters and will be extensively discussed there. But it is worth providing here an outline of previous work which has used ELSA to profile the basic skills proficiency of the older population in England. ELSA is a large-scale dataset and provides a representative sample of the English population aged 50 and over (apart from those living in institutional settings). In the first, 2002, wave of the ELSA survey there was a numeracy test while in the second wave, conducted in 2004, there was a literacy test. These data were analysed by Huppert *et al* (2006). Defining very poor performance on these tests as 'impairment', they found just over 12 per

cent to be impaired on numeracy, just below 12 per cent on literacy and 4 per cent were impaired on both. The percentage impaired on both literacy and numeracy increased five-fold with age, from 1.8 per cent of those in their fifties to 8.9 per cent of those aged 80 and over. Men were more likely to be impaired on literacy than numeracy (12 per cent and 7 per cent respectively), but the reverse was true for women, with 17 per cent of women impaired on numeracy and 12 per cent on literacy.

2.3 Changes over the lifecourse

Is there variation in an individual's literacy and numeracy proficiency during their adult lifecourse? To what extent are people able to retain these vital skills as they age? The differences in proficiency by age group described in the previous section raise the issue of whether they arise because of differences between cohorts - for example that more recent cohorts have received more years in initial education than earlier cohorts which has raised their skills - or whether there are actually changes in proficiency over the lifecourse. Answering this question would require data on individuals and their proficiency over long periods of time, a very demanding requirement. In Britain two established cohort studies, the National Child Development Study (NCDS) and the British Cohort Study (BCS70) which each follow a large sample of all those born in certain year - 1958 and 1970 respectively - have the potential to provide this lifecourse perspective, tracking individuals over time. The most recent data collection on literacy and numeracy for the cohort studies occurred for the BCS70 cohort in 2004, when cohort members had reached the age of 34. This was an ambitious undertaking which involved the use of new instruments and applied to the whole of the cohort. As a sub-sample of ten per cent of the BCS had been assessed for literacy and numeracy at age 21, it was possible to look at change in proficiency over time for this group of about 1,100 adults (Bynner and Parsons, 2006).

A striking feature of their analysis was that there was substantial change in proficiency. Even on a very simple, dichotomous (i.e. high vs low) summary of

proficiency, one in five of the sample had changed their literacy skills and more than one in three had done so for numeracy. Further research would be required to establish why these changes had occurred; engagement in study and the development of proficiency through tasks at work would be among the hypotheses to pursue. Bynner and Parsons (2006) also showed that these shifts in skill levels were associated with socio-economic change. For example, improving literacy and numeracy was associated with being less likely to be on state benefits and more likely to be in full-time work. Those who saw skills deteriorate were more likely to have no qualifications, more likely to be in rented accommodation and less likely to be working full-time. These are interesting and important correlations, although establishing the direction and nature of causal chains is a major challenge for further research. The importance of this preliminary work by Bynner and Parsons was in showing the extent of the apparent fluidity of literacy and numeracy skills, at least among young adults.

Probably the major longitudinal study of literacy and numeracy is that led by Reder in the United States. Reder argues that many existing studies are too short-term to track meaningful change and/or follow only program participants without a control group. The Longitudinal Study of Adult Learning (LSAL) was designed to overcome these problems. It studies both proficiency and practice of literacy and numeracy. The population from which a sample was drawn encompassed residents of Portland, Oregon metropolitan area, aged 18 to 44, proficient but not necessarily native English speakers, high school drop-outs so did not receive a high school diploma nor had taken high school equivalency certificates such as the GED (General Educational Development). Two samples were drawn: a random sample of this population and those enrolled on adult education programs. The total sample was 940 individuals. They have been followed for five waves. By wave 5 90 per cent of the original sample were still in the study. Average age was 28 and roughly evenly divided by gender. There was a good deal of variation in the levels of literacy proficiency among the respondents.

The main findings from analysis of this survey are summarised in Reder (2008). Among background characteristics only two – starting age and whether US-born – predicted change in literacy proficiency. The models predict small increases in proficiency over time for young adults and very small year by year declines in literacy proficiency for those aged 35 years and above (the oldest participants were in their forties in this study). Reder also reports a set of results for literacy and numeracy practices. Here the effect of age was much less pronounced than for literacy proficiency. Both program participation and self-study had significant positive effects on the growth of literacy practices but not on proficiency. They also influenced numeracy practices. The decline in proficiency for among the older adults in the survey emphasises the importance of adult educators developing programs that ensure skill retention among older adults. This also suggests that practice may be a better measure of program impact than proficiency gains. ‘It may well be that further research will demonstrate that proficiency gains are a long term outcome of participation in programs’. The short term gains in practice eventually mediate long term effects on proficiency. The results from the British cohort studies and from the Longitudinal Study of Adult Learning are clearly important findings but do not provide information about how proficiency varies over the lifecourse as a whole, and especially in older age ranges.

2.4. Work

In ageing societies ensuring that older adults remain in work has become a priority for policy-makers. What does research tell us about the linkages between basic skills and labour market outcomes, such as earnings and employability? For adults in their 20s and 30s there is actually quite a good base of evidence, much of it drawing once again on analyses of the two major cohort studies, the NCDS and the BCS70. Important analyses of the associations between basic skills and labour market outcomes include Parsons and Bynner (1998), McIntosh

and Vignoles (2001), Bynner (2004), Grinyer (2006), Bynner and Parsons (2006), Parsons and Bynner (2007), and De Coulon et al (2007). Broadly, these studies tend to show that people in these age groups with poor literacy and/or numeracy skills tend to earn less and to be at greater risk of unemployment than their counterparts with better basic skills. There is, then, a reasonable amount of evidence on the relationships between literacy and numeracy and disadvantage in the labour market. This evidence has drawn extensively on some of the best datasets available to researchers in Britain, the 1958 and 1970 cohort studies. It is possible that the forms of disadvantage experienced by people in these age groups – lower wages, greater risk of spells out of work, fewer opportunities for training - might well continue to apply to older workers too. However, in the absence of evidence there can be no robust grounds for such an assertion. People who are currently in their thirties will have first entered the labour market in the very difficult economic conditions of the 1980s and early 1990s. Older adults, on the other hand, will have entered the labour market in more prosperous conditions. They would have had much less difficulty finding a job, which in turn would have given them opportunities to develop skills and job-specific expertise. Speculating and drawing inferences about the situation of older adults in the labour market on the basis of disadvantage among some cohorts of younger adults does not, then, seem at all sensible.

2.5. Encouraging Participation

The review of literature also considered the available evidence on what motivates older adults in particular to attend basic skills courses. The low levels of participation by older adults in some publicly-funded basic skills provision make this very relevant. The main finding here is that, although there is much research on participation in adult learning, research specifically on participation in literacy and numeracy courses is less common.

Taking the literature on participation in adult learning more generally, NIACE survey data (Aldridge and Tuckett, 2007) show that, in terms of barriers to learn, among adults over 55 and who had done no recent study, more than one in three gave lack of interest in studying as a reason, while a quarter reported that they felt too old to learn. Access can sometimes be a factor. Among all adults in the NIACE survey less than five per cent stated that access was very difficult, but this rose to nearly 15 per cent among those aged 75 plus. Research by NIACE (Aldridge and Tuckett, 2007) gives some indications of the reasons that people engage in learning and it is clear that intrinsic interest in learning and/or in a specific subject, and meeting people become more important reasons for learning at older ages. Vocational learning and obtaining qualifications decline in importance with age. Qualitative research, such as Withnall (2008) shows also that older adults are often engaged in a diverse range of informal learning activities, not all of which would necessarily be recorded in quantitative surveys.

Some NIACE research on engaging and supporting older adults to develop their numeracy and ICT skills involved focus groups with older learners and an evaluation of some development projects which addressed these issues is Derrick et al, (2008). On engagement this work found that obtaining qualifications from numeracy courses was a low priority for older learners. The terms 'maths' and 'mathematics' were also unattractive ones for older adults but the bundling of numeracy and ICT could encourage participation as many older learners were keen to improve their ICT skills. Some older adults were also conscious of the importance of improving their financial management and financial planning skills. Major lifecourse transitions, such as retirement, often heightened perceptions among older adults of the need to strengthen numerical skills. Not surprisingly, this research also stressed that venues for courses should be accessible in all senses of the word; courses which ran during the daytime were attractive to those older adults who were post-work. Older adults were cost-conscious and preferred courses which were free or where fees were low. Taster workshops followed by short courses were seen as an effective way

to engage in new numeracy/ICT learning. Older adults were more likely to engage if the courses were provided by or through voluntary and community groups and agencies which they were already aware of and were therefore trusted by them (Derrick et al, 2008).

2.6. Effective Practice

What works best in teaching basic skills? Do the same practices apply equally well across all age groups? Starting with the first question, much of the literature here is from the US, including papers by Quigley (1997), Beder and Medina (2001), Beder et al (2007) and Alampresi (2008). As for the UK, until quite recently the evidence base was thin on the factors contributing to successful learning of literacy and numeracy, and on how the teaching and learning of these subjects might be improved (Brooks et al, 2001). Here the work of NRDC has made an important contribution to a stronger foundation of evidence on which to build practice. Of particular significance have been the Effective Practice Studies which included research projects on reading and writing (an outline of these studies was given in the progress section earlier).

The reading study (Brooks et al, 2007) gathered data on 454 learners in 59 classes. It investigated teaching and learning, effective and promising practices and the training and development of teachers. Observations of classroom teaching and learning were an important part of the study, in combination of assessments of the progress made by learners. Among the key findings was that much of the observed teaching was seen as good or fairly good quality. Some teaching strategies which the literature has suggested were effective were little used in the observed classes, such as encouragement of fluent oral reading, and reciprocal teaching (where pairs of learners take turns role-playing as teacher and student). In fact, learners who worked in pairs were found to have better progress but most classroom activity was based on individual work.

In the NRDC Effective Practice Study on writing (Grief et al, 2007), most effective were classes in which learners spent time composing texts of different kinds, allowing time for discussion about writing, and where individual feedback and support was provided to learners as they were working on composition. Also important was a flexible approach, responding to learners' concerns as they arise. An interesting finding was that classes where the emphasis was on use of authentic materials (such as newspapers, brochures etc) rather than textbooks and exercises was associated with learners making less progress. This contradicts some other evidence, notably from the US, suggesting that authentic materials work best. A possible explanation would be that the authentic material was too challenging and so off-putting. However, it should be noted that only a small number of classes in this study made extensive use of authentic materials. Classes in which learners tended to work often in collaborative groups made less progress than learners in other types of classes.

As for the second question there are no convincing answers at present. It is encouraging that evidence is now beginning to accumulate on effective practice in the teaching of literacy and numeracy. This research has provided new and important information about the effective teaching and learning of reading in a UK context. However, a focus on older learners was not an aim of the studies and so it can tell us little about what works for older adults specifically, or indeed whether or not there is any need to make a distinction between older and younger adults. In other words, we do not yet know whether it is safe to assume that the same approaches work effectively for both younger and older adult learners.

2.7 Key Evidence Gaps

While there has been considerable new research on literacy and numeracy in the last decade, very little of this work has focused on older adults and much of it has

not included them at all. This review of the literature has highlighted a number of topics on which evidence for older adults is in very short supply:-

- There is a lack of survey evidence on the literacy and numeracy proficiencies of adults aged over 65. There is some data in the English Longitudinal Study of Ageing (which will be exploited for quantitative analysis later in this report) but ELSA is a general-purpose survey rather than one solely, or mainly, concerned with adult basic skills. The main reason for this data deficiency is that adults aged 65-plus have not been included in the *Skills for Life* surveys. Without such survey data it is not possible to get a fully adequate picture of the extent of basic skills and how they correlate with advantage and disadvantage in the lives of older adults.
- Very little is known about how basic skills proficiencies change as people grow older. It would be valuable to have information on whether literacy and numeracy skills continue to develop over the lifecourse and when, if at all, they go into decline. A further question is how the change in basic skills is related to spells in or out of the labour force. Is there a deterioration of literacy and numeracy levels for those in unemployment? Answering these questions would require longitudinal data in which people had been tested on multiple occasions over the course of their lives.
- There is no research on the associations between the levels of literacy and numeracy skills and labour market outcomes in later life. This is all the more pressing given the current emphasis on the importance of keeping adults in employment beyond conventional retirement ages. At present we essentially have no idea as to what extent a lack of basic skills play a part in adults in their fifties and beyond moving out of the labour force.

- There is some interesting, recent evidence on effective practice in teaching literacy and numeracy. But it remains unclear whether the most effective approaches apply readily across all age groups or whether they need to be adjusted or altered when teaching older adults.

3. Data and Method

3.1 The English Longitudinal Study of Ageing (ELSA)

This study uses data from the English Longitudinal Study of Ageing (ELSA). This is a continuing, longitudinal survey of adults who were aged 50 and above in 2002 and includes a broad range of information about their mental and physical health, well-being, quality of life and economic and social circumstances. The original sample for ELSA was drawn from three waves – 1998, 1999 and 2001 – of the Health Survey of England (HSE) and included 12,100 participants (a response rate of 64.3 per cent). The fieldwork for this first wave of ELSA took place in 2002 to 2003. Full details of the sample design and response rates are reported in Scholes et al (2008) and the survey aimed to be representative of people aged 50 years and above living in private households in England. Respondents were followed up in 2004/05 (Wave 2) and 2007 (Wave 3).

Because literacy was measured at Wave 2, and numeracy at Wave 1, in conducting cross-sectional analyses the dataset was confined to people present at both of these waves. Data from the later waves were also used to analyse change in outcomes over a time period of five years or so between waves 1 and 3. The three waves of ELSA provide information about the lives of respondents at the time they were interviewed, when they were aged from their fifties upwards. In 2007 (Wave 3) this was supplemented by a life history interview which aimed to collect retrospective information about the whole course of their lives. This data is particularly important for understanding how events early in life continue to have effects later on. The life history ranged over many topics including, for instance, marriage and co-habiting, children and housing and geographical mobility. Here the focus will mainly be on the module in the life history on working lives although information from the health module will also be utilised in some parts of the research.

Throughout the research cases which were not part of the core sample (such as partners of ELSA core sample members) and cases where the recorded age was less than 50 were dropped from the dataset prior to analysis. A common problem with longitudinal surveys such as ELSA is that people tend to drop out over time (non-response), so that the survey may become unrepresentative. The ELSA surveys are supplied with weights ensure representativeness by adjusting for patterns of non-response. These weights were used throughout the analyses which follow, both in this chapter and other chapters.

3.2 Measuring Literacy and Numeracy in ELSA

Among the ELSA modules there is one on cognitive function which has included some questions to identify literacy and numeracy ability. To assess literacy, ELSA participants were shown a medicine label for a realistic, but actually fictitious, product called Medco Aspirin and asked a set of questions to establish how well they had understood the instructions on the label. The first question concerned the maximum number of days for which the medication should be taken, while the second question invites respondents to list three situations in which a doctor should be consulted (out of six situations mentioned on the label); the remaining two questions asked respondents to name conditions for which the tablets can be taken and conditions for which they should not be taken. This test has been widely used. It formed part of the International Adult Literacy Survey (IALS) and also the Adult Literacy and Life Skills Survey. The answers on the literacy test were simply summed to give a maximum score of four and respondents were allocated to one of three levels of literacy proficiency on the basis of how many questions they answered correctly.

The assessment of numeracy in ELSA asked five questions which required successively more complex numerical calculations. The six possible questions are listed below. Respondents had to answer the questions entirely without

prompting i.e. the questions were not multiple choice. Each respondent was asked to attempt questions b, c and d.

Numeracy questions in ELSA wave 1:

- a) If you buy a drink for 85 pence and pay with a one pound coin, how much change should you get?

- b) In a sale, a shop is selling all items at half price. Before the sale, a sofa costs £300. How much will it cost in the sale?

- c) If the chance of getting a disease is 10 per cent, how many people out of 1,000 would be expected to get the disease?

- d) A second hand car dealer is selling a car for £6,000. This is two-thirds of what it cost new. How much did the car cost new?

- e) If 5 people all have the winning numbers in the lottery and the prize is £2 million, how much will each of them get?

- f) Let's say you have £200 in a savings account. The account earns ten per cent interest per year. How much will you have in the account at the end of two years?

If all of these three were answered wrongly, the respondent was given question (a) and that was then the end of their numeracy module; otherwise they proceeded to questions (d) and (e). If the respondent gave a correct answer to at least one of questions (c) to (e) then they also received question (f). A correct answer here required the ability to calculate compound interest – it was the last and most difficult question. There are various ways of dividing the respondents

into groups on the basis of their answers to the numeracy questions. We follow Banks and Oldfield (2007) in deriving four broad groups, as shown in Table 3.1.

Table 3.1: the four broad numeracy groups

<i>The Groups</i>	<i>Correct and incorrect responses</i>
Group I	Either Qus b, c, d all incorrect; or Qu b correct but Qus c, d, e all incorrect
Group II	At least one of Qus b, c, d, e incorrect
Group III	Qus b, c, d, e all correct but f not correct
Group IV	Qus b, c, d, e, f all correct

Group IV, those with the highest numeracy, got all of the questions attempted, including qu (f) correct. Group III only got the tricky qu (f) wrong but other questions were answered correctly; Group II got one of qus (b) to (e) wrong, while Group I got all or most of the first three questions wrong. It would be possible to divide up into groups in other ways for numeracy. However, some analyses were tried with five groups and delivered very similar results, suggesting that results were not particularly sensitive to the way in which the groups were set up.

3.3 Descriptive Statistics: Literacy

As shown in Table 3.2, almost two-thirds of respondents answered all the literacy questions correctly, just over a fifth answered one question incorrectly and about one in seven respondents answered two or more questions incorrectly. These three groups of respondents will be referred to as the high, medium and low literacy groups in the following discussion of the literacy test results.

Table 3.2: Literacy Levels

<i>Level</i>	<i>Score on literacy test</i>	<i>Number</i>	<i>Per Cent</i>
Low	Score of 0 to 2	1,117	13.5
Medium	Score of 3	1,690	20.5
High	Score of 4 (maximum)	5,439	66.0
ALL		8,246	100.0
Weighted counts. N weighted: 8,246; unweighted: 8,316			

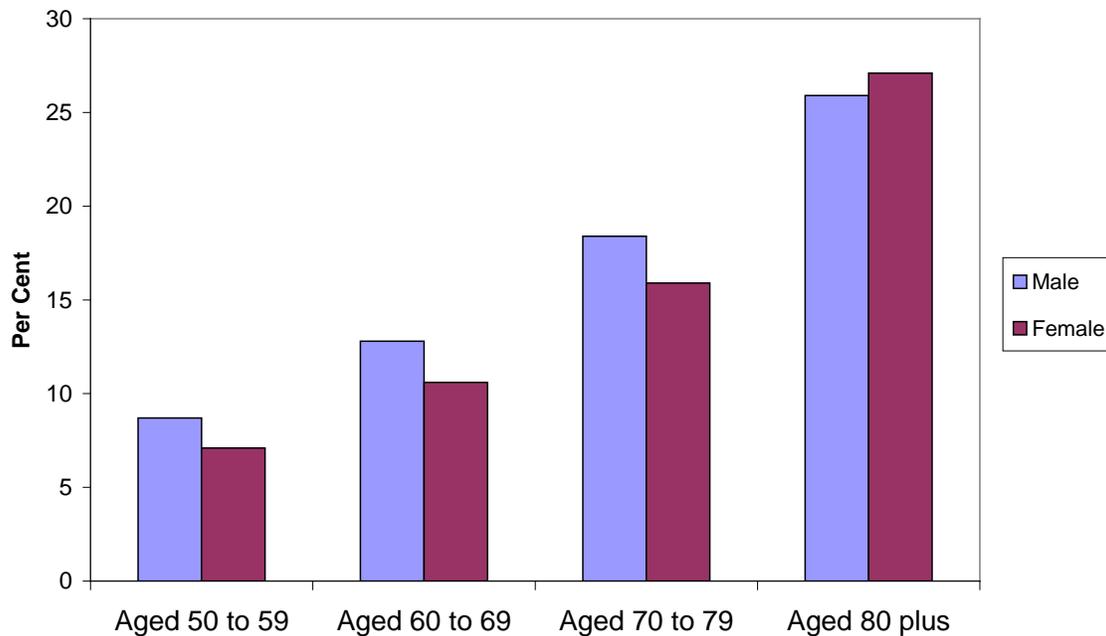
There was very little apparent difference between the sexes on this measure of literacy. Amongst the sample as a whole men were slightly more likely than women to be in the high literacy group (67 per cent compared to 65 per cent). It is worth noting here that this doesn't take account of differences in average age by sex, and we will return to this point a little later.

Differences in literacy level by age were much more marked. Nearly three-quarters of people in their fifties were in the high literacy group but this fell steadily with age to less than half among people aged 80 and above. Conversely, only 8 per cent of those in their fifties were in the low literacy group, rising to 12 per cent among people in their 60s, 17 per cent for people in their seventies and nearly 27 per cent for those aged 80 plus.

Figure 3.1 records the percentages in the low literacy group by age and gender. Further investigation of this is important as there are more older women than men in the sample. Among people in their fifties some 7.1 per cent of women and 8.9 per cent of men were in the low literacy group; the percentages of men in this group were also higher among those in their sixties and seventies. For the

80-plus group the proportion of women with low literacy was slightly greater than the percentage of men. For the most part, then, at a given age women were somewhat less likely than men to be in the low literacy group.

Figure 3.1: Proportions with Low Literacy, by Sex and Age Band



As might be expected, there was also a relationship between literacy level and highest qualification. The education levels of ELSA respondents were coded into four broad groups, based on highest qualification. The groups are: those with some higher education – this includes people with degrees but also sub-degree qualifications such as H.E diplomas; qualifications below higher education, such as NVQ3/ A levels, NVQ2/O levels and some with NVQ1 qualifications; those with other/foreign qualifications, and finally those with no qualifications. As for the relationships between education and literacy, about four-fifths of those with some higher education achieved the maximum score on the literacy test and so were in the highest literacy group, compared to a little over half of those with no

qualifications. Only five per cent of those with some higher education were in the low literacy group, compared to about ten per cent of those with qualifications below higher education level, while over a fifth of those with no qualifications were in the low literacy group.

3.4 Descriptive Statistics: Numeracy

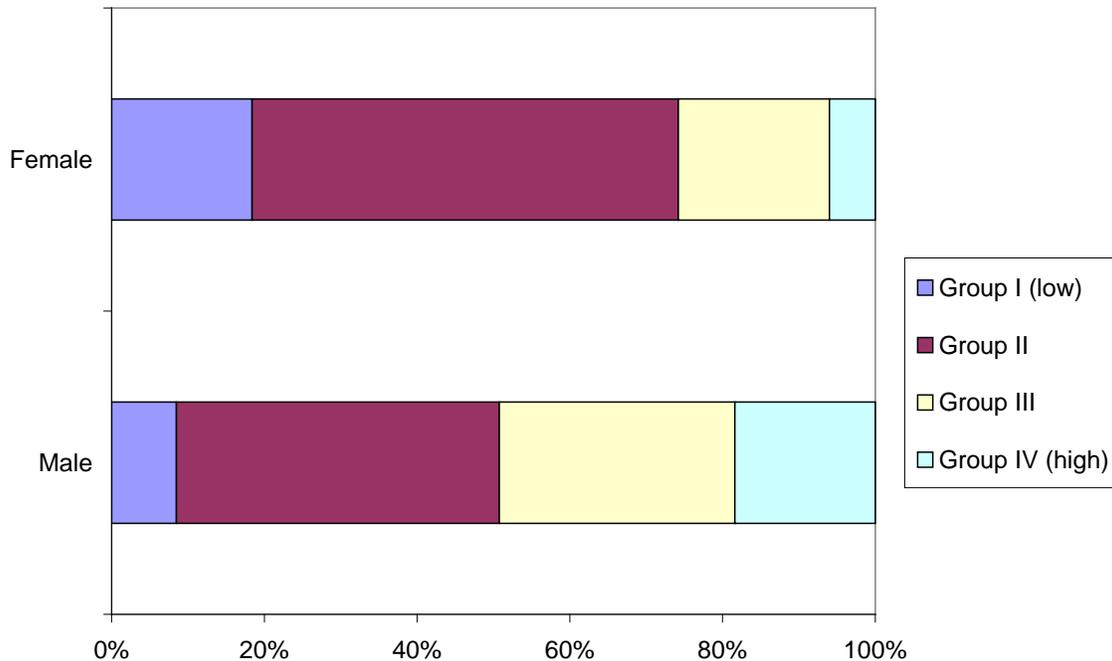
The results of the numeracy tests were used to classify respondents into four broad groups of numerical ability (Table 3.3). About 14 per cent of respondents were in the lowest group, Group I, nearly half of respondents were in Group II, a quarter in Group III, and nearly 12 per cent in Group IV, the highest group who made no errors in answering the numeracy questions.

Table 3.3: Numeracy Groups

<i>Level</i>	<i>Number</i>	<i>Per Cent</i>
Group I (lowest)	1,190	13.8
Group II	4,266	49.6
Group III	2,144	24.9
Group IV (highest)	1,004	11.7
ALL	8,603	100.0
Weighted counts. N weighted: 8,603; N unweighted: 8,625		

There was a very noticeable difference in numerical ability by sex (Figure 3.2). Some 18 per cent of women were in the lowest numeracy group compared to only 9 per cent of men, and over 18 per cent of men were in the highest numeracy group while only 6 per cent of women were in this group.

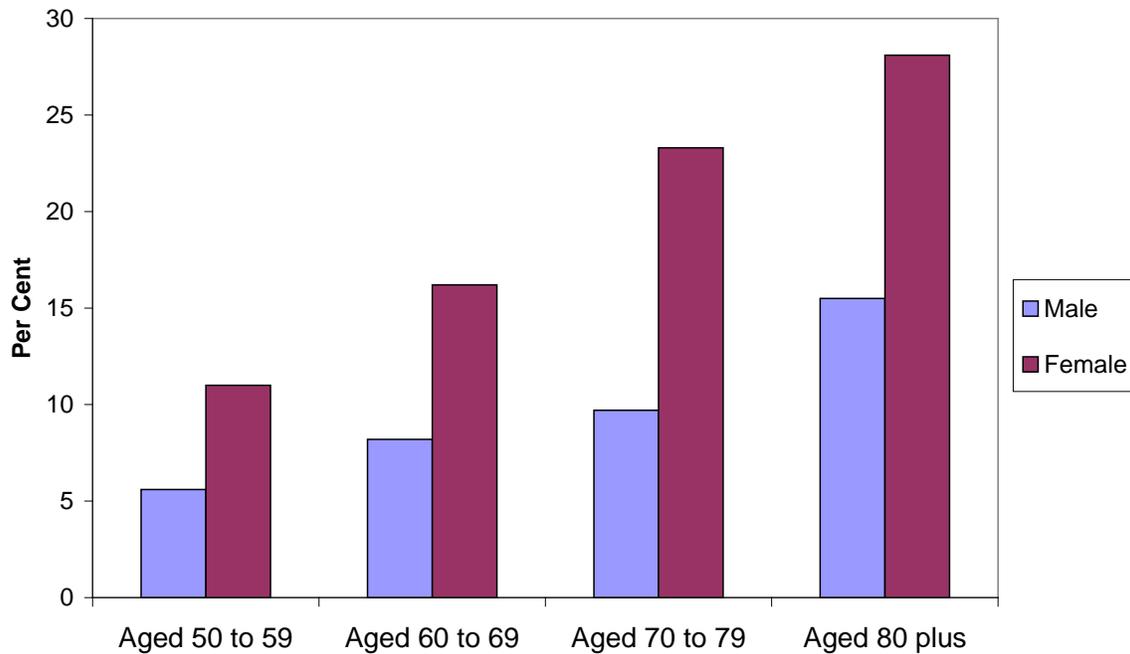
Figure 3.2: Numeracy Levels by Sex



Numerical ability tended to be lower at older ages. A little above half of people in their fifties (51.7 per cent) were in one of the bottom two numeracy groups but this proportion rose to 62 per cent for people in their sixties, 72 per cent among people in their seventies and 78 per cent for those aged 80-plus.

Within each age range men tended to score more highly on the numeracy test than women (see Figure 3.3). Only about 6 per cent of men in their fifties were in the lowest numeracy category, rising to 18 per cent of men aged 80-plus, but 11 per cent of women in their fifties, rising to 28 per cent of women aged 80-plus were in the low numeracy category. These results contrast rather sharply with the findings on literacy, where women were found to be less likely to be in the low literacy category than men in most age groups.

Figure 3.3: Proportions in Lowest Numeracy Group by Sex and Age Band



3.5 Comparing Literacy and Numeracy

Table 3.4 reports the relationship between the literacy and numeracy levels. This shows the numbers in each cell of the cross-tabulation between literacy and numeracy levels, with row percentages underneath. There was clearly a relationship between literacy and numeracy abilities. For example, among those who had low literacy many more also had low numeracy – 32 per cent in the lowest literacy category compared to 12.5 per cent on average. However, the relationship was not so strong. There were many individuals (nearly 3,000 in fact) with the maximum score on literacy but who were nonetheless in one of the two lowest groups for numeracy.

Table 3.4: Cross-tabulating the Literacy and Numeracy Groups

	<i>Numeracy Groups</i>				
<i>Literacy Groups:</i>	Group I (low)	Group II	Group III	Group IV (high)	TOTAL
Low	353	560	150	36	1,099
%	32.1	51.0	13.6	3.3	100.0
Medium	261	946	359	107	1,672
%	15.6	56.5	21.4	6.4	100.0
High	404	2,543	1,598	834	5,379
%	7.5	47.3	29.7	15.5	100.0
ALL	1,018	4,049	2,106	977	8,151
%	12.5	49.7	25.8	12.0	100.0

Key: weighted counts

row percentages

3.6 Overview of Method

Having described the data on literacy and numeracy in ELSA, in this section the methods to be utilised in the quantitative analysis chapters will be outlined. Our interest is in the relationships between literacy and numeracy proficiency on the one hand and various forms of disadvantage on the other. The ELSA dataset, which gathered information on both of these things, forms the basis for all of the analyses. The groups for literacy and numeracy levels, as described earlier in this chapter, will be used and enable a straightforward classification of broad proficiency in literacy and numeracy. Initially, cross-tabulations and graphs will be used to probe and explore the associations between these literacy or numeracy groups and the outcome of interest. Such exploratory analysis can provide useful insights and is an important first step

It might be the case that literacy or numeracy are merely proxying for some other factor which is associated with an outcome of interest - quality of life, say. Perhaps more educated people are more likely to have high quality of life and are also more likely to have good literacy or numeracy. Or adults aged over 80 might tend to have lower quality of life and to have lower levels of these basic skills, on average. It would then be important to allow for education level and age when testing for relationships between literacy or numeracy and the quality of life outcome. To address this issue much of the research in this report uses regression analysis. This is a standard way of examining how a set of explanatory variables are related to a quantitative response variable, such as the measure of quality of life. The main reason for using multiple regression is that it enables the researcher to control for a range of variables when examining the key relationship of interest. After controlling for lots of other factors which might influence quality of life, is there a statistically significant relationship with literacy?

There are various types of regression analysis and their appropriateness depends on the form of the outcome variable. Some outcomes are measured on a continuous scale, such as quality of life. Multiple linear regression is the appropriate regression technique here. But others outcomes are inherently binary – being unemployed versus being employed, for example. In this situation, the probability of being employed can be modelled as a function of a set of explanatory variables using logistic regression. A convenient property of logistic regression is that results can be presented in the form of odds ratios. An odds ratio of one implies that the odds of ‘success’ (here, being employed) are unaffected by the explanatory variable. For example there is no difference in the odds of being employed between those with high literacy and those with low literacy. An odds ratio larger than one might mean that the odds of being employed are greater for those with high literacy than for those with low literacy. In some of the analyses, the outcome is in the form of time to an event, such as exit from the labour force. Some people will still be in work at the time of the survey and so we cannot measure the exact time at which they exit the labour

force and so the outcome variable is said to be censored. Here another form of regression, known as survival analysis, or duration analysis, is used to deal with this censoring issue. The outcome here is referred to as the hazard and is essentially the risk that an event occurs at a specific time given that it has not occurred before then. Does having poor numeracy increase 'hazard' of early exit from the labour force, for instance. So there are various forms of regression model according to the type of outcome. But always the underlying purpose of the analysis is much the same: to test whether statistically significant relationships with literacy and/or numeracy persist after controlling for the other relevant factors.

4. Older Adults and Work: Cross-Sectional Analysis

The relationship between skills and the employment of older workers has been little researched. The review of literature in Chapter 2 on the links between poor basic skills and work found some research findings on younger adults (from late teens to early thirties), but there appears to be no evidence at all on how the literacy and numeracy skills of older adults affect their employment. In this chapter questions about literacy, numeracy and work are explored. All the analyses consider work at the time the ELSA survey was conducted, with work over the lifecourse forming the subject of the next chapter.

4.1. Work Status

As might be expected among this sample of older adults, a high proportion were in retirement (Table 4.1). In fact, 53 per cent were retired. Nearly a third were in the labour force (almost all of them working and just a few unemployed), about ten per cent were looking after home or family and six per cent were classified as permanently sick or disabled.

Table 4.1: Employment Status among the ELSA Sample

	N	Per Cent
Retired	4,612	53.0
In labour force	2,662	30.6
Permanently sick/disabled	535	6.1
Looking after home/family	900	10.3
	8,708	100.0
Weighted counts		

Work status varied by age, as shown in Table 4.2. Some 72 per cent of people in their 50s were in the labour force, this fell to 24 per cent amongst people in their 60s and to very low percentages amongst adults aged 70 and over. Unsurprisingly, the bulk of these were in retirement.

Table 4.2: Age and Employment Status

	Age Band				ALL
	50 to 59	60 to 69	70 to 79	80 plus	
	%	%	%	%	%
Retired	8.3	59.7	83.9	84.0	53.0
In labour force	71.9	24.2	3.0	0.5	30.6
Permanently sick/disabled	10.0	5.8	2.7	4.3	6.1
Looking after home/family	9.8	10.3	10.5	11.3	10.3
ALL	100.0	100.0	100.0	100.0	100.0
N	2,701	2,697	2,089	1,221	8,708
Weighted counts					

The breakdown by sex revealed little difference between the proportions in retirement. Just over half of both men and women were retired. Over a third of men, compared to about a quarter of women, were in the labour force, while women were much more likely than men to report their status as looking after home or family. Nearly 18 per cent of women, but less than two per cent of men stated that their status was looking after home or family.

Because many factors play a part in determining whether an individual is in work it was important to construct models which allow for these factors in assessing the influence of literacy and numeracy levels. So logistic regression models were estimated for the probability of being in work. Apart from literacy or numeracy these models included a range of other factors which might influence the likelihood of being in work. The controls used in the models included basic controls for gender, age, highest qualification, and scores on a cognitive function test. Factors which might affect the incentives to work including presence of a partner, wealth and finance were added to the models, as were a set of variables to measure the health of survey respondents. Separate models were estimated with literacy level and numeracy level respectively among the explanatory variables. The results in detail are reported in the Appendix (See Tables A1 to A6). Here the main findings will be summarised. Controlling for highest qualification and overall cognitive function reduced the link between low literacy and the likelihood of not being in work and it became non-significant once allowance was also made for a range of health variables. As for numeracy, it was no longer a significant predictor of whether a person was in work once controls for highest qualification and cognitive ability were included in the model. In short, after controlling for other factors which influence the likelihood of being in work, there was no evidence that either literacy or numeracy levels were associated with the likelihood that someone was in work amongst this large sample of older adults.

4.2. Hours and Pay

Models of monthly earnings were estimated which controlled for gender, age, highest qualification, and cognitive function. Other potential controls were not statistically significant and were dropped from the model. Literacy did not appear to have any significant effect on earnings once allowance was made for other factors. However, numeracy remained a significant determinant of earnings even in the presence of control variables.

Among the sample in work the number of hours per week (including overtime) was split into four categories. If 30 hours or less is taken as the definition of part-time work then those with low literacy were somewhat more likely to be working part-time but the differences by literacy level were not large, nor were they of statistical significance – some 40 per cent of those in the low literacy group were working 30 hours per week or less, 39 per cent of those in the medium literacy group and 36 per cent of those in the high literacy group were working part-time. The differences between the numeracy groups in terms of hours worked were much more noticeable, and statistically significant. Among the sample in work, only a quarter of those in the highest numeracy group (group IV) were working 30 hours or less; a third of those in group III, 43 per cent of those in group II and almost half of those in group I, the lowest numeracy group, were working 30 hours per week or less. These differences were most apparent for people in their 50s, less so for older adults (Figure 3.5). In short, amongst those in the ELSA sample who were in work, those with high numeracy were more likely to be working full-time hours while those with low numeracy were more likely to be in part-time work. However, in statistical models of part-time versus full-time working there was no evidence at all that either literacy or numeracy affected the likelihood of working part-time (see Appendix Tables A5 and A6). Gender, age and health were the key factors here. Women were far more likely to work part-time than men; older people tended more often to be part-time; if they were in work, people with poorer health were more likely to be employed part-time.

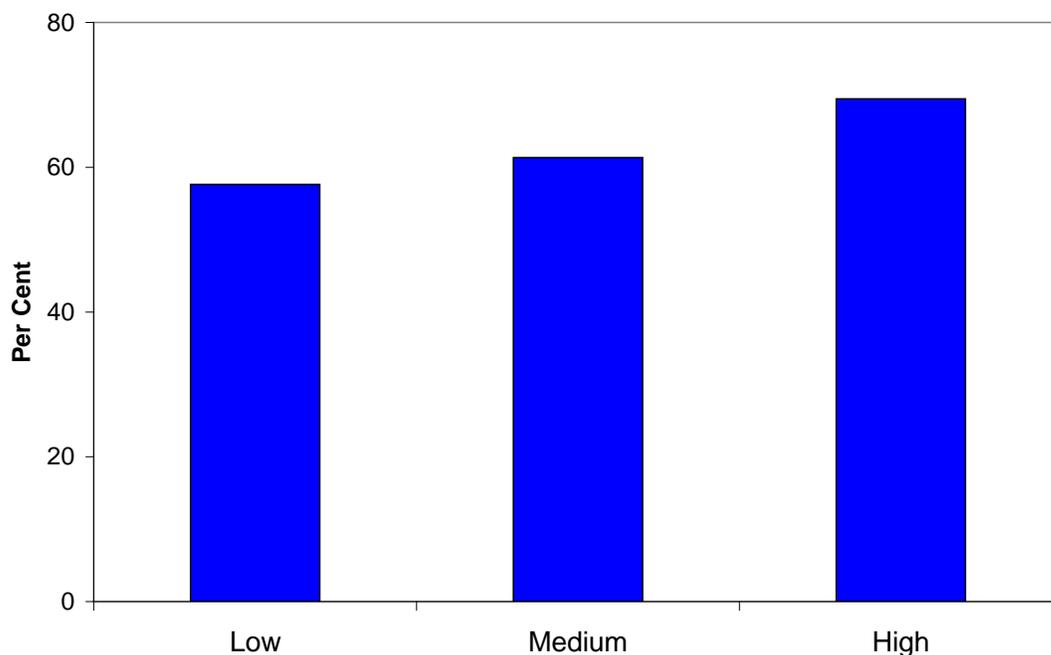
4.3. Job Quality

ELSA respondents who were in work were asked a set of questions with regard to how they felt about their jobs. Nine in ten respondents either agreed or strongly agreed when asked whether they were satisfied with their job. There

were only small differences in satisfaction levels by literacy level or numeracy level and these differences were not statistically significant.

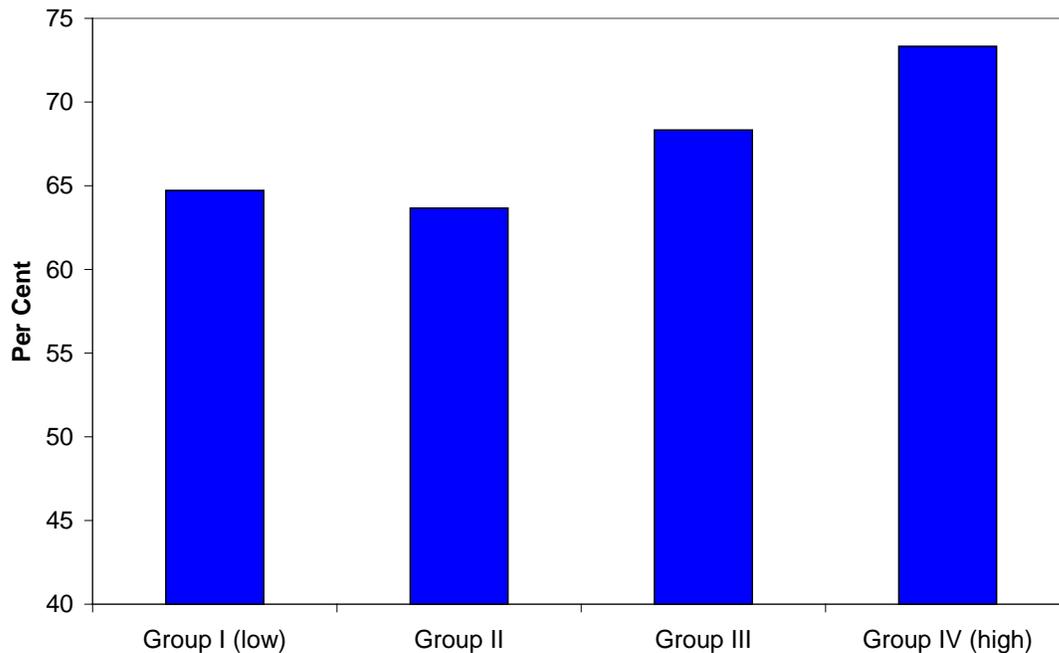
Differences by literacy and numeracy levels were more noticeable, and statistically significant, when respondents were asked whether they considered their salaries to be adequate. Overall, some two-thirds of people in work agreed or strongly agreed that their salary was adequate. For the low literacy group 57.5 per cent agreed/strongly agreed about this, rising to 69 per cent among the high literacy group (Figure 4.1).

Figure 4.1: Percentages agreeing/strongly agreeing that salary adequate, by literacy level



Likewise, for the numeracy groups, shown in Figure 4.2, only 65 per cent among the lowest literacy group agreed/strongly agreed that their salary was adequate but among the highest numeracy group the percentage agreeing or strongly agreeing on the adequacy of their salary was 73 per cent.

Figure 4.2: Percentages agreeing/strongly agreeing that salary adequate, by numeracy level



Differences in the proportions who felt that they had opportunities to develop new skills were quite marked and statistically significant for both literacy levels and numeracy levels. Almost 70 per cent of those in the highest literacy group agreed or strongly agreed that they had opportunities to develop new skills while only about 55 per cent of those in the low literacy group agreed or strongly agreed with the statement. As for numeracy groups, only just over half of those in numeracy group I, the lowest group, agreed or strongly agreed that their jobs provided them with opportunities to develop new skills compared to over three-quarters in group IV, the highest numeracy group. Those in their 50s were more likely to agree or strongly agree that they had opportunities to develop new skills than those in their 60s but, even allowing for this, differences by literacy and numeracy levels were still apparent, as is clear in Figures 4.3, for literacy, and

Figure 4.4 for numeracy groups. To summarise, the perceptions of people in the low literacy and numeracy groups were less likely to be that they had adequate salaries or that their jobs provided them with opportunities to develop new skills.

Figure 4.3: Percentages agreeing or strongly agreeing that they had opportunities to develop new skills at work by age and literacy Level

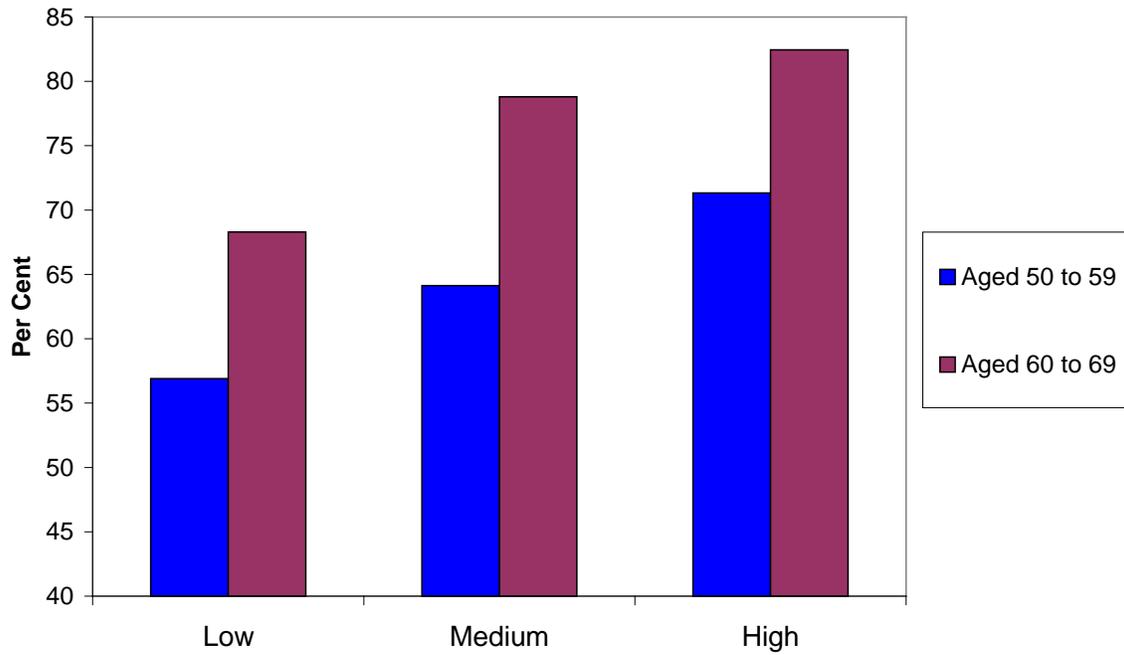
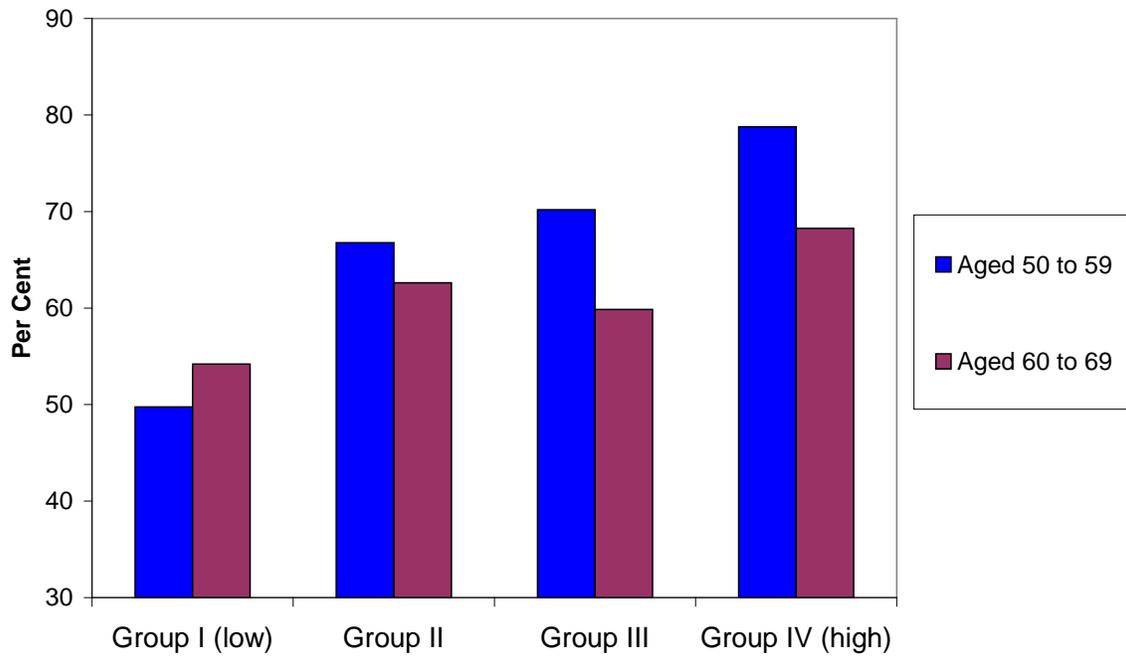


Figure 4.4: Percentages agreeing or strongly agreeing that they had opportunities to develop new skills at work by age and numeracy Level



4.4 Summary

- After controlling for other variables which influence the probability of being in work, there was no evidence that either literacy or numeracy levels were associated with the likelihood that someone was in work.
- In models of earnings literacy did not appear to have any significant effect on pay. Higher numeracy skills were significantly associated with higher pay.
- As for hours worked, there was no evidence that, amongst older adults who were in employment, those with lower literacy or numeracy skills were more likely to be in part-time employment.
- Older adults with low literacy or low numeracy were more likely to report that they did not regard their salary adequate; they were also less likely to have opportunities to develop their skills. These findings suggest that older adults with low literacy or numeracy were more likely to work in jobs of relatively poor quality.

5. Longitudinal Analysis of Work

Encouraging people to work for longer is a key policy objective in Britain, as in many other developed economies. The challenge for policy makers is the healthcare and pensions burden of an ageing population. The extension of working lives would help to address worsening dependency ratios. Remaining in work may also help to improve the wellbeing of individuals across an increased lifespan. The factors underlying the exit of people from the labour force are likely to be both varied and complex. Health, wealth and the attitudes of employers all play a part. Skills, including literacy and numeracy skills, may be one factor in the process. For example, a lack of demand could make older workers with only poor literacy or numeracy, at increased risk of losing their jobs, or make it more difficult to find new work should their current employment cease.

As the labour market for older adults has only become of interest to policy-makers and researchers quite recently so the evidence base on the older workforce in general remains quite thin (McNair, 2010). To make progress in understanding the role of skill in the ending or prolonging of careers longitudinal data tracking older adults through to retirement is needed. This is the rationale for the use of ELSA data. This chapter considers movement into, and out of, work over time. It uses data from the three main waves of ELSA data (referred to here collectively as 'panel data') and also from the retrospective life history information which was a component of a recent ELSA survey.

5.1. Descriptive Analysis of ELSA Panel Data

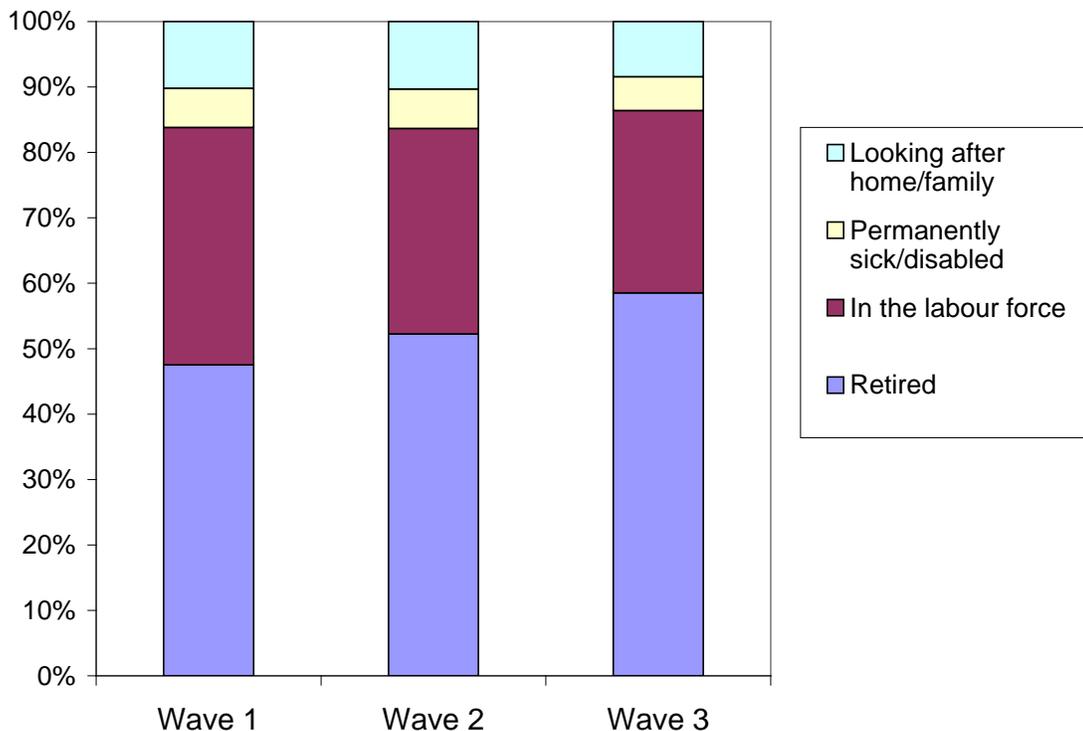
The initial ELSA survey (Wave 1) took place in 2002. There was a follow-up in 2004 (Wave 2) and a further survey in 2007 (Wave 3). Analysis of work status in these three waves can deliver information about transitions in and out of work among older adults, over a period of roughly five years, and whether the likelihood of staying in work over time is related to literacy and numeracy skills. In this part of the analysis, the sample was confined to those with data at all three waves. Longitudinal weights were used to ensure the representativeness

of the findings. This section includes material on the overall proportions in work at each wave of the survey, the probability that someone was in work at Wave 3 depending on whether they were in work at Wave 1, and the likelihood that a respondent was in work at all three waves.

Changes in Work Status Over Time

Among the ELSA respondents with data at all three waves of the survey, some 35 per cent were in work at Wave 1 in 2002. This fell to 31 per cent by 2004 and to 27 per cent by 2007. Over this five year period a substantial proportion of the sample crossed the threshold into retirement. As shown in Figure 5.1, some 47 per cent of this sample reported their status as retired at Wave 1. This rose to 52 per cent at Wave 2 and 58 per cent at Wave 3.

Figure 5.1: Summary of Work Status at each Wave of ELSA



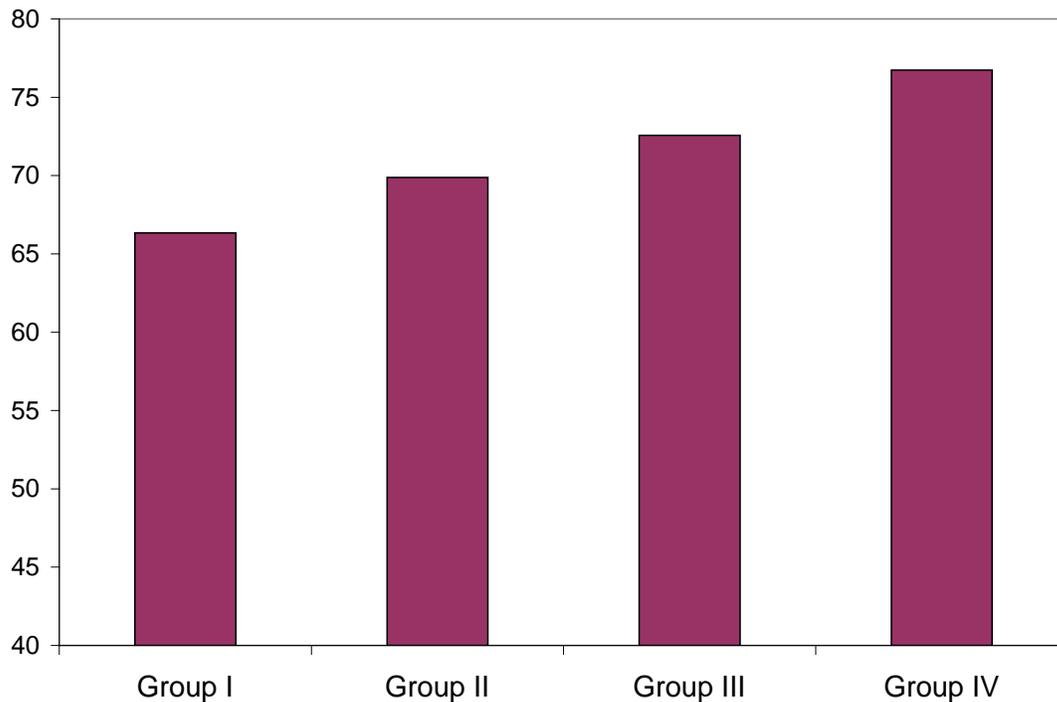
Breaking the figures down by literacy group showed that those with low literacy were always less likely to be in work than those with medium levels of literacy, who in turn were less likely to be working than those with high literacy. A similar pattern was observed for the four numeracy groups. Those with low numeracy were always less likely to be in work at each wave, although the rate of decline in the percentage in work appeared to be somewhat greater for those with higher levels of numeracy.

Likelihood of a person being in work at Wave 3 given that they were in work at Wave 1

The previous section reported the overall proportions in work at each wave. We can also look at how likely people were to make transitions between work and non-work. Overall, amongst those who were in work at Wave 1, almost 72 per cent were still in work by Wave 3 (roughly five years later). Few people made the transition in the other direction: just three per cent of those not working at Wave 1 were found to be working at Wave 3.

Considering the proportions who stayed in work at Wave 3 given that they were in work at Wave 1 by literacy group it was apparent that those in the low literacy group were less likely to remain in work by Wave 3, if they had a job at Wave 1. Only 62 per cent did so. But there was little difference between the medium or high literacy groups, with approximately 72 per cent of each group remaining in work at Wave 3 given they were in work at Wave 1. Differences by numeracy were more clear-cut (Figure 5.2), rising steadily with numeracy level from 66 per cent among those in the lowest group to nearly 77 per cent amongst those with the highest numeracy.

Figure 5.2: Proportion in work at Wave 3 of ELSA, given that they were in work at Wave 1, by numeracy level



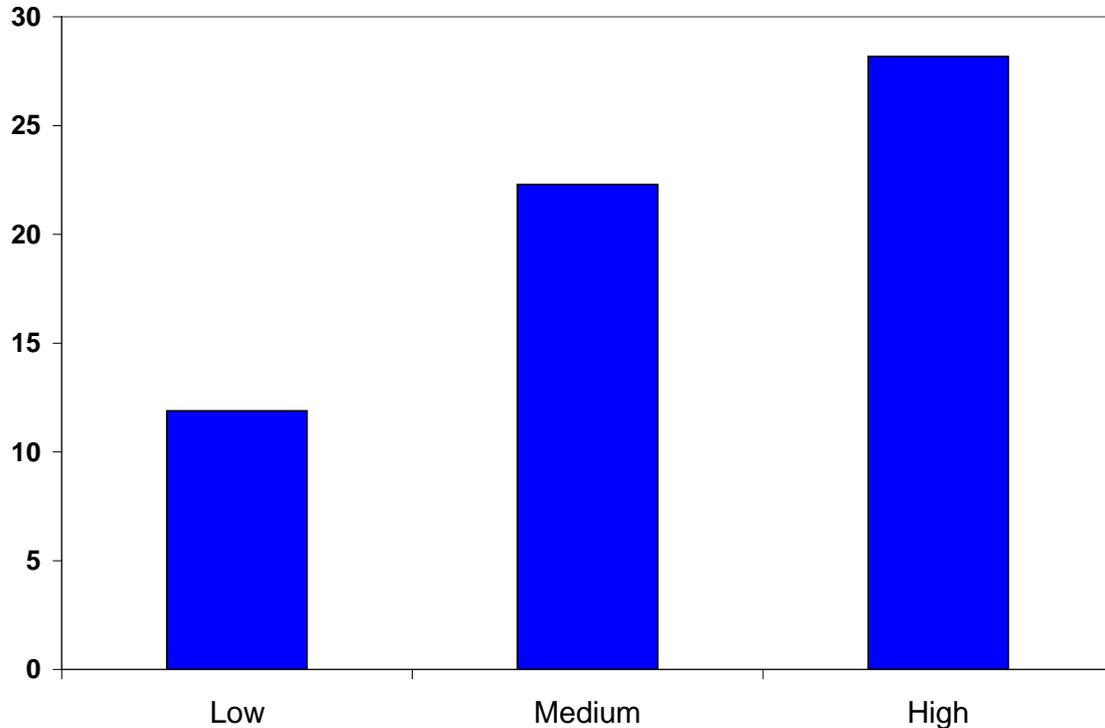
Younger members of the sample were more likely to be observed in work at Wave 3 if they were in work at Wave 1: among those in work at wave 1, 80 per cent of those in their fifties at Wave 1 stayed in work at Wave 3, compare to 40 per cent of those who began the survey in their sixties and about a third of those in their seventies. Highest qualification also appeared to be an important determinant of remaining in work. Other potentially relevant factors, such as gender and marital status showed less variation.

Likelihood of being in work at all three waves

Just under a quarter (24 per cent) of respondents were in work at all three waves of the survey. There was very considerable variation by literacy and numeracy levels. Only 12 per cent of those in the lowest numeracy group were found to be

in work at all three waves but this rose to 40 per cent amongst those in the highest numeracy group. As for literacy, the proportion in work at all three waves was 12 per cent for the low literacy group and 28 per cent for those in the high literacy group.

Figure 5.3: Proportion in work at all three waves of ELSA, by literacy level



Clearly age was also a major factor here. Of those aged in their fifties at the time of the first wave of the survey in 2002, 54 per cent were found to have been in work at all three waves. The figure for those in their sixties when the survey started was roughly eight per cent, while less than one per cent of those in their seventies and eighties in 2002 (Wave 1) were found to have been in work at all three waves.

5.2. Regression Analysis of ELSA Panel Data

The three waves of ELSA data were also used for regression analyses of employment status among older adults. Three research questions were addressed. What were the determinants of staying in employment at Wave 3 for those who were in employment at Wave 1? Which factors explained whether someone who was out of work at Wave 1 had made a successful transition into employment by Wave 3. And what were the characteristics of those who were in employment at all three waves? The main findings are summarised here. See Tables A7 to A12 in the Appendix for the estimates in detail.

On the first question, remaining in work by Wave 3 for those at work in Wave 1, relative to the base of high literacy, people in the low literacy group had odds ratios less than one, implying that they were less likely to remain in work by Wave 3 of ELSA given that they were in work at Wave 1. However, as further controls were added to the model, literacy became statistically insignificant – so there were no significant differences by literacy groups here once other factors which influenced employment were allowed for. Likewise, once age and gender were controlled for, there were no statistically significant differences among the various numeracy groups in the likelihood of being in employment at Wave 3 given that they were in work at Wave 1. The results for the determinants of moving into work by wave 3 for people not in work at wave 1 also showed no robust evidence of a relationship between literacy and employment transitions. There was no evidence that numeracy played any role here once other influences on the transition, such as age, gender and health status had been taken into account.

Literacy and numeracy levels were statistically significant determinants of being in work in all three waves of ELSA in the absence of any control variables but both literacy and numeracy levels quickly became, for the most part, insignificant once other influences were taken into account. For literacy there was some evidence that those with medium levels of literacy were somewhat more likely to

be in employment at all three waves than those with high literacy, although this was only significant at 10 per cent level when all controls were included in the model. Women were less likely than men to be in employment at each of the three waves of ELSA, and older adults were less likely than younger adults. Health was an important determinant of whether or not someone was in employment at all three waves of the survey. Other significant variables included having a degree, being divorced (relative to a married person), having a mortgage and high expectation of financial difficulties in future.

5.3 Working Lives

In the 2007 wave of ELSA (that is Wave 3) there was a life history module which asked respondents to look back over their life from childhood. It covered a range of topics including health, parenting and housing. Here the focus is on what respondents said in the part of the life history questionnaire which dealt with their working lives. The research questions which we attempt to answer are about whether people with low levels of basic skills had fragmented or interrupted careers. Did their poor skills mean that they were often precariously placed in the labour market, easily dislodged into lengthy spells without work? Or perhaps their careers were curtailed at a relatively early stage. Did they exit work prematurely? The work history data contains questions about the start and end dates of each job. It asks whether the respondent had a gap of three months or more before the start of one job and the beginning of the next one. And it provides a date for when they completed their last job. This information was used to investigate whether there were spells not in work during people's careers, the proportion of their potential working life which was actually spent not in work, and when they made their final exit from work.

A number of assumptions were made in these analyses. Firstly, although gaps in which people were not in work have been identified, the reasons for those gaps have not been distinguished. In principle it is possible to do so, but due to the time-consuming complexity of the task, it has not been attempted here. A preliminary look at the data suggested that the main reasons were unemployment, health reasons and, for women, to look after children and possibly other family members. More detailed enquiry would be needed to determine the importance of these and other reasons in explaining why respondents were not in work at various points in their careers. Secondly, some assumptions had to be made about the lengths of each gap out of work since the start dates and end dates of jobs are only available to the nearest year. As the question asks about gaps of three months or more, obviously any identifiable gap must have been at least that long. So, if the end date of a job and the start date of the next job were both in the same year, it was assumed that the gap was six months. If the start date of the next job occurred in the following year the gap was assumed to be one year, and so on. Thirdly, some attempts were made to impute the length of gaps where a start date or an end date

was missing. In practice this was only done in a handful of cases, as there were not so many cases with problematic data and for some of these the assumptions required for imputation would have been just too heroic. Such cases were dropped from the analysis. Fourthly, as the whole of someone's working life is under consideration there is the risk of recall bias. Moreover as short gaps of less than three months were not asked about, they will be omitted from any calculation of gaps in working life. Finally, perhaps the major limitation is that although the histories cover working life, we just have a single measurement occasion for literacy and numeracy. So implicitly the assumption is that an individual's literacy or numeracy level did not change over time. The extent to which literacy and numeracy actually vary over the lifecourse was discussed earlier in the literature review chapter. While the evidence base is not as strong as one might like here, it certainly seems unlikely that literacy and numeracy actually would remain constant over an adult lifetime. However, note that the analysis has only assigned people to broad levels of literacy and numeracy, rather than some very precise value. That people remain within such broad bands of literacy and numeracy is, perhaps, less implausible. Bearing these assumptions in mind, we now proceed with the analysis.

Gaps at the Start of Careers

Whether there was any pattern by literacy or numeracy level in the proportions having a gap after leaving school and before obtaining their first job was explored. Among males with low literacy, six per cent had a gap at the start of their work histories, and this was slightly less than the 6.6 per cent in the medium literacy group or the 7.2 per cent in the high literacy group. For women, those with the lowest literacy were more likely to have experienced a spell of not working after initially leaving education, in fact around 13 per cent of them did so, compared to between 9 and 10 per cent of those in the medium and high literacy groups. The proportions experiencing a spell not in work after the end of full-time education fluctuated somewhat by numeracy group but there was no clear trend, either decreasing or increasing, in the proportions by numeracy level. This was the case for both males and females. So it did not seem, from this exploration of the data, that there was any pattern by either literacy or numeracy level in the likelihood of not working in the

time immediately after leaving full-time education. To take account of other potential influences, some binary logistic regression models were estimated for the probability that respondents had a gap of three months or more between completing full-time education and starting work. Literacy and numeracy levels were not significant explanatory factors in these models. In other words, amongst this sample of older adults who began their working careers a considerable time ago, there was no evidence that those with low literacy and/or low numeracy were any more likely than other individuals to have lengthy gaps before obtaining work.

Any Gaps in Careers

The next step was to look at gaps in work histories by three points in time: by age 50, by age 60 and by age 65. For the age 50 analysis all ELSA respondents with life history data were analysed; for age 60 and age 65, of course only those who had reached these ages could be considered. This does mean that the sample sizes are not the same at each age, which might account for variation in results. Women with low literacy were actually slightly less likely to have had a gap in their work history by age 50. There were not noticeable differences between the medium and high literacy groups among women. Men were much less likely to have had gaps in their work histories than women. For example, by age 50 less than a third of men had spent some time out of work, compared to well over four-fifths of women. There was little evidence that those with low literacy were any more likely than those with medium or high levels of literacy to have gaps in employment. As for numeracy, it was the case that *fewer* women in the lowest numeracy group had experienced a gap in their employment history by age 50 (Figure 5.4). Any differences had largely evened out by age 65, however, by which point over 95 per cent of all women had gaps in their work histories. Among men, those with low numeracy were the most likely to have had a gap in their work history by age 50, but any differences by numeracy group had diminished by age 60 and disappeared by age 65 (Figure 5.5).

Figure 5.4: Percentages of Women with Any Gaps in their Work Histories at ages 50, 60 and 65, by numeracy level

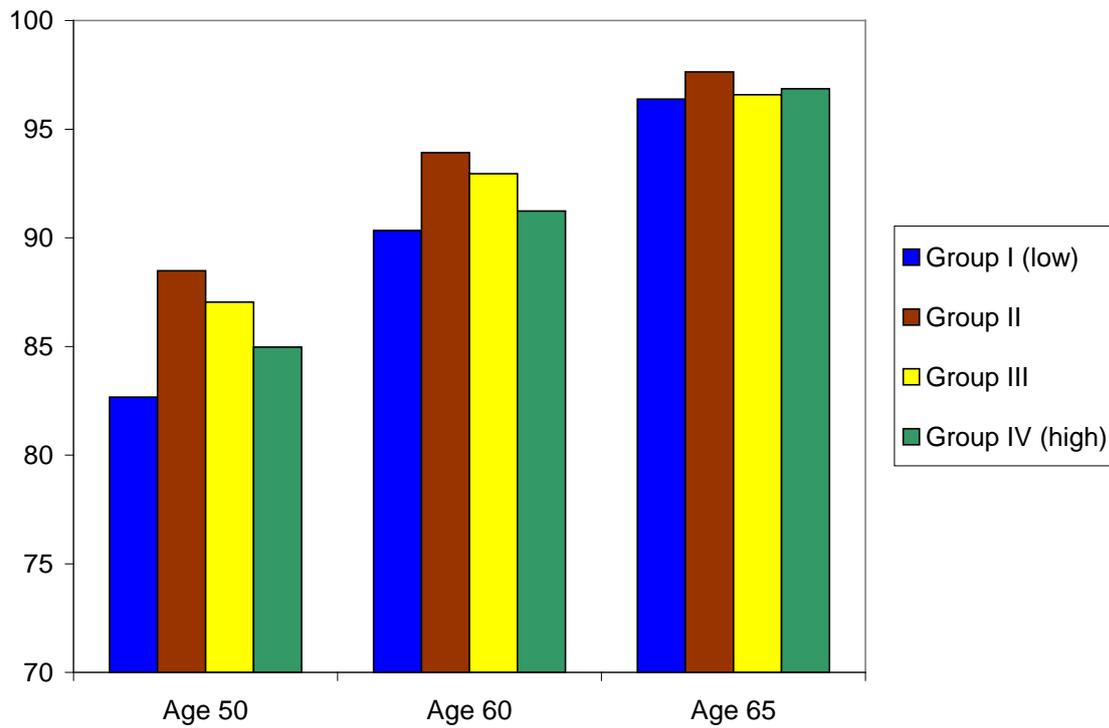
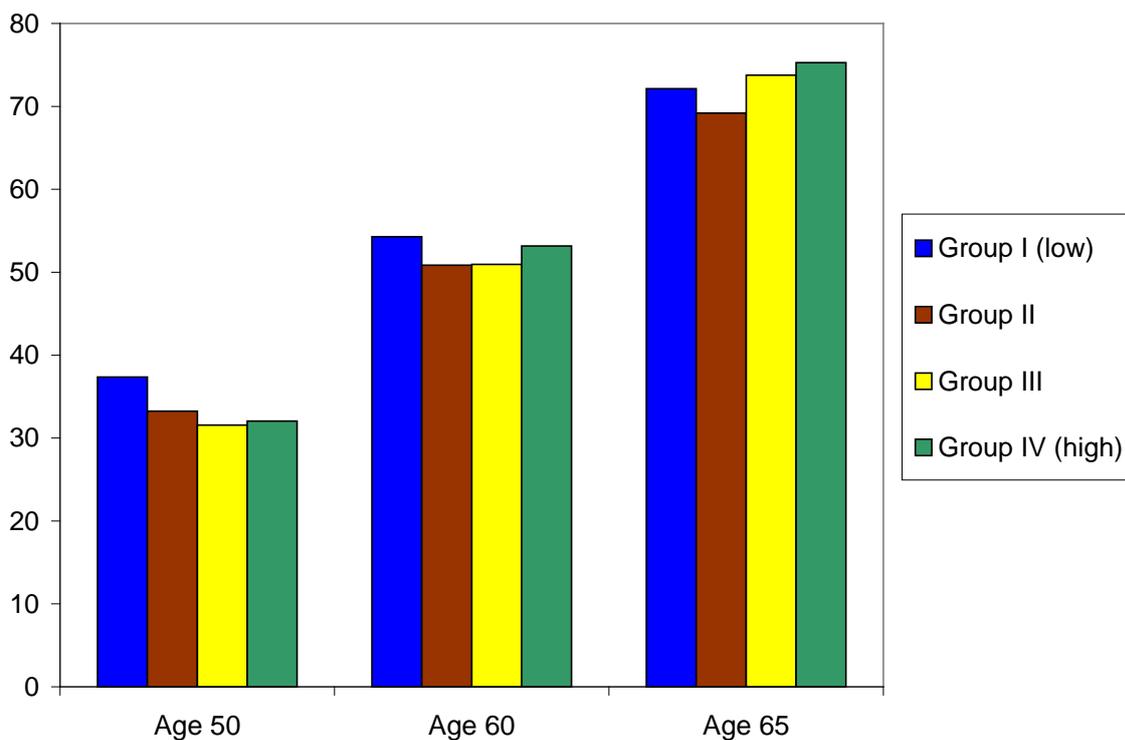


Figure 5.5: Percentages of Men with Any Gaps in their Work Histories at ages 50, 60 and 65, by numeracy level



Regression models were estimated in order to determine whether individuals with low literacy or low numeracy were more likely to have gaps in their work histories by each of these ages. These models were logistic regression models for the probability of having one or more gaps. They were estimated separately for males and females, and separately for literacy level and numeracy level. The controls in the models included cohort (year of birth), education level, cognitive function score and several indicators of health through the lifecourse, as well as whether the respondent ever had a partner and number of children.

Table 5.1: Any Gaps in Work History, Males, by Numeracy Level
Logistic Regression: Results reported as Odds Ratios

	(1)	(2)	(3)
	By Age 50	By Age 60	By Age 65
<i>Numeracy Level (base Group IV, high)</i>			
Numeracy Group I (lowest)	1.614	1.039	0.987
	(2.23)**	(0.16)	(0.04)
Numeracy Group II	1.394	1.031	0.886
	(2.52)**	(0.21)	(0.61)
Numeracy Group III	1.166	1.035	1.064
	(1.21)	(0.24)	(0.31)
t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			
All models control for cohort (year of birth), age left full-time education, cognitive score, ever had a partner, age began co-habiting, number of children, respondent's own health in childhood, number of spells of ill-health in adulthood, whether injury or ill-health has limited opportunities for paid work.			

For women there was no evidence that the likelihood of having a gap in work history was adversely affected by either poor literacy or poor numeracy. Indeed there was some evidence that women with poor literacy were less likely to have had a gap in

their work history by age 65. However, the number of women who had no gaps in work by age 65 was extremely small, at just 51 cases in the dataset. Men were found to be more likely to have had a gap in their working life by age 50 if they had lower levels of numeracy, as can be seen in Table 5.1. This was even after controlling for many other influences on the probability of a gap in their work history. Literacy level was not found to be a significant factor.

Proportion of Years in Work

The proportion of years between completion of full-time education and ages 50, 60 and 65 actually spent in work was examined. About 30 per cent of women in the low literacy group had spent less than half of their time in work by age 50 compared to about a fifth of those in the medium and high literacy groups. The differences in this statistic by literacy level among men were quite small. By numeracy level, some 68 per cent of men in the higher numeracy groups had spent all their years in work since leaving full-time education, and this compared to about 63 per cent for men in the low numeracy group (see Figure 5.6). Differences between the numeracy groups for men were less evident by age 60.

At age 50, the work histories of women in Group I, the lowest numeracy level were polarised, with some 29 per cent having spent less than half of their time since completing full-time education, a much higher percentage than in the other numeracy groups. This can be seen in Figure 5.7. But these women in the lowest numeracy group were also the most likely to have spent all of their time in work, with about 17 per cent of them showing this pattern in their work history. Women in the low numeracy group were still much the most likely to have spent less than half of their time since leaving full-time education in work by age 60, with about a third of them in this situation, compared to just one in seven of the highest numeracy group.

Figure 5.6: Proportion of Years since completing full-time education and age 50 spent in work for males, by numeracy level.

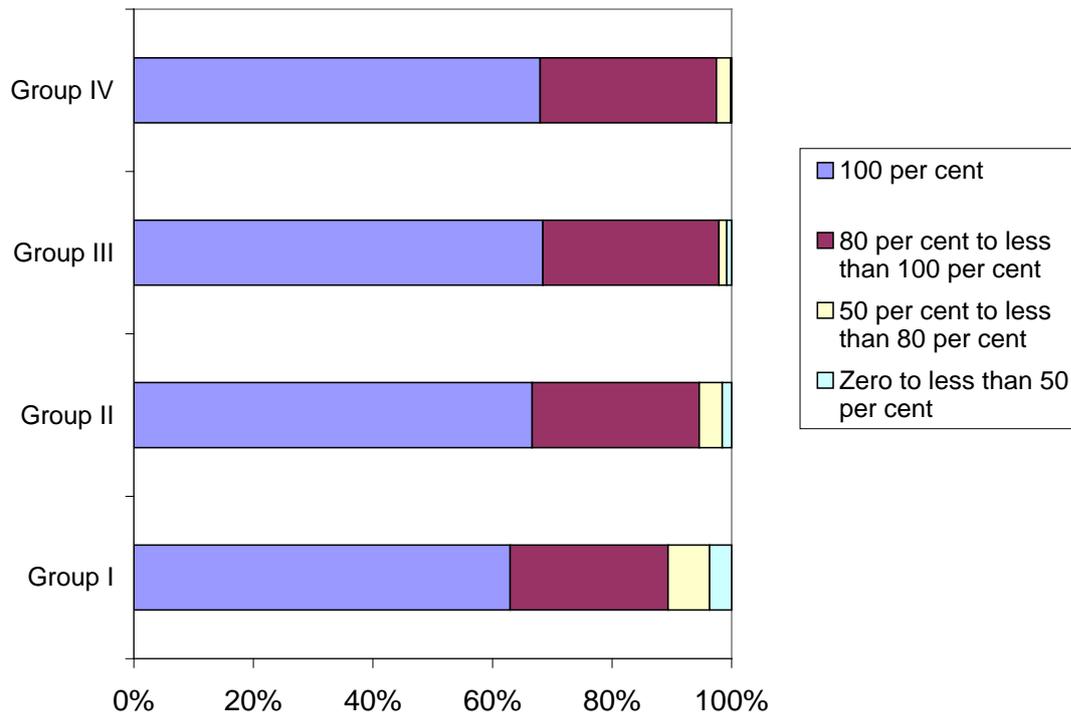
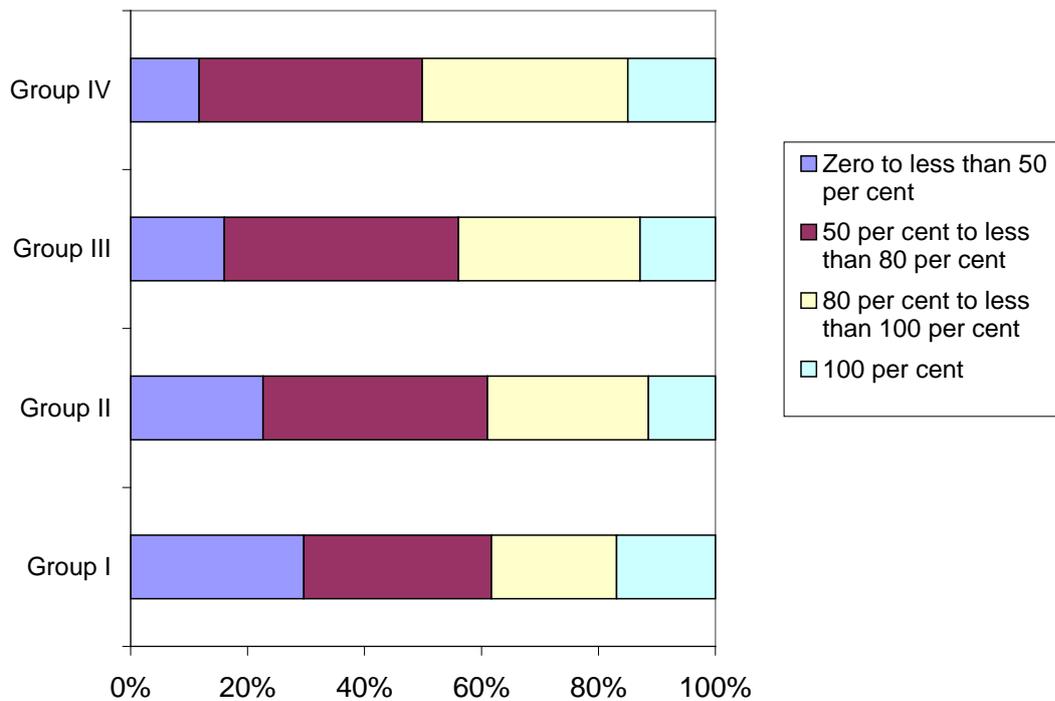


Figure 5.7: Proportion of Years since completing full-time education and age 50 spent in work for females, by numeracy level.



Regression models were run to test whether basic skills were related to the proportion of time spent in work after allowing for other factors which might have an influence on the proportion of time spent in work. In these models no evidence was found for men of any links between literacy and amount of years in work, but there was strong evidence of an association with numeracy for men (Table 5.2). The odds for time spent in work were much reduced for the two lowest numeracy groups by age 50, and there was still evidence of an association between numeracy and proportion of time spent in work by age 60.

Table 5.2: Regression of Proportion of Years in Work, Males, by Numeracy Level
Binomial Regression, Results reported as Odds Ratios

	(1)	(2)	(3)
	By Age 50	By Age 60	By Age 65
<i>Numeracy Level (base, Group IV, high)</i>			
Numeracy Group I (lowest)	0.472	0.641	0.950
	(2.79) ^{***}	(1.97) ^{**}	(0.28)
Numeracy Group II	0.592	0.795	1.063
	(3.06) ^{***}	(1.67) [*]	(0.54)
Numeracy Group III	0.853	0.975	1.159
	(0.89)	(0.18)	(1.42)
Observations	2529	1992	1443
z statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			
All models control for cohort (year of birth), age left full-time education, cognitive score, ever had a partner, age began co-habiting, number of children, respondent's own health in childhood, number of spells of ill-health in adulthood, whether injury or ill-health has limited opportunities for paid work.			

The pattern was quite similar for women, after controlling for other factors. No evidence of an association was found for literacy, but better numeracy was associated with more years in work, especially for the measure at age 60 (Table 5.3).

Table 5.3: Regression of Proportion of Years in Work, Females, by Numeracy Level
Binomial Regression, Results reported as Odds Ratios

	(1)	(2)	(3)
	By Age 50	By Age 60	By Age 65
<i>Numeracy Level (base, Group IV, high)</i>			
Numeracy Group I (lowest)	0.886	0.812	0.859
	(1.15)	(1.75)*	(1.15)
Numeracy Group II	0.869	0.800	0.870
	(1.77)*	(2.33)**	(1.23)
Numeracy Group III	0.954	0.900	0.964
	(0.58)	(1.03)	(0.30)
Observations	3007	2355	1728
Robust z statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			
All models control for cohort (year of birth), age left full-time education, cognitive score, ever had a partner, age began co-habiting, number of children, respondent's own health in childhood, number of spells of ill-health in adulthood, whether injury or ill-health has limited opportunities for paid work.			

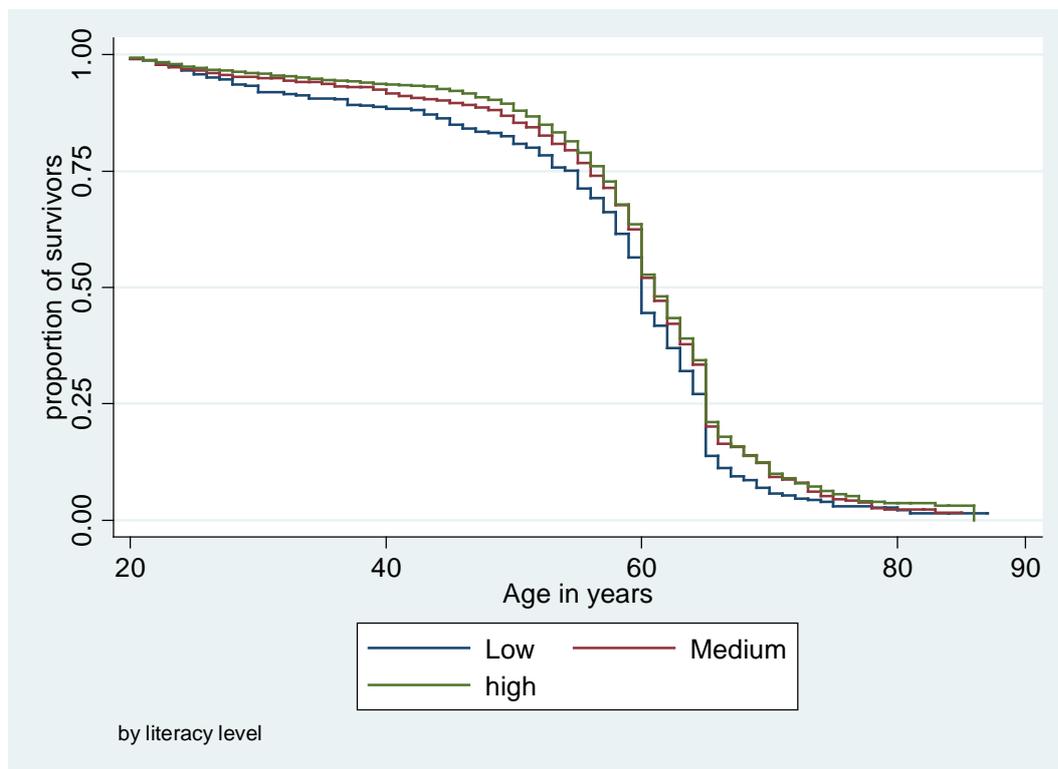
The influence of other factors on proportion of time in work showed some variation by gender. Education level, measured by age left full-time education, was found to be important for men, but less so for women, after allowing for other factors. As might be expected, the number of children had a major impact for women on the proportion of time spent in work – those with no children had odds some three times

as great of a continuous work history compared to those with two children. Variables measuring health were important for both men and women.

5.4 Summarising the Data on Leaving Work

The factors determining exit from work into retirement were investigated. The life history provides the year/age at which someone completed their last job. It doesn't actually ask about retirement as such, although we presume that respondents then enter the post-work, or retirement phase, of their lives. Information on the ages up to which people in the ELSA sample stayed in work by literacy and numeracy levels is summarised in Figures 5.8 and 5.9. These graphs show the proportion of survivors in work at each age, that is the proportion of the sample who were still in work at each age.¹

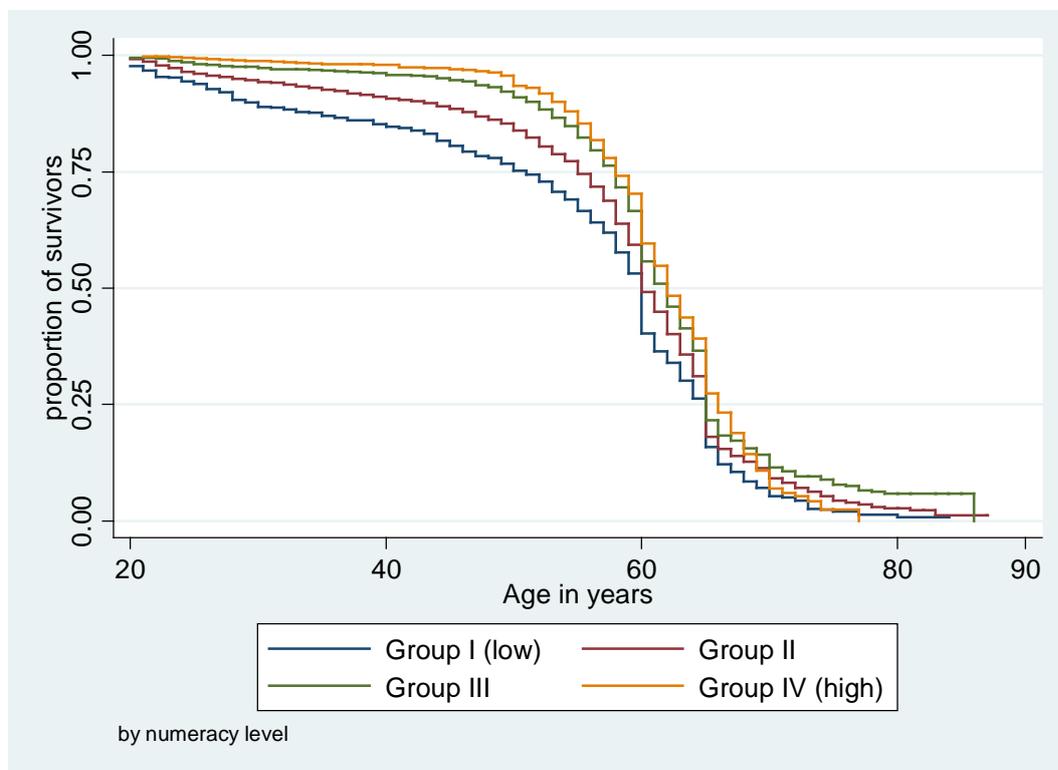
Figure 5.8: Age at Last Exit from Work, by Literacy Level



¹ Not all of the ELSA sample have retired – some of them, especially the younger members of the study, were still in work in 2007 when the life history interview was conducted. This creates a problem for summarising the age at which they left work - those who were still in work would have to be left out. This problem was circumvented by using the Kaplan-Meier estimate of the survival function, which makes certain assumptions about the survival times of those still in work. It is a widely used technique for overcoming the problem of censored survival times.

Figure 5.8 shows that people with low literacy were more likely to drop out of work at younger ages – there were fewer survivors at higher ages, than for the other literacy groups. Differences between the medium and high literacy groups were less apparent, although those with medium literacy were slightly more likely to end their attachment to work at younger ages. Differences between the four numeracy groups were apparent, with a clear pattern of the lower the numeracy the greater the proportions no longer in work as age increased (Figure 5.9).

Figure 5.9: Age at Last Exit from Work, by Numeracy Level



However, there are clearly other factors which are likely to influence the age that someone leaves the labour force. These include gender, with the proportions of women dropping out of paid work being greater at younger ages, and there was also some evidence of differences between cohorts. In the older groups in the sample, the proportion of women leaving the labour for the last time at very young ages was striking, highlighting the extent of social change with respect to women doing paid

work which occurred over the twentieth century. It is plausible that other factors, such as education level and health would also play a role in determining when someone left work for the last time. The next stage, then, was to estimate some models for age left work to decide which factors were most important, and whether literacy and/or numeracy played a role.

5.5 Regression Modelling of Leaving Work

Survival models were used to analyse the associations between basic skills and the time at which adults completed their last job and left the labour market. Survival models are essentially regressions which allow for the fact that some people were censored i.e were still in work at the time of the survey, so that we do not actually observe when they finally left the labour market. The models were estimated separately for males and females, as they may have exited the labour market at different ages, not least because of differences in state pension age. The findings are summarised here and the estimates are shown in the Appendix in Tables A14 to A17.

Initially, low literacy made it more likely that someone would leave the labour market at a relatively early point. However, any association between literacy level and labour market exit became statistically insignificant as controls were added, and especially controls for health status, which were of importance in determining when someone left the labour market. For women, these regression models showed that any association between literacy level and the age of moving out of the labour force soon disappeared as controls for other factors, especially education and cognitive function score, were introduced. A similar pattern was observed for numeracy: controls for education, cognitive function, demographic and health factors reduced any associations between numeracy and exit from the labour market and such associations were not statistically significant.

5.6 Summary

This chapter has addressed the extent to which adults remain in the labour force over the course of their careers, and the age at which they move from work into retirement. It has used data from three waves of the ELSA survey, and retrospective ELSA work history data. On the key question of the role of either literacy or numeracy skills in influencing the timing of retirement, the findings from both the main ELSA survey waves and the life history data were consistent. After controlling for other factors, those with low levels of literacy or numeracy were not less likely to be in work at later waves of the survey. Nor, based on an analysis of the work histories, and again after allowance was made for other factors, did it appear that literacy or numeracy were related to the age at which people completed their last job and moved into retirement. Perhaps the most important single factor in influencing the timing of this transition was health. The central result of this analysis, then, is to downplay the role of literacy and numeracy skills in the transition from work to retirement.

Analysis of the work history data also showed that those with poor numeracy were likely to spend a larger proportion of their adult lives not in work. This was found to be the case for both men and women. This is consistent with other evidence, on younger adults, that poor basic skills are associated with increased risk of becoming unemployed.

6. Health

The potential relationship between low levels of basic skills and poor health has long been recognised. Indeed a specific category of literacy, health literacy, has been developed. Health literacy refers to the ability to read and understand materials encountered in health care settings and to obtain the knowledge necessary for positive health outcomes (Nurss, 1998; Roman, 2004). It is a crucial component of functional literacy. A lack of health literacy can potentially have very serious consequences. Low literacy may lead to problems in accessing health care. These could include difficulties reading medicine labels, doctors appointment slips, or health education brochures. Secondly, low literacy may well be linked to a lack of health related knowledge, including lack of knowledge about their illness and disease-management skills (Baker et al, 1997). Thirdly, there may be a link between low literacy and poor health outcomes such as heart conditions or diabetes (Greenberg, 2001). It seems likely that, in the main, the relationship between literacy and health would be indirect. For example, it might be due to people with low literacy not being in work. This would then lead to the health problems that are associated with living in poverty.

As conventionally defined, health literacy may encompass a range of skills including the ability to perform basic reading and numerical tasks required to function in a health care environment (Greenberg, 2001). This definition includes important aspects of numerical ability such as reading blood glucose levels, taking a temperature, or knowing the right number of pills to take. While health literacy is an issue among the population in general it is likely to be of especial concern for older adults. The needs of older patients tend to be greater because older patients have more frequent clinic visits and hospital admissions. In addition some may have failing eyesight, reduced memory and hearing loss which could all compound their literacy problems.

At present the research literature draws overwhelmingly on evidence from the United States. (Roman, 2004). Health literacy is an emerging area of study in the UK. As a result, there are few empirical studies on health literacy in the UK which

encompass the older population. A study by von Wagner et al. (2007) investigated the prevalence of limited functional health literacy in the UK and associations with health behaviours and self-reported health. Their sample included adults up to the age of 90 and used a British version of a standard US health literacy assessment to determine the level of health literacy. The researchers found that older participants were more likely to have limited functional health literacy; this applied to 30 per cent of adults aged 65 and over compared with less than six per cent of 18 to 44 year-olds. Those with limited health literacy were more likely to be without formal education, to be male and to have low incomes. Higher health literacy scores were associated with healthier diets i.e. eating more fresh fruit and vegetables, not smoking and good self-rated health.

Given the paucity of UK studies further contributions to the evidence base are important, and so in this chapter the potential of the ELSA dataset for uncovering information about the relationships between literacy, numeracy and health will be explored. The research reported here aimed to consider a range of different health outcomes. Variables selected were self-reported health, whether currently a smoker and depression. In other words, one measure of overall health, a measure of healthy behaviour variable and a measure of psychological health were investigated.

6.1 Self-reported health

Respondents were asked about their health in general, with possible answers as excellent, very good, good, fair and poor. The less well people did on the literacy test the more likely they were to report that their health was poor. In the lowest literacy group, 14.5 per cent of the sample felt that their health was poor, 61 per cent stated that it was either fair or good, while nearly a quarter maintained that it was either very good or excellent. This can be contrasted with those who obtained the maximum score on the literacy test, among whom less than 6 per cent thought their health was poor, just over a half fair or good and over 40 per cent regarded their health as either very good or excellent. An association was also apparent between numeracy level and self-reported health. Among those in the highest numeracy ability category, well over half reported their health as either very good or excellent and only four per cent said that their health was poor. Yet among those in the lowest

numeracy group, some 26 per cent regarded their health as very good or excellent and nearly 15 per cent thought that it was poor.

Some further analyses were conducted, using regression models, to probe further these associations between poor literacy and numeracy and own assessment of health. A binary variable was constructed taking the value one if the respondent said their health was excellent, very good or good and taking the value zero if they said their health was only fair or poor. Logistic regression models were then used to predict the probability that someone gave the more positive appraisal of their health, rather than stating that it was fair or poor. The models controlled for age, gender and highest qualification. Even after controlling for these basic characteristics, it emerged that both literacy and numeracy remained strongly related to self-reported health, with those in the low literacy group and lower numeracy groups tending to give more negative evaluations of their own health. These results are summarised in Tables 6.1 and 6.2.

Table 6.1: Logistic Regression Model of Literacy and self reported health
Likelihood of reporting very good or excellent health: odds ratios

	(1)	(2)	(3)	(4)
<i>Literacy level (base: high literacy group)</i>				
low literacy	0.364	0.407	0.407	0.505
	(14.16) ^{***}	(12.28) ^{***}	(12.26) ^{***}	(9.04) ^{***}
medium literacy	0.612	0.641	0.641	0.724
	(7.83) ^{***}	(6.99) ^{***}	(7.00) ^{***}	(4.97) ^{***}
Controls	None	Age	Age and gender	Age, gender, highest qualification
Observations	8,312	8,312	8,312	8,306
t statistics in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

These tables show that, after controlling for age, gender and highest qualification, the odds of someone with low literacy stating that their health was good, very good or excellent were only half those of someone with high literacy stating this; as for numeracy, the odds of stating that health was good/very good/excellent were 38 per cent for an individual in the lowest numeracy group relative to an individual in the highest numeracy group. These results can be regarded as indicative. They rule out the idea that the associations between poor basic skills and poor health arose merely because older adults in the sample, who were more likely to be in poor health, tended also to have lower literacy or numeracy, or that these basic skills measures were merely proxying for highest qualification. However, there are many other variables which could have had an impact on self-reports of health, and further research would be needed to investigate these other factors and also to map out more clearly and test the pathways leading from basic skills to health.

Table 6.2: Logistic Regression Model of Numeracy and self reported health
Likelihood of reporting very good or excellent health: odds ratios

	(1)	(2)	(3)	(4)
Numeracy level (base: high numeracy group)				
Numeracy Group I (lowest)	0.220	0.261	0.238	0.379
	(14.26) ^{***}	(12.41) ^{***}	(12.86) ^{***}	(8.24) ^{***}
Numeracy Group II	0.435	0.489	0.456	0.629
	(9.02) ^{***}	(7.66) ^{***}	(8.19) ^{***}	(4.62) ^{***}
Numeracy Group III	0.660	0.701	0.679	0.787
	(4.14) ^{***}	(3.54) ^{***}	(3.82) ^{***}	(2.32) ^{**}
Controls	None	Age	Age and gender	Age, gender, highest qualification
Observations	8,556	8,556	8,556	8,553
t statistics in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

6.2. Current cigarette use

The research also examined associations between basic skills and health behaviours, including risky health behaviour and current smoking provides one indicator here. In the lowest literacy ability category, 18.6 per cent of people smoked, falling slightly to 17.2 per cent in the medium literacy category and 14.8 per cent of those in the highest literacy ability group. In short, there was a modest decline in the likelihood of being a smoker at higher levels of literacy ability. The likelihood of smoking declined somewhat more markedly by numeracy ability with the proportion of current smokers falling from exactly a fifth in the lowest numeracy group to less than one in seven (13.8 per cent) among the highest numeracy group.

A logistic regression modelling approach was adopted for predicting whether someone was likely to be a smoker (the details are in Appendix Tables A18 and A19). Here too, low literacy and low numeracy were predictive of currently being a smoker after allowing for age, gender and highest qualification. The odds of being a smoker were increased by just over a third (34.5 per cent) for those in the low literacy group relative to those in the high literacy group; the odds of being a smoker were over three-quarters higher (77.5 per cent) for those in the low numeracy group relative to those in the highest numeracy group. These models should be regarded as indicative, as just some basic characteristics were controlled for. For some health risks the channel from poor basic skills to risky behaviour would probably occur via lack of access to relevant information, but it seems hard to believe that anyone in contemporary society would be unaware of the health risks of smoking. So perhaps there is a need for further work exploring the factors which would be predictive of smoking and which could be included in the models. Nonetheless, the results suggest, at the very least, that low literacy and low numeracy are factors which merit further investigation in research which focuses specifically on smoking behaviour in later life.

6.3 Depression

So far in this chapter the focus has been on general health, and on health behaviour, but it is important to consider psychological health also. So in this section we turn to study one of the most widespread forms of psychological ill-health, depression. In the ELSA surveys respondents were asked to answer a set of eight questions, known as the CES-D scale, which is used to assess the presence of depressive symptoms. Respondents who scored more than three out of eight on this scale can be regarded as displaying symptoms of depression. The prevalence of this measure of depression was analysed across the literacy and numeracy groups.

In the low literacy group, 36 per cent of the sample were found to have depressive symptoms. This compared to some 26 per cent in the medium literacy group and, just under a fifth (19.5 per cent) had depressive symptoms in the highest literacy group. As for the numeracy levels it transpired that well over a third (38 per cent) of those in the lowest numeracy group were found to have depressive symptoms, but less than one in eight of the cases in the highest numeracy ability group (12 per cent) had depressive symptoms.

These associations between basic skills and the presence of depressive symptoms are of interest. But it might be the case that literacy or numeracy attainments were merely proxying for some other factor which was associated with depression. Perhaps less educated people were more likely to be depressed and were also more likely to have poor literacy or numeracy. Or older adults would also tend to be depressed and to have lower levels of these basic skills, on average. To take account of this logistic regression models were fitted.

In further investigating the relationships between basic skills and health, several models for the probability of reporting depressive symptoms were estimated. These models allow for many other factors which might affect the probability of reporting depressive symptoms including measures of income and wealth, a wide range of physical health variables, and variables which measure the extent of social contact experienced by older adults. In full, the set of explanatory variables included gender, age, highest qualification, marital status, work status, home ownership, household income decile and whether expected to experience financial difficulties in future,

various aspects of physical health (whether a current smoker, poor eyesight, suffered physical pain at present, whether had experienced heart disease, bone disease, stroke, lung disease, cancer, or diabetes) mobility difficulties and disabilities (ADL and IADL) and the extent of support from family and friends. The choice of these variables was based on factors found to be important in previous studies of depression, including some such as Chou (2007) which have used data from the ELSA survey. So the objective here was to determine whether any statistically significant associations remained with literacy or numeracy and depressive symptoms after allowing for many other factors in the models. As shown in Table 6.3, relative to the base case of high literacy, those in the low literacy group had much higher odds of reporting depressive symptoms even after controlling for age, gender, income, health variables and contacts with family and friends. In fact the odds of depressive symptoms, even after allowing for this long list of other explanatory variables, were some 35 per cent higher in the low literacy group relative to those in the high literacy group. Similarly, relative to those with high levels of numeracy (Table 6.4), those in the low numeracy groups also tended to be more likely – the odds were approximately two-thirds higher - to report depressive symptoms even after allowing for a range of other influences on the likelihood of being depressed.

Table 6.3: Logistic Regression Models of Depressive Symptoms and Literacy

Results reported as odds ratios

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Literacy (base, high literacy)</i>						
low	2.322 (11.58) ^{***}	2.240 (10.74) ^{***}	1.928 (8.52) ^{***}	1.698 (6.49) ^{***}	1.457 (4.36) ^{***}	1.355 (3.38) ^{***}
medium	1.496 (6.20) ^{***}	1.448 (5.62) ^{***}	1.332 (4.29) ^{***}	1.262 (3.30) ^{***}	1.198 (2.44) ^{**}	1.118 (1.46)
Observations	8301	8301	8295	8067	8055	7771
Controls	None	Age and Gender	As (2) plus education	As (3) plus all income and wealth variables	As (4) plus health variables, mobility, ADL, IADL	As (5) plus emotional support from family, friends

Absolute value of z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6.4: Logistic Regression Models of Depressive Symptoms: Numeracy

Results reported as odds ratios

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Numeracy (base, group IV, highest)</i>						
Group I	4.218 (12.65) ^{***}	3.474 (10.53) ^{***}	2.573 (7.59) ^{***}	1.925 (4.95) ^{***}	1.738 (3.98) ^{***}	1.656 (3.53) ^{***}
Group II	2.464 (8.92) ^{***}	2.153 (7.38) ^{***}	1.757 (5.23) ^{***}	1.521 (3.70) ^{***}	1.459 (3.19) ^{***}	1.438 (3.01) ^{***}
Group III	1.698 (4.85) ^{***}	1.593 (4.23) ^{***}	1.455 (3.37) ^{***}	1.325 (2.41) ^{**}	1.306 (2.19) ^{**}	1.274 (1.95) [*]
Observation	8508	8508	8505	8244	8231	7940
s						
Controls	None	Age and Gender	As (2) plus education	As (3) plus all income and wealth variables	As (4) plus health variables, mobility, ADL, IADL	As (5) plus emotional support from family, friends

Absolute value of z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

7. Well-Being

As the proportion of older adults in society has increased so the notion of successful ageing has grown in prominence in research and policy discussion (DWP, 2005; 2009). Successful ageing will include maintaining good health, having sufficient resources, and remaining active both physically and socially (Tate et al, 2003; Duay and Bryan, 2006). All of these factors contribute to the wellbeing of adults in later life. So far our research has looked at different aspects of older people's lives, such as employment, and health which are themselves important components of successful ageing. In this chapter the aim is to get a broader sense of a person's overall wellbeing and also to investigate whether it was related to literacy and numeracy levels.

Among the information collected for the English Longitudinal Study of Ageing (ELSA) was a subjective wellbeing measure, the CASP-19 quality of life indicator. CASP-19 was designed specifically to gauge quality of life amongst older adults (Hyde et al, 2003). There are four sections to the questionnaire covering the need to act freely in one's own environment (control); the need to be free from undue interference (autonomy); the need for self-realisation; and the need to enjoy oneself (pleasure) and the measure consists of 19 questions in total – hence the name. The items on control/autonomy included questions such as 'my age prevents me from doing the things I would like to', 'my health stops me doing the things I want to do', 'shortage of money stops me doing the things I want to do'. For self-realisation and pleasure the questions included 'I look forward to each day', 'I feel that my life has meaning', 'I feel full of energy these days', 'I enjoy the things I do'. For each question, respondents were asked to say how often they felt like that on a scale from 'often' to 'never'. So the CASP-19 measure gives a broad sense of the extent to which older adults were able to act freely, to enjoy themselves and to find meaning in their lives.

Summarising mean scores on CASP-19 by literacy level, it was found that quality of life was significantly higher amongst those with high literacy (mean score, 43.5), compared to those with medium literacy (mean 41.9) and low literacy (mean 39.1). As for the mean CASP-19 scores by numeracy level. there were substantial and statistically significant differences in quality of life by numeracy level, and those in

the high numeracy group had a mean score nearly five points greater than those in the lowest numeracy group. It is worth summarising briefly how this quality of life measure differed across other covariates such as gender, age and education level. Quality of life was very similar, in terms of mean scores, for men and for women. For both sexes quality of life was highest for people in their sixties and much lower for people in their eighties. Those with no qualifications had noticeably lower quality of life. People in work had somewhat higher quality of life than people who were retired, but it was those who reported their work status as being permanently sick/disabled who tended to have very low quality of life indeed.

Some statistical models of quality of life and associations with literacy and numeracy were estimated. Models were initially run containing just the literacy or numeracy variables. Then controls were added sequentially to the models to see how they impacted on the strength of the relationships between well-being and literacy or numeracy. The set of control variables, and the way in which they were added to the models, were similar to that for models of depressive symptoms discussed in the previous chapter. From Tables 7.1 and Table 7.2 (below) it can be seen that quality of life was strongly related to both literacy and numeracy in the absence of any controls. In other words, people with low literacy or low numeracy tended to have lower scores on the quality of life measure, confirming the impression from the summary statistics quoted earlier. For literacy (Table 7.1) it was found that, even after allowing for other variables those in the low literacy group had lower quality of life than the base case, the high literacy group. For numeracy in simpler models there was a significant relationship with lower quality of life (Table 7.2) but numeracy was no longer significant when all variables were in the model. Insofar as numeracy had an impact on quality of life, then, it appeared to do so via its influence on earnings and perhaps educational attainment.

The broad pattern, then, was that quality of life was strongly associated with literacy and numeracy. The relationships became weaker when controls were added to the model. This can be interpreted as indicating that the included controls were important as channels through which low literacy or numeracy were related to this measure of subjective well-being. These pathways entirely explained the

relationship between numeracy and quality of life, but in the case of literacy there was still a significant relationship apparent even when all available controls were in the model, suggesting that while the set of health, income and other variables were important, there was possibly some additional impact of literacy on quality of life.

Table 7.1: Regression Models of Subjective Wellbeing and Literacy

Dependent variable: CASP-19 Quality of Life Score

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Literacy (base, high literacy)</i>						
low literacy	-4.243 (12.17)***	-3.771 (10.76)***	-2.961 (8.36)***	-2.013 (6.01)***	-1.099 (3.54)***	-0.835 (2.81)***
medium literacy	-1.571 (5.85)***	-1.471 (5.50)***	-1.051 (3.93)***	-0.574 (2.27)**	-0.342 (1.47)	-0.321 (1.44)
Observations	6690	6690	6687	6527	6520	6351
R-squared	0.0239	0.0392	0.0578	0.1892	0.3142	0.3933
Controls	None	Age and Gender	As (2) plus education	As (3) plus all income and wealth variables	As (4) plus health variables, mobility, ADL, IADL	As (5) plus emotional support from family, friends

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7.2: Regression Models of Subjective Wellbeing and Numeracy

Dependent variable: CASP-19 Quality of Life Score

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Numeracy (base, Group IV, highest)</i>						
Numeracy Group I (lowest)	-4.451 (10.11)***	-4.402 (9.76)***	-2.796 (5.95)***	-0.937 (2.09)**	-0.122 (0.30)	-0.040 (0.10)
Numeracy Group II	-1.980 (6.22)***	-2.016 (6.16)***	-0.949 (2.80)***	0.031 (0.10)	0.256 (0.87)	0.150 (0.53)
Numeracy Group III	-1.329 (3.87)***	-1.341 (3.91)***	-0.884 (2.58)**	-0.286 (0.89)	-0.197 (0.66)	-0.198 (0.70)
Observations	6754	6754	6751	6572	6564	6393
R-squared	0.0159	0.0384	0.0566	0.1880	0.3206	0.3977
Controls	None	Age and Gender	As (2) plus education	As (3) plus all income and wealth variables	As (4) plus health variables, mobility, ADL, IADL	As (5) plus emotional support from family, friends

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

8. Conclusion

This report has aimed to examine the relationships between literacy and numeracy and a set of indicators of disadvantage, encompassing many aspects of the lives of older adults.

Our literature review highlighted some key gaps in the evidence base, including a lack of research on the associations between the levels of literacy and numeracy skills and labour market outcomes in later life. A key area of interest is clearly how skill levels influence the attachment of older workers to the labour market. Do skills play as central a role here as is often assumed in policy dialogue and, if so, what are the implications for extending working lives? There was, in fact, little evidence that moving out of work and into retirement was associated with literacy or numeracy levels as such, once controls for other factors were included in statistical models. This applied both in analyses of successive waves of ELSA, and in models applied to ELSA work history data. Understanding this transition into retirement is complex, involving as it does individual and familial circumstances, as well as accumulated wealth, and the attitudes and practices of employers. At the individual level the analyses in this report suggest that there are differences in behaviour by both gender and cohort, and health must certainly be a major factor influencing early transitions out of the workforce. It seems that the role of skills may be less important than is often supposed.

There were, nonetheless, some substantial differences amongst those older adults who were in work according to literacy and numeracy levels. Pay was less amongst those with low numeracy (although not significantly so amongst those with low literacy), and older adults with low literacy and/or low numeracy were also less likely to feel that they had opportunities to develop new skills in their current post. These findings are quite similar to studies looking at the way basic skills appear to influence the type of jobs available for adults in their twenties and thirties.

The report also considered aspects of disadvantage beyond the world of work and explored their relationships with low literacy and/or low numeracy. The topics covered here included a range of measures of physical and mental health, and the overall well-being of respondents. Those in the lower literacy and numeracy groups

tended to give lower evaluations of their own health, that is they were more likely to state that their own health was poor, and less likely to regard it as good or very good. They tended to score relatively highly on a measure of the presence of depressive symptoms, and this persisted even after allowing for many other factors which might play a role here. They were more likely to be current smokers, too. In fact, across a broad set of health indicators low literacy and low numeracy were associated with poorer health outcomes. Subjective assessments of well-being were also strongly associated with literacy and numeracy. Links between numeracy and well-being became weaker in models which controlled for other factors but in the case of literacy there was often still significant relationships apparent even when all available controls were in the models.

This project has highlighted the limited amount of research conducted in the field of older adults' basic skills. This report has provided new quantitative evidence, particularly on labour market outcomes. Deficiencies which still require attention include the lack of detailed evidence on the literacy and numeracy proficiencies of adults aged over 65; information on how proficiencies in these essential skills change as people grow older; and studies of both how to encourage participation in learning amongst low-skilled older adults and the kind of approaches which work best for adults in this age group. Addressing these gaps will require a range of different methods and represents a challenging agenda for further research.

References

- Alampresi, J. (2008). Developing Learners' Reading Skills in Adult Basic Education Programs. In S. Reder and J. Bynner (eds) Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research. London, Routledge.
- Aldridge, F. and A. Tuckett (2007). What Older People Learn. Leicester, NIACE.
- Baker, D. W., R. M. Parker, et al. (1997). "The Relationship of Patient Reading Ability to Self-Reported Health and Use of Health Services." American Journal of Public Health **87**(6): 1027-1030.
- Banks, J. and Z. Oldfield (2007). "Understanding Pensions: Cognitive Function, Numerical Ability and Retirement Saving." Fiscal Studies **28**(2): 143-170.
- Barton, D., Tusting, K., et al. (2008) Learners Experience of Work. NRDC Research Report. Institute of Education: London.
- Beder, H. (1991). Adult Literacy: Issues for Policy and Practice. Malabar, Florida, Krieger.
- Beder, H., A. Lipnevich, et al. (2007). "A Typology of Adult Literacy Instructional Approaches." Adult Basic Education and Literacy Journal **1**(2): 63-72.
- Brooks, G., K. Giles, et al. (2001). Assembling the Fragments: A Review of Research on Adult Basic Skills. London, DfEE.
- Brooks, G., M. Burton, et al. (2007). Effective Teaching and Learning: Reading. London, NRDC.
- Bynner, J. (2004). "Literacy, Numeracy and Employability: Evidence from the British Birth Cohort Studies." Literacy and Numeracy Studies **13**(1): 31-48.

Bynner, J. and S. Parsons (2006). *New Light on Literacy and Numeracy*. London, NRDC.

Chou, K-L (2007). "Reciprocal Relationship between Pain and Depression in Older Adults: Evidence from the English Longitudinal Study of Ageing." Journal of Affective Disorders 102: . 115-23.

De Coulon, A., O. Marcenaro-Gutierrez, et al. (2007). *The Value of Basic Skills in the British Labour Market*. London, Centre for the Economics of Education.

Derrick, J., J. Swinney, et al. (2008). *NIACE Maths, ICT and Older Learners Project: Final Report*. Leicester, NIACE.

DfES/DTI/ HM Treasury/DWP (2003). *21st Century Skills: Realising Our Potential*. London, Dept for Education and Skills.

Duay, D and Bryan, V (2006). "Senior Adults' Perceptions of Successful Aging." Educational Gerontology 32: 423-445.

DWP (2005). *Opportunity Age*. London, Dept for Work and Pensions.

Greenberg, D. (2001). "A Critical Look at Health Literacy." Adult Basic Education 11(2): 67-79.

Grief, S., B. Meyer, et al. (2007). *Effective Teaching and Learning: Writing*. London, NRDC.

Grinyer, J. (2006). *Literacy, Numeracy and the Labour Market: Further Analysis of the Skills for Life Survey*. London, Dept for Education and Skills.

Gross, J. (2009) The Long Term Costs of Numeracy Difficulties. Every Child a Chance Trust, London.

HM Government (2009). Building a Society for All Ages. Norwich, The Stationery Office.

Huppert, F., E. Gardener, et al. (2006). Cognitive Function. In J. Banks, E. Breeze, C. Lessof and J. Nazroo (eds) Retirement, Health and Relationships of the Older Population in England: The 2004 English Longitudinal Study of Ageing (Wave 2). London, Institute for Fiscal Studies.

Hyde, M. *et al* (2003), "A measure of quality of life in early old age: the theory, development and properties of a needs satisfaction model (CASP-19)". *Ageing and mental health*. **7**(3): 186-194.

McIntosh, S. and A. Vignoles (2001). "Measuring and Assessing the Impact of Basic Skills on Labour Market Outcomes." Oxford Economic Papers **53**(3): 453-481.

McNair, S (2006). "What Do Older Workers Want?" Social Policy and Society **5**.

McNair, S (2010). Learning and Work in Later Life: A Report for the Nuffield Foundation.

Meadows, P (2004). Retirement Ages in the UK: A Review of the Literature. DTI Report 18: Dept of Trade and Industry.

Moser, C. (1999). A Fresh Start: The Report of the Working Group Chaired by Sir Claus Moser. London, Dept for Education and Employment.

Nurss, J. (1998). Adult Literacy and Health Care. Literacy for the 21st Century. C. Smith. Westport, CT, Praeger.

Parsons, S. and J. Bynner (1998). Influences on Adult Basic Skills. London, Basic Skills Agency.

Parsons, S. and J. Bynner (2007). Illuminating Disadvantage: Profiling the Experiences of Adults with Entry Level Literacy or Numeracy over the Lifecourse.

London, NRDC.

Quigley, A. (1997). Rethinking Adult Literacy: The Critical Need for Practice-based Change. San Francisco, Jossey-Bass.

Reder, S. (2008). The Development of Literacy and Numeracy in Adult Life. In S. Reder and J. Bynner (eds) Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research London, Routledge.

Reder, S. and J. Bynner (2008). Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research. London, Routledge.

Roman, S. (2004). "Illiteracy and Older Adults: Individual and Societal Implications." Educational Gerontology **30**(2): 79-93.

Scholes, S, Taylor, R, Cheshire, H, Cox, K and Lessof, C (2008), Retirement, health and relationships of the older population in England: Technical Report on the 2004 English Longitudinal Study of Ageing. NatCen: London.

Tate, R *et al*, (2003). "Definition of Successful Aging by Elderly Canadian Males: The Manitoba Follow-up Study." The Gerontologist **43**(5): 735-744.

von Wagner, C., K. Knight, et al. (2007). "Functional Health Literacy and Health Promoting Behavior in a National Sample of British Adults." Journal of Epidemiology and Community Health **51**: 1086-1090.

Withnall, A. (2008). Improving Learning in Later Life. London, Routledge.