

# Retirement outcomes and lifetime earnings: descriptive evidence from linked ELSA – NI data

by Antoine Bozio, Rowena Crawford,  
Carl Emmerson and Gemma Tetlow

**Department for Work and Pensions**

**Working Paper No 81**

# **Retirement outcomes and lifetime earnings: descriptive evidence from linked ELSA – NI data**

**Antoine Bozio, Rowena Crawford, Carl Emmerson and Gemma Tetlow**

A report of research carried out by the Institute for Fiscal Studies on behalf of the Department for Work and Pensions

© Crown Copyright 2010. Published for the Department for Work and Pensions under licence from the Controller of Her Majesty's Stationery Office.

Application for reproduction should be made in writing to The Copyright Unit, Her Majesty's Stationery Office, St Clements House, 2-16 Colegate, Norwich NR3 1BQ.

First Published 2010.

ISBN        978 1 84712 796 9

Views expressed in this report are not necessarily those of the Department for Work and Pensions or any other Government Department.

# Contents

Acknowledgements .....	vii
The Authors.....	viii
Abbreviations.....	ix
1 Introduction .....	1
2 Representativeness of the English Longitudinal Study of Ageing – NI linked subsample .....	3
2.1 Individual level univariate analysis .....	4
2.2 Individual level multivariate analysis .....	8
2.3 Analysis of couples .....	11
2.4 Conclusions .....	13
3 Accuracy of previous state pension wealth estimates.....	15
3.1 Distribution of accrued state pension rights .....	16
3.2 Average errors in estimated state pension entitlements .....	18
3.3 Average absolute errors in estimated state pension entitlements .....	26
3.4 Conclusions .....	30
4 Retirement outcomes and lifetime earnings.....	33
4.1 Distribution of lifetime earnings and retirement income .....	34
4.2 Relationship between lifetime earnings and retirement income .....	39
4.3 Conclusions .....	41
5 Conclusions .....	43

5.1	Representativeness of the ELSA – NI linked subsample .....	44
5.2	Accuracy of previous state pension wealth estimates.....	44
5.3	Retirement outcomes and lifetime earnings .....	44
5.4	Future research .....	45
Appendix A	Representativeness of the ELSA – NI linked subsample .....	47
Appendix B	Calculating accrued state pension wealth .....	51
Appendix C	Accuracy of previous state pension wealth estimates .....	53
References	.....	59

## List of tables

Table 2.1	Linkage groups .....	4
Table 2.2	Summary of the differences in average observed characteristics, by linkage group .....	5
Table 2.3	Summary of the differences in average income and wealth, by linkage group .....	7
Table 2.4	Multivariate analysis of the observed characteristics associated with being successfully matched with the NI records (individual level).....	9
Table 2.5	Correlation of NI linkage group within couples .....	11
Table 2.6	Multivariate analysis of the characteristics associated with being successfully matched with the NI records (couple level, couples only) .....	13
Table 4.1	Distribution of the ratio of retirement income in 2002 to average earnings from 1975 to 2002 (percentages) .....	39
Table 4.2	Distribution of the ratio of retirement income in 2002 to lifetime earnings from 1975 to 2002, by marital status (percentages).....	40
Table 4.3	Distribution of the ratio of retirement income in 2002 to lifetime earnings from 1975 to 2002 by numeracy level (percentages).....	41
Table A.1	Characteristics in the full ELSA sample and the group that could not be linked when individuals aged 75 and over are excluded .....	47
Table A.2	Characteristics in the full ELSA sample and the group that did not give consent when widows and the self-employed are excluded .....	49
Table C.1	Distribution of accrued state pension wealth, estimates using ELSA data only compared with those utilising information from NI records – those aged 50 to SPA in 2002/03, by sex.....	56

Table C.2	Median percentage error in estimated accrued state pension rights using ELSA data only – those aged 50 to SPA in 2002/03, by sex, age group and marital status (percentages).....	57
Table C.3	Distribution of average absolute error in estimated accrued state pension rights using ELSA data only – those aged 50 to SPA in 2002/03, by sex, age group and marital status (£).....	58

## List of figures

Figure 3.1	Distribution of accrued state pension wealth: estimates using ELSA data only compared with those utilising information from NI records, all aged 50 to SPA in 2002/03 .....	17
Figure 3.2	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: all aged 50 to SPA in 2002/03, by sex.....	19
Figure 3.3	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: men aged 50 to SPA in 2002/03, by age group .....	20
Figure 3.4	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: men aged 50 to SPA in 2002/03, by current marital status .....	20
Figure 3.5	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by age group .....	22
Figure 3.6	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by age group .....	22
Figure 3.7	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by whether sometimes or never paid reduced rate NI contributions.....	23
Figure 3.8	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: men aged 50 to SPA in 2002/03, by whether sometimes or never earned NI credits .....	25
Figure 3.9	Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by whether sometimes or never earned NI credits .....	26

Figure 3.10	Distribution of absolute errors in estimated accrued state pension wealth, all aged 50 to SPA in 2002/03, by sex.....	27
Figure 3.11	Distribution of absolute errors in estimated accrued state pension wealth, men aged 50 to SPA in 2002/03, by age group .....	28
Figure 3.12	Distribution of absolute errors in estimated accrued state pension wealth, men aged 50 to SPA in 2002/03, by current marital status .....	29
Figure 3.13	Distribution of absolute errors in estimated accrued state pension wealth, women aged 50 to SPA in 2002/03, by age group .....	29
Figure 3.14	Distribution of absolute errors in estimated accrued state pension wealth, women aged 50 to SPA in 2002/03, by current marital status .....	30
Figure 4.1	Earnings profile for couples from 1975 to 2002, by cohorts (in 2002 prices) .....	35
Figure 4.2	Earnings profile for single men from 1975 to 2002, by cohorts (in 2002 prices) .....	35
Figure 4.3	Earnings profile for single women from 1975 to 2002, by cohorts (in 2002 prices).....	36
Figure 4.4	Cumulative distribution of total lifetime earnings (up to UEL) per head from 1975 to 2002 (measured in 2002 earnings terms).....	37
Figure 4.5	Cumulative distribution of weekly retirement income (per head) in 2002 .....	38
Figure C.1	Distribution of accrued state pension wealth, estimates using ELSA data only compared with those utilising information from NI records – men aged 50 to SPA in 2002/03.....	53
Figure C.2	Distribution of accrued state pension wealth, estimates using ELSA data only compared with those utilising information from NI records – women aged 50 to SPA in 2002/03 .....	54
Figure C.3	Distribution of accrued BSP wealth: estimates using ELSA data only compared with those utilising information from NI records, all aged 50 to SPA in 2002/03 .....	54
Figure C.4	Distribution of accrued S2P wealth: estimates using ELSA data only compared with those utilising information from NI records, all aged 50 to SPA in 2002/03 .....	55
Figure C.5	Distribution of errors in estimated accrued state pension wealth, all aged 50 to SPA in 2002/03, by component of state pension wealth.....	55
Figure C.6	Distribution of absolute errors in estimated accrued state pension wealth, all aged 50 to SPA in 2002/03, by component of state pension wealth.....	56

# Acknowledgements

We are grateful to James Banks and Paul Johnson for useful comments and to numerous individuals, including those at Capgemini, Department for Work and Pensions (DWP), HM Revenue & Customs (HMRC), National Centre for Social Research (NatCen), for making the link to English Longitudinal Study of Ageing (ELSA) respondents' National Insurance contribution records happen. Co-funding towards setting up the data provided by the IFS Retirement Saving Consortium is also gratefully acknowledged. The Consortium comprises the Association of British Insurers, Bank of England, Barclays, Chartered Institute of Personnel and Development, Department for Work and Pensions, Financial Services Authority, HMRC, HM Treasury, Investment Management Association, the Pensions Regulator, Personal Accounts Delivery Authority, Scottish Widows and The Actuarial Profession. Additional co-funding from the ESRC-funded Centre for the Microeconomic Analysis of Public Policy at the Institute for Fiscal Studies (IFS) (grant number RES-544-28-5001) is also gratefully acknowledged. ELSA is funded by the National Institute of Aging and a consortium of UK government departments. The data were supplied by the ESRC Data Archive and the copyright is held jointly by IFS, the National Centre for Social Research and University College London. Responsibility for interpretation of the data, as well as for any errors, is the authors' alone.



# The Authors

**Antoine Bozio** is a senior research economist at the Institute for Fiscal Studies.

**Rowena Crawford** is a research economist at the Institute for Fiscal Studies.

**Carl Emmerson** is deputy director of the Institute for Fiscal Studies and programme director of their work on pensions, saving and public finances.

**Gemma Tetlow** is a senior research economist at the Institute for Fiscal Studies.

# Abbreviations

BSP	Basic State Pension
ELSA	English Longitudinal Study of Ageing
HRP	Home Responsibilities Protection
NI	National Insurance
NINO	National Insurance Number
SERPS	State Earnings Related Pension Scheme
SPA	State Pension age
S2P	State Second Pension
UEL	Upper Earnings Limit



# 1 Introduction

Recent years have seen greater than expected increases in life expectancies, and weaker than expected investment returns. Furthermore, the level of income that an individual who was on average earnings throughout their working life could expect to get from state pensions, in proportion to their working life earnings, peaked for those reaching State Pension age (SPA) in about 2000.<sup>1</sup> (Recent reforms in the Pensions Act 2007 will probably halt the decline in state pension income relative to working life earnings for 'average earners' but will not see the state pension replacement rate increase to the level available for earlier cohorts.) Against this backdrop it is perhaps unsurprising that the focus of UK pension policy has been the adequacy – or otherwise – of working age individuals' provision for their own retirement. Accurate and timely information on the level and distribution of retirement resources, and the characteristics of those who are at greatest risk of not making appropriate retirement saving decisions, are therefore an important ingredient in determining which, if any, reforms might be sensible to pursue. This was acknowledged in the 2002 pensions green paper, *Simplicity, Security and Choice: Working and Saving for Retirement*, which stated that '*it is essential to develop good-quality data about people's saving over time: their assets, and the savings and assets of partners*' (Department for Work and Pensions (DWP), 2002).

As part of continued efforts to improve the evidence base, and thereby to aid public policy decision making, DWP commissioned Institute for Fiscal Studies (IFS) researchers to carry out research to improve estimates of the retirement resources of those approaching retirement. This paper presents the first two outputs from this research. The third, and final, output will be a derived dataset containing some of the key variables that were constructed for the purposes of the studies presented here. We will also be publishing a report in summer 2010 examining in more detail the relationship between individuals' lifetime earnings and their subsequent retirement income. This will build on the work presented in this paper and is funded by the IFS Retirement Saving Consortium (of which DWP is a member).

---

<sup>1</sup> Figures for state pension income as a share of age 50 earnings for example individuals earning at the level of median male earnings in each year of their working life (under pre- and post-Pensions Act 2007 policy) can be found in Figures 7.1 and 7.2 of Bozio, Crawford and Tetlow (2010).

This paper uses new evidence available from a unique UK dataset, which combines information from household survey data on individuals' circumstances at or near retirement with information on their lifetime earnings from administrative records, to look at how retirement incomes relate to lifetime earnings. The English Longitudinal Study of Ageing (ELSA) has interviewed a sample of individuals aged 50 and over every other year since 2002. Respondents to the survey are also asked for permission to link to their National Insurance (NI) records, which are held by HM Revenue & Customs (HMRC). This paper uses data from the first (2002/03) wave of the survey and the linked NI records.

This paper adds to the evidence base on retirement income adequacy and how retirement incomes relate to lifetime earnings in two dimensions. First (in Chapter 3), we use information on individuals' actual entitlements to state pensions to shed light on the groups for whom previous estimates of state pension entitlement, and hence resource adequacy (see Banks, Emmerson, Oldfield and Tetlow, 2005), could be improved upon. Second (in Chapter 4), we compare families' incomes observed in retirement to measures of their earnings during their working lives. In particular, we examine how closely correlated income in retirement is to income during working life and whether the relationship observed differs across groups defined according to various personal characteristics.

The administrative NI records are only available for a (non-random) subsample of all respondents to ELSA. Therefore, before we turn to results based on the matched subsample, we describe (in Chapter 2) the extent to which this matched subsample differs in its observable characteristics from the entire sample. Chapter 5 provides a summary of the findings.

## 2 Representativeness of the English Longitudinal Study of Ageing – NI linked subsample

The English Longitudinal Study of Ageing is a biennial longitudinal survey of a sample of the English population aged 50 and over (plus their partners). The first wave was conducted between April 2002 and March 2003 and sampled 12,099 individuals (of whom 11,391 were core sample members) from 7,934 households. There are currently four waves of data available.

Respondents to ELSA are asked for permission to link their NI records to the survey data. If respondents do not initially give consent, they are asked again in subsequent waves of the survey; those who have given consent are also allowed subsequently to withdraw it. Those who do give consent are asked for their National Insurance Number (NINO).

Matching with the NI records was carried out by Capgemini under the auspices of the Aspire partnership.<sup>2</sup> For those individuals who gave consent and a valid NINO, a match with the NI records was done using their NINO. For those who gave consent but did not give a valid NINO, a match was attempted using their date of birth and sex. For cases where date of birth and sex provided more than one possible match, this was further refined using the first three letters of their surname. If this still did not produce a unique match, their postcode was also used. Despite these various methods used to find matching records, some respondents still could not be matched.

This chapter documents which of the wave 1 core sample members have been successfully matched to their NI records (henceforth the 'matched subsample') and whether unsuccessful matches were because the respondent did not give

---

<sup>2</sup> For details see <http://www.uk.capgemini.com/aspire/>

their consent to a match taking place or whether it was because the respondent gave consent but a successful match was not found. There is a final group of individuals who were never asked for permission to link to their administrative records; in almost all cases, this was because the survey was answered by a proxy respondent.

Since we only have information from NI records for just under three-quarters of the ELSA respondents, it is important to compare the characteristics of those who were successfully matched with those who did not give permission for the link, could not be matched, or were not asked for permission. Any statistically significant differences between these groups could have implications for further analysis using these data. In particular, they would imply that conclusions drawn from looking just at those for whom NI records were available might not be applicable to the ELSA sample as a whole and thus, perhaps more pertinently, to the whole of the older English household population.

This chapter begins by documenting the overall response rate and univariate analysis of which observed characteristics are relatively more or less common among the matched subsample (Section 2.1). It then goes on to present results from multivariate analysis (Section 2.2). Finally, for those individuals currently in couples, it examines which characteristics are relatively more or less common among the couples for whom information from NI records on both individuals within the couple are available (Section 2.3).

## 2.1 Individual level univariate analysis

Among wave 1 respondents, 79.0 per cent ultimately gave their permission for the NI record link and 71.8 per cent have been successfully linked. Among those not linked, the most common reason was that the respondent did not consent to the link being done, although there was a not insubstantial minority of respondents who gave consent but for whom a successful match was not possible. A small number of individuals were never asked for permission – in most of these cases this was because the survey was conducted by a proxy respondent (who is not asked to provide consent for the link to NI records to be done). Table 2.1 describes the division of the ELSA wave 1 survey respondents into the various linkage groups.

**Table 2.1 Linkage groups**

	Frequency	Percentage
All (full ELSA sample)	11,391	100.0
Successfully linked	8,177	71.8
Not linked	3,214	28.2
<b>of which</b>		
Data problems	824	7.2
Did not give consent	2,180	19.1
Were not asked	210	1.8

Tables 2.2 and 2.3 summarise the proportion of individuals with various characteristics and average income and wealth in each linkage group. Differences between the proportions imply that there is some non-randomness in the selection of individuals into each group and therefore, in particular, indicates some of the dimensions in which the matched subsample are not representative of ELSA respondents more generally.

**Table 2.2 Summary of the differences in average observed characteristics, by linkage group**

	Full ELSA (1)	Successfully linked (2)	Data problems (3)	No consent (4)	Not asked (5)
	Proportion of sample				
Female	54.5	53.3*	60.4	56.6	53.3
Age 50 to 54	17.4	18.5*	16.1	14.8	7.1
Age 55 to 59	19.2	20.2*	18.3	16.1	12.9
Age 60 to 64	14.8	15.5*	10.8	14.1	11.9
Age 65 to 69	15.0	15.4	10.1	15.5	14.3
Age 70 to 74	12.9	12.9	10.6	13.9	11.4
Age 75 to 79	9.6	9.3	9.5	10.9	10.5
Age 80 to 84	7.1	5.6*	13.2	9.4	15.2
Aged 85 and over	4.0	2.6*	11.4	5.2	16.7
Single	5.5	5.3	6.4	6.1	7.6
Married	66.5	68.5*	60.8	61.1	65.2
Separated or divorced	10.5	10.9*	9.1	10.2	3.8
Widowed	17.5	15.4*	23.7	22.7	23.3
Employed	28.9	31.1*	26.8	22.3	14.3
Self-employed	6.8	6.2*	6.6	9.2	4.8
Retired	47.9	46.7*	46.5	52.8	48.1
Unemployed	0.9	0.9	0.7	0.7	1.4
Permanently sick/disabled	6.3	6.3	5.9	5.4	20.5
Looking after family/home responsibilities	8.7	8.3	12.6	8.9	8.6
Other activity	0.6	0.5	0.8	0.7	2.4

Continued



Table 2.2 Continued

	Full ELSA (1)	Successfully linked (2)	Data problems (3)	No consent (4)	Not asked (5)
	Proportion of sample				
Not worked since 1948 <sup>a</sup>	0.1	0.0*	0.4	0.1	0.2
Degree	11.0	11.3	10.6	10.8	6.2
Higher	10.9	11.1	11.0	10.2	9.5
A level	5.9	6.2	5.8	5.2	3.3
O level	15.7	16.4	13.1	14.7	5.7
CSE	4.8	5.0	4.1	4.8	3.3
Foreign qualifications	8.6	8.6	7.9	9.4	7.6
No qualifications	42.7	41.4*	47.3	44.8	53.8
Owner-occupier	79.4	79.7	76.3	80.0	79.4
Excellent health	12.5	13.3*	10.8	11.1	2.9
Very good health	28.4	29.6*	27.8	26.2	8.1
Good health	30.8	30.8	33.1	32.1	8.1
Fair health	19.2	19.0	19.3	21.1	7.1
Poor health	7.5	7.1	8.9	8.6	6.7
Missing health data	1.5	0.2*	0.1	0.9	67.1

\* Indicates the difference between the mean among those successfully matched and those not successfully matched is statistically significantly different from zero at the 95 per cent confidence interval.

<sup>a</sup> Excludes those individuals who had worked at some stage but were unable to report the end date of their last job.

Relative to the whole ELSA sample (shown in the column headed '1') the matched subsample (shown in the column headed '2') contains slightly more individuals who: were men rather than women; were younger rather than older; were married or separated rather than widowed; had done some paid work since 1948; were currently employed or self-employed rather than retired; reported being in excellent or very good health rather than having missing health data (the predominant reason for not having answered the self-rated health question is that the interview was answered by a proxy respondent<sup>3</sup>); and had some, rather than no, formal educational qualifications. They were also found, on average, to have

<sup>3</sup> On average, those who required a proxy interview were in worse health than those who did not require proxy interviews. For example, 62 per cent of those who required a proxy interview were reported to have limiting long-standing illness, compared with just 34 per cent of those who did not require a proxy interview.

higher levels of earned income, higher levels of private pension income and higher levels of total income. All of these differences were statistically significant at the five per cent level (as denoted by \* in column 2 of Tables 2.2 and 2.3).

**Table 2.3 Summary of the differences in average income and wealth, by linkage group**

	Full ELSA (1)	Successfully linked (2)	Data problems (3)	No consent (4)	Not asked (5)
	Mean				
Employment income (£ pa)	6,651	7,140*	6,729	5,087	3,475
Self-employment income (£ pa)	1,473	1,463	1,968	1,402	652
State pension income (£ pa)	3,526	3,451	3,502	3,712	4,586
Private pension income (£ pa)	3,410	3,563*	2,649	3,140	3,256
Total equivalised income <sup>a</sup> (£ pa)	12,718	12,893*	12,845	12,195	10,858
Total net (non-pension) wealth <sup>a</sup> (£)	205,944	201,311	213,373	223,085	180,054

\* Indicates the difference between the mean among those successfully matched and those not successfully matched is statistically significantly different from zero at the 95 per cent confidence interval.

<sup>a</sup> Income/wealth of the individual and, where relevant, their partner.

Tables 2.2 and 2.3 also provide information on the characteristics of individuals for whom information from the NI records are not available, split by the broad reason for why these data are not available.

The characteristics of the group that gave permission but could not be linked due to data problems are shown in the column headed '3' in each of Tables 2.2 and 2.3. This reveals that, relative to all ELSA respondents, this group contained a higher proportion of females, single and widowed individuals, those currently looking after the home or family, those who had not worked since 1948, and those with no formal qualifications. This group had a lower proportion of married individuals, employed individuals, and those in owner-occupied housing. The majority of these differences stem from the individuals in this group being generally older. If individuals over the age of 75 are excluded then (as shown in Table A.1) there are actually slightly fewer females, and fewer widows, in the group who were not matched due to data problems compared with the whole ELSA sample.

The group that did not give consent – which is the most common reason for information from the NI records not being available – (shown in the column headed '4' of Tables 2.2 and 2.3) is slightly older on average, and contains a higher proportion of individuals who are widowed and a lower proportion of individuals who are currently married. The other key difference is that those who are currently self-employed comprise a higher proportion of the group who did not consent to their NI records being linked than they do the ELSA sample as a whole.

If we exclude widows and the self-employed from the sample and then compare the characteristics of those who did not give consent to those of the rest of the ELSA sample (as shown in Table A.2), we find that those who did not consent tended to be slightly older. This results in a higher proportion of retired individuals and people with fair or poor health in the group who did not give consent (as shown in Table 2.2). Income from all sources is slightly lower on average for the group who did not give consent than the full ELSA sample, although total wealth tends to be higher (Table 2.3).

Finally, some individuals were not asked for consent to be matched to their NI records. In two-thirds of these cases this was because the ELSA questionnaire was being answered by a proxy respondent. (This also explains why such a high percentage of these individuals also have missing self-reported general health in Table 2.2.) Those who were not asked for consent are not a random sample; they are in much poorer than average health, are generally older and have lower levels of total wealth. This pattern can be seen in the columns headed '5' of Tables 2.2 and 2.3, which detail the characteristics of all of those not asked for consent.

## 2.2 Individual level multivariate analysis

The previous section documented average observed characteristics of groups defined by whether or not information from the linked NI records is available. This analysis took each characteristic one at a time and highlighted the statistically significant differences. However, in many cases it could be that one factor in particular is driving many of the differences. For example, those for whom information from the linked NI records is available were found to be younger, on average, than the whole ELSA sample and were also found to be more likely to be married rather than widowed, to have been in paid work at some point since 1948 than not, and to have some formal qualifications rather than none. But all of these factors could be driven by the difference in age: younger individuals will be more likely to have been in paid work since 1948 (due to later generations of women having higher rates of participation in the labour market), less likely to be widowed (yet), and will also be more likely to have received formal education qualifications (because, for example, minimum school leaving ages have risen over time).

**Table 2.4 Multivariate analysis of the observed characteristics associated with being successfully matched with the NI records (individual level)**

	Marginal effect	Standard error
Female	-0.022**	0.009
Age 55 to 59	-0.005	0.015
Age 60 to 64	-0.022	0.018
Age 65 to 69	-0.042*	0.023
Age 70 to 74	-0.057**	0.024
Age 75 to 79	-0.072***	0.026
Age 80 to 84	-0.167***	0.030
Age 85 and over	-0.248***	0.036
Single	-0.042*	0.020
Separated or divorced	-0.004	0.015
Widowed	-0.023*	0.014
Self-employed	-0.118***	0.023
Retired	0.002	0.016
Sick or disabled	0.030	0.022
Unemployed	0.039	0.048
Looking after family/home responsibilities	-0.014	0.020
Other activity	-0.002	0.066
Not worked since 1948	-0.218***	0.055
Higher	0.004	0.018
A level	0.032	0.021
O level	0.035**	0.017
CSE	0.020	0.023
Foreign qualifications	0.008	0.020
No qualifications	0.012	0.016
Owner-occupier	-0.019	0.011
Very good health	-0.014	0.015
Good health	-0.046***	0.015
Fair health	-0.045***	0.017
Poor health	-0.082***	0.024
Missing health data	-0.578***	0.060
Private pension income (£'000 per year)	0.003***	0.001
State pension income (£'000 per year)	0.004**	0.002
Employment income (£'000 per year)	0.001**	0.001
Self-employment income (£'000 per year)	0.001**	0.001
Total equivalised income <sup>a</sup> (£'000 per year)	-0.002**	0.001
Total net (non-pension) wealth <sup>a</sup> (£'00,000)	-0.004***	0.001

The reference group is men aged 50-54, who are married, employed, do not own their own home and are in excellent health.

Sample size = 10,809, pseudo R<sup>2</sup> = 2.9 per cent.

Statistical significance denoted by \*\*\*, \*\* and \* for the one per cent, five per cent and ten per cent levels of significance respectively.

<sup>a</sup> Income/wealth of the individual and, where relevant, their partner.

Therefore, this section presents the results from multivariate analysis in order to investigate the effects of different observed individual characteristics on the likelihood that an ELSA respondent's NI records were successfully matched after controlling for other observed background characteristics. A probit model is used to identify the association between the probability of an individual being successfully linked and each characteristic with all other characteristics held constant. Table 2.4 shows the list of explanatory variables, their estimated marginal effects and the associated standard errors.

Older age is associated with a diminished likelihood of being successfully linked. Individuals aged 70 and over are statistically significantly less likely to have been successfully linked, and this negative effect is greater at successively older ages. Older individuals had more data problems, which could be because it has been longer since their NI records were accessed and individuals may be more likely to have moved address without informing the relevant authorities. There also seems to be some indication that older people are simply less likely to grant consent, maybe because they are more concerned about disclosing personal details than younger individuals are.

Currently, married individuals are more likely to be successfully linked (shown by the negative associations for singles, those who are separated or divorced and those who are widowed). This is because married individuals are less likely to have missing data, possibly because they move home less often. Married individuals are also slightly more likely to give consent for their data to be linked.

The self-employed were statistically significantly less likely to be successfully linked – by 11.8 percentage points in Table 2.4 – although this association decreases as self-employment income increases. The former relationship is due to the self-employed being simply less likely to grant consent, and also due to the self-employed being slightly less likely to be successfully linked even if they do give consent.

Those who reported not having been in paid work at any point since 1948 are much less likely to have been successfully linked to the administrative data (21.8 percentage points less likely, as shown in Table 2.4). These individuals would be harder to link to NI records since (if it is true that they have not been in paid work at any point since 1948) they will not have paid NI contributions at any point. They were also less likely to consent to the data link although this could be because they did not see the point of doing so as they knew they had no contribution history. The under-representation of those who have not worked since 1948 is of lesser importance since there is likely to be little information contained in these individuals' NI records, if they exist at all.

Poor health is statistically significantly negatively associated with being successfully linked. Very poor health will have made it more likely that the individual required a proxy respondent for the ELSA survey and therefore was not asked for consent to link the administrative data (this is highlighted by the fact that those with missing

self-reported general health, which will be true of all those with a proxy interview, were 57.8 percentage points less likely to have been successfully matched). Individuals with poor health also seem to be less likely to grant consent for the link.

Those with higher income and those with higher non-pension wealth are also found to be less likely to be successfully matched to their NI records.

## 2.3 Analysis of couples

For some analyses, information about both individuals in a couple may be required. For example, the living standards of a couple in retirement might be explained by the earnings and employment histories of both individuals rather than that of one or other of the partners. Sections 2.1 and 2.2 documented the extent to which different individual characteristics (including current marital status) were associated with whether or not linked information from the NI records was available. This section considers linkage at the level of the couple. For this analysis only those currently in couples are considered, with 'successful linkage' being defined as whether or not both members of the couple were successfully linked to the information in their NI records.

There is a high degree of correlation between the linkage group of an individual and that of their partner, as is shown in Table 2.5. Among those in couples who were matched successfully to the NI records, 82.9 per cent of their partners were also matched (compared with 70.2 per cent of those in couples more generally). It is clear that one member of a couple not being matched for a particular reason is also strongly associated with the other member of the couple also not being matched for the same reason. Specifically: of those who gave consent but who could not be matched, 21.6 per cent of their partners also gave consent but could not be matched (compared with just 6.4 per cent more generally); of those who refused consent, nearly two-thirds (65.5 per cent) of their partners also refused consent (compared with 15.9 per cent more generally); and of those not asked for consent, 12.3 per cent of their partners were also not asked for consent (compared with 1.8 per cent more generally).

**Table 2.5 Correlation of NI linkage group within couples**

	Partner's NI linkage group				Non-responding partner
	Matched	Data problems	Refused consent	Not asked	
Matched	82.9	6.1	4.8	1.3	4.9
Data problems	66.0	21.6	6.1	1.1	5.1
Refused consent	19.7	2.4	65.5	3.0	9.4
Not asked	52.1	2.7	30.1	12.3	2.7
All	70.2	6.4	15.9	1.8	5.7

Sample size = 7,830. Those in couples only.

The extent to which this varies by different observed characteristics, holding all other characteristics constant, is documented in Table 2.6, which presents the results of a multivariate probit (analogous to those presented in Table 2.4). Among those in couples, older age was associated with information from the NI records of both partners being less likely to be available. This is also found to be true of those who reported that they had not been in paid work since 1948, those who are not owner-occupiers and those reporting less than excellent health (the omitted health category in this probit). As before, those with missing self-reported general health – which will be true of all those with a proxy respondent – are much less likely to be in a couple that is successfully matched.

**Table 2.6 Multivariate analysis of the characteristics associated with being successfully matched with the NI records (couple level, couples only)**

	Marginal effect	Standard error
Female	-0.031**	0.012
Age 55 to 59	-0.021	0.018
Age 60 to 64	-0.014	0.021
Age 65 to 69	-0.040	0.029
Age 70 to 74	-0.055*	0.032
Age 75 to 79	-0.127***	0.035
Age 80 to 84	-0.215***	0.040
Age 85 and over	-0.279***	0.055
Self-employed	-0.105***	0.026
Retired	0.022	0.020
Sick or disabled	0.078**	0.028
Unemployed	0.047	0.068
Looking after family/home responsibilities	0.042*	0.023
Other activity	-0.001	0.098
Not worked since 1948	-0.226*	0.115
Higher	0.013	0.023
A level	0.018	0.027
O level	0.017	0.021
CSE	0.027	0.029
Foreign qualifications	-0.008	0.026
No qualifications	0.006	0.020
Owner-occupier	0.047***	0.018
Very good health	-0.032*	0.019
Good health	-0.043**	0.019
Fair health	-0.034	0.022
Poor health	-0.054*	0.030
Missing health data	-0.490***	0.062
Private pension income (£'000 per year)	0.004***	0.001
State pension income (£'000 per year)	0.008***	0.003
Employment income (£'000 per year)	0.002***	0.001
Self-employment income (£'000 per year)	0.002***	0.001
Total equivalised income <sup>a</sup> (£'000 per year)	-0.003***	0.001
Total net (non pension) wealth <sup>a</sup> (£'00,000)	-0.005***	0.002

Sample size = 7,485, pseudo  $R^2$  = 2.0 per cent.

Statistical significance denoted by \*\*\*, \*\* and \* for the one per cent, five per cent and ten per cent levels of significance respectively.

<sup>a</sup> Income/wealth of the individual and their partner.



## 2.4 Conclusions

Overall the matched subsample is broadly representative of the entire ELSA sample. However, there are some observed characteristics that are found to be associated with whether or not an individual has been successfully matched, which could have implications for certain pieces of future analysis using these data. In particular, older people in the sample are less likely to have been successfully matched to their NI records, especially those at the very oldest ages. Because of the different characteristics of the older people in the sample compared with the sample as a whole, this means that females, retired individuals, those claiming state pensions, those with no formal qualifications, those in poor health and those who have not worked since 1948 are slightly under-represented in the matched subsample. The under-representation of those who have not worked since 1948 is of lesser importance, since there is likely to be little information contained in these individuals' NI records, if they exist at all.

Aside from the age differences (and their related effects) there are two other notable differences between the matched subsample and the full ELSA sample. Married individuals are somewhat more likely to have been successfully matched, while the self-employed are less likely to appear in the matched subsample. However, these differences in characteristics are generally small and, unless specific subgroups are of interest (such as certain age groups or the currently self-employed), the matched subsample can be considered representative of the individuals in the full ELSA sample. All researchers using the matched data should, however, consider the impact that any unrepresentativeness of the subsample might have on their analysis, particularly if certain subgroups are of interest (such as the self-employed).

### 3 Accuracy of previous state pension wealth estimates

One key component of individuals' potential future retirement income is that which they will receive from their state pensions. Individuals' NI records contain exactly the information required to calculate the amount of state pension to which they will be entitled (since this is one of the main purposes for which these records are held by government). As it took some time to extract the data on NI contributions from the administrative data, initial work looking at the potential adequacy of future retirement resources (Banks, Emmerson, Oldfield and Tetlow, 2005) was based on an estimate of state pension entitlement, rather than the figure implied by their administrative records.

These previous estimates of pension wealth, using data on respondents to the first (2002/03) wave of ELSA, were based on relatively limited information on employment histories and no information on prior earnings. While these are not particularly important for estimates of private pension wealth, which typically depend mainly on either current fund value or on pension tenure, final salary and scheme rules, the calculation of accumulated entitlement to state pensions can depend on past earnings. Entitlement to the State Earnings Related Pension Scheme (SERPS and, since April 2002, the State Second Pension, S2P) depends on NI contributions paid in each year since April 1978.

This chapter assesses the accuracy of the estimates of accrued rights to state pensions that were produced before information from the NI records was available by comparing them to true state pension entitlements calculated using individuals' NI records.<sup>4</sup> This is done only for individuals aged between 50 and the SPA. (For those who were already receiving their state pension when they responded to ELSA, their total entitlements can be estimated relatively straightforwardly using the amount of state pension income they reported receiving when interviewed.)

---

<sup>4</sup> The methodology for the previous estimates is documented in full in Banks, Emmerson and Tetlow (2005) and a comprehensive description of the implications of these entitlements, along with assessed accrued private pension rights and other potential sources of retirement resources on retirement incomes is provided in Banks, Emmerson, Oldfield and Tetlow (2005).

The findings in this chapter could inform future analysis in two ways: First, future analysis that used the existing estimates of accrued state pension entitlements, which are available for all ELSA respondents (since those computed using NI records are, by definition, only available for the subset of respondents who were successfully matched), might wish to consider how accurate, or otherwise, these estimates are. Second, any future work on estimating state pension entitlements (using information from ELSA, or indeed from another dataset) could use the analysis here to see whether the assumptions previously used could be improved upon.

The earlier calculation of state pension wealth estimated the discounted present value of accrued rights to future income from the basic state pension (BSP), SERPS and S2P for respondents to the first (2002/03) wave of ELSA. In order to compute these estimated state pension entitlements, information from ELSA on current earnings, date last worked (if not currently in work) and the dates of birth of children was used. Unfortunately, information was not available on the employment and earnings histories of individuals so assumptions were made in order to compute each individual's state pension entitlement.

For the subset of individuals for whom information from the NI records are now available it is possible to calculate accurately accrued state pension entitlements using the **actual** history of employment and earnings and also to take into account periods where NI contributions were paid on the individuals behalf (for example due to a period of receipt of unemployment or disability benefit) or periods where the individual qualified for Home Responsibilities Protection (HRP).<sup>5</sup>

All of the analysis in this chapter is based on those ELSA respondents for whom information from their NI records is available. Section 3.1 compares the estimated distribution of accrued state pension rights (as discussed in Banks, Emmerson and Tetlow, 2005) to the true distribution, with separate analysis by sex. Section 3.2 compares the distribution of percentage errors in the previous estimate, with separate analysis by sex, age group and current marital status. Since low average errors could potentially be due to large positive and negative errors offsetting and large percentage errors could reflect small absolute differences but with a relatively small base, Section 3.3 examines the distribution of average absolute errors measured in pounds sterling (£), again with the analysis being split by sex, age group and current marital status.

### 3.1 Distribution of accrued state pension rights

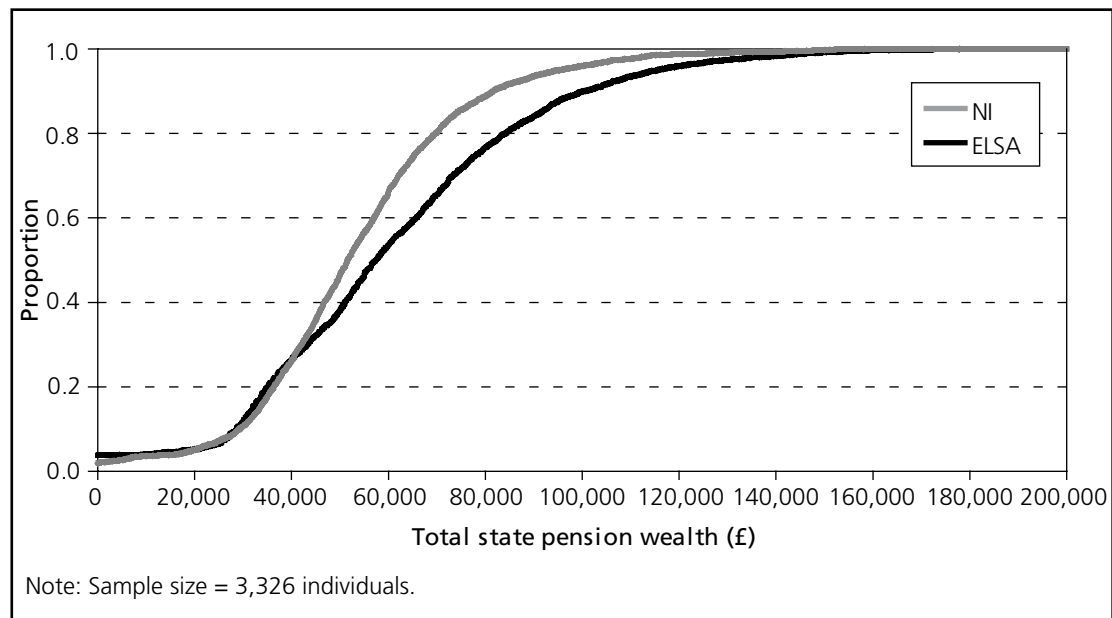
The calculation of accrued state pension rights is described in Appendix B. The distribution of estimated accrued state pension rights among those aged 50 to the SPA, alongside actual entitlements computed using information from the NI records of the same individuals, is shown in Figure 3.1. Summary statistics of

---

<sup>5</sup> Home Responsibilities Protection was available from 6 April 1978 to 5 April 2010. It was designed to help to protect the basic State Pension position of people whose opportunities to work were limited because of caring responsibilities at home.

these two distributions can be found in Table C.1. The two distributions are very similar up to around the 30th percentile after which they start to diverge, with the distribution of estimated state pension rights being above that of true state pension rights. For example, the 25th percentile of estimated state pension rights is £38,900, which is almost identical to the £39,200 that was computed using information from the NI records. In contrast, median estimated rights are £57,400, which is 11 per cent above median rights from the NI records of £51,500.

**Figure 3.1 Distribution of accrued state pension wealth: estimates using ELSA data only compared with those utilising information from NI records, all aged 50 to SPA in 2002/03**



The two distributions are shown separately for men and women in Figures C.1 and C.2, respectively. In general, the difference between the two distributions is larger for men than for women. However, state pension entitlements were also estimated to be zero for slightly too many women when the ELSA data alone was used.

It is also possible to compare separately the distribution of accrued BSP wealth and the distribution of accrued S2P wealth from both the original ELSA estimates and those computed using information from the NI records. These are shown in Figures C.3 and C.4. It is clear that the distributions are more similar for accrued BSP wealth and less similar for accrued second-tier state pension wealth. This is perhaps not surprising because estimating second-tier state pension wealth is naturally harder than estimating entitlements to the BSP; the former requires estimates of earnings and contracted out status for each year back to 1978, whereas the latter only requires an estimate of whether a NI contribution was made.<sup>6</sup>

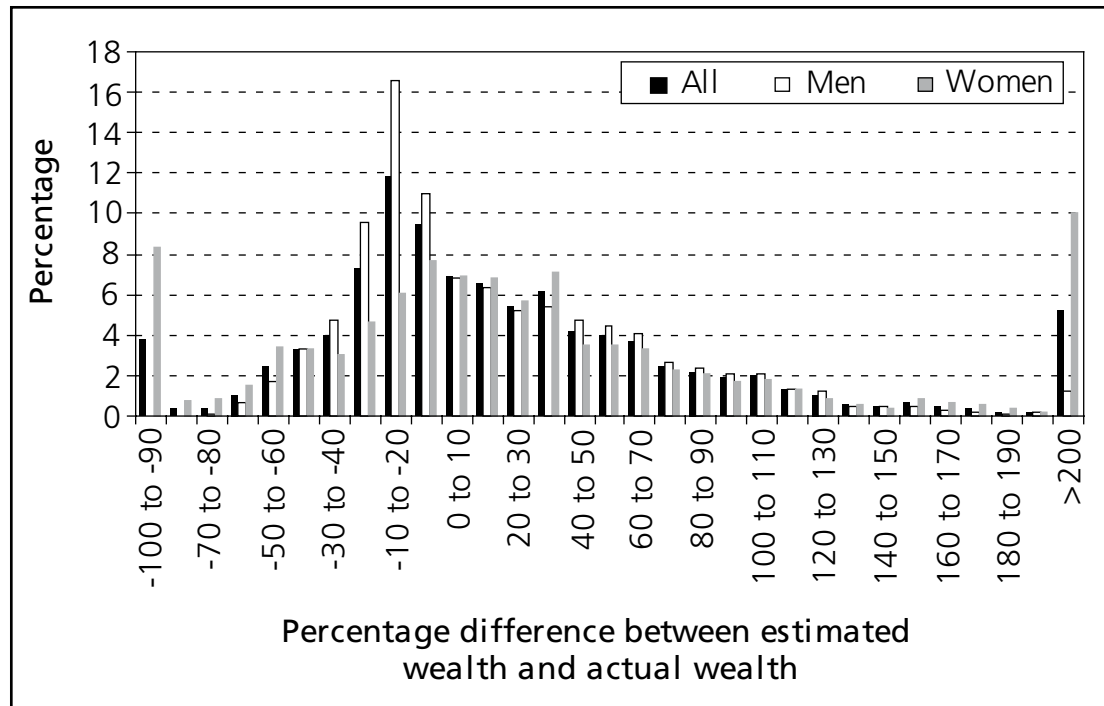
<sup>6</sup> BSP entitlement also requires an estimate of whether the individual qualified for HRP and, for women, whether or not they had elected to pay the reduced rate of NI for married women (also known as the 'half stamp').

### 3.2 Average errors in estimated state pension entitlements

Even if the distribution of estimated accrued state pension rights using only the information available from the ELSA survey had matched the distribution of accrued rights computed using information from the NI records, this would not necessarily imply that the estimates were accurate for each individual in the survey. Rather it could be that there were a number of positive and negative errors in the estimated entitlements that were, in the overall distribution, offsetting each other. This section takes the difference between the previously estimated and actual state pension entitlements at the individual level and describes the distribution of these differences.

The distribution of the previous over-estimate of state pension wealth (as a percentage of actual state pension wealth), split by sex, is shown in Figure 3.2 – in other words, negative values imply that the previous estimate of accrued state pension wealth was lower than the actual wealth calculated from the NI records, while positive numbers indicate that the previous estimate was higher than actual accrued wealth. The most common error is for the estimated state pension entitlement to have been slightly below the actual accrued level of rights (the graph shows the difference between estimated rights and actual rights as a percentage of actual rights and the most common difference is between –10 and –20 per cent). This is despite the fact that, as shown in the previous section, there was a tendency for too many people to be estimated to have had state pension entitlements above about £41,000. It is also clear from Figure 3.2 that the estimates were typically more accurate – at least in percentage terms – for men than for women: among men the errors are more clustered towards relatively small percentage errors, whereas among women very large percentage under- or over-estimates are actually relatively common (as shown by the spikes at either side of Figure 3.2). The median percentage error, split by sex, age group and current marital status is presented in Table C.2.

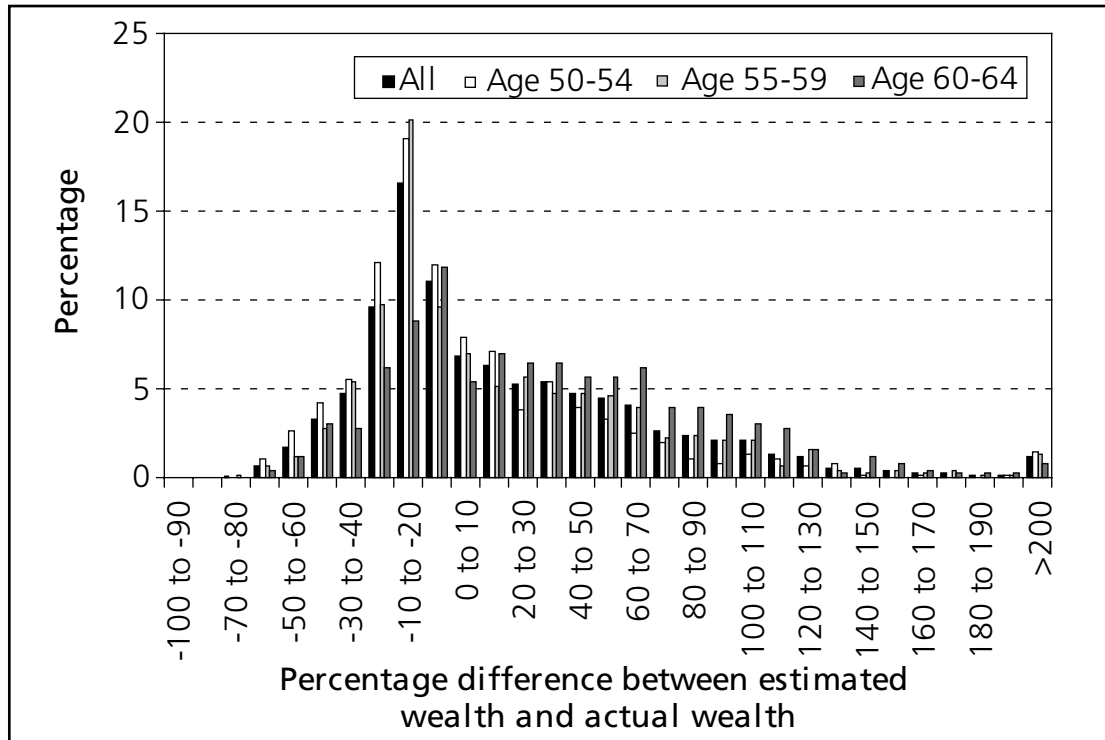
**Figure 3.2** Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: all aged 50 to SPA in 2002/03, by sex



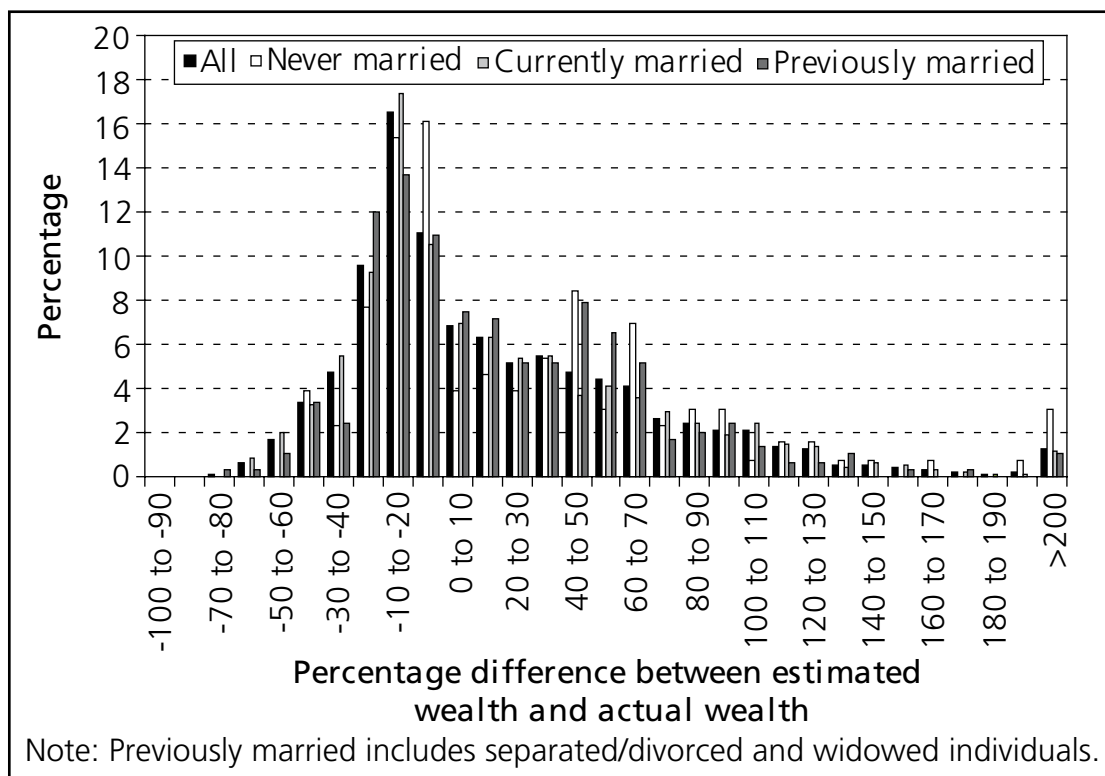
The distribution of the percentage errors for men is broken down by age group in Figure 3.3 and by current marital status in Figure 3.4. The earlier estimates of state pension entitlements, at least in percentage terms, were relatively more accurate among those aged 50 to 54 and those aged 55 to 59 than they were among those aged in the five years up to the SPA. Among this latter group there is a clear tendency for state pension rights to have been over-estimated previously. The fact that the estimates are more accurate for those further from the SPA is perhaps because, for these individuals, their current earnings are more likely to have been a better guide to their earlier earnings, which is an important factor when computing accrued second-tier state pension rights. The estimates for previous earnings were more likely to be inaccurate when individuals had already left the labour market (so there were no current earnings to use as a guide for previous earnings) or where individuals had reduced their hours of work or moved to a less demanding job (so their current earnings were likely to be a poor guide to their earlier earnings). Comparing the errors made for estimates of BSP entitlements to the errors made for estimates of accrued rights to SERPS and S2P (shown in Figure C.5) is consistent with this explanation. The original estimates of accrued BSP entitlements, which do not require an estimate of an individual's earnings history, are found to be relatively more accurate than the estimates of accrued rights to SERPS and S2P, which do require an estimate of earnings for each year back to 1978.

Pension entitlements were previously over-estimated by more for never married and previously married men (either separated or widowed). They are found to have frequently had their entitlement over-estimated by around 40 to 70 per cent.

**Figure 3.3** Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: men aged 50 to SPA in 2002/03, by age group



**Figure 3.4** Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: men aged 50 to SPA in 2002/03, by current marital status

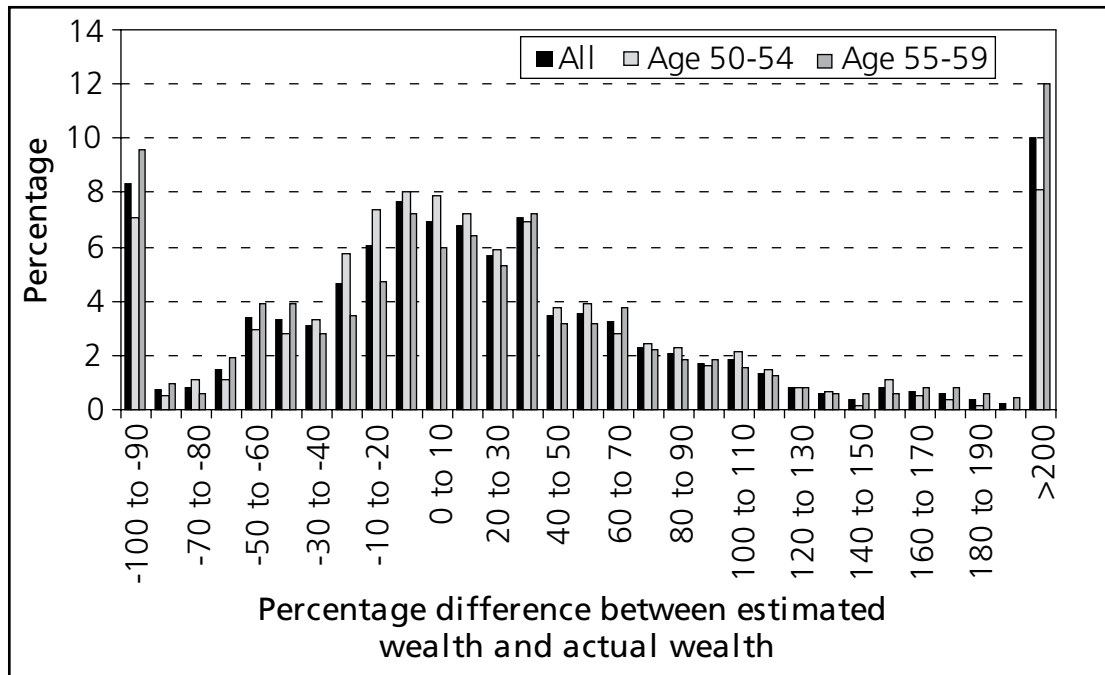


Among women there are large differences in the accuracy of the previous estimates of accrued state pension rights (which used only information from the ELSA survey) depending on marital status. For those who had never been married, the estimated entitlements were relatively more accurate, with the most common error being a tendency to under-estimate slightly the true level of accrued rights and with relatively few very large under- or over-estimates (at least in percentage terms), as was the case for men. For currently married women and previously married women (i.e. those who are now either separated or widowed) large percentage errors are found to be far more common. In particular, state pension entitlements were under-estimated by 90 to 100 per cent for three-in-ten previously married women. For currently married women the most common percentage error was at the other extreme – with almost one-in-eight having their state pension entitlement over-estimated by 200 per cent or more.

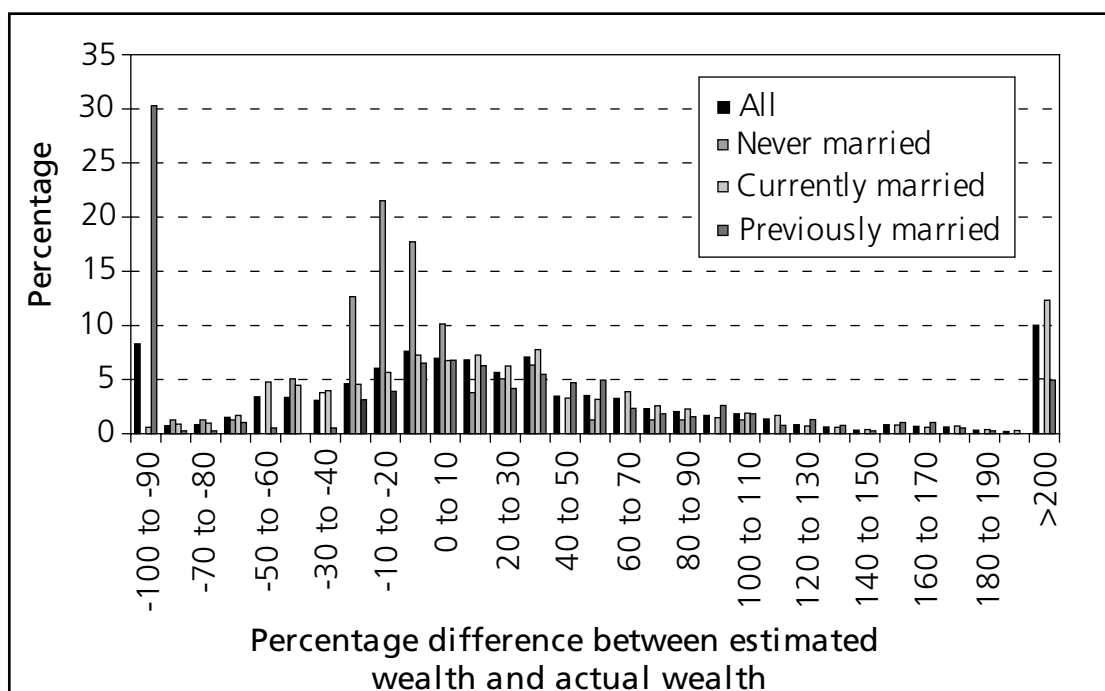
The distribution of percentage errors made in the initial estimates of state pension wealth for women, split by age group and current marital status are shown in Figures 3.5 and 3.6, respectively. As was the case for men, the previous estimates are found to be less accurate for those in the five years before the SPA (55 to 59 in the case of women) than for those who are younger. Again this could be indicative of the difficulty of estimating entitlements to accrued second-tier state pension rights for individuals who had already left the labour market and therefore for whom no measure of current earnings was available in order to estimate what earlier earnings might have been. Indeed large percentage errors (both negative and positive) are much less common when looking at estimated accrued rights to the BSP than with estimated accrued rights to SERPS and S2P, as shown in Figure C.5 (note, however, that since many will have small entitlements to S2P large percentage errors arising despite small absolute errors will be more likely to occur than with estimated accrued BSP wealth).



**Figure 3.5** Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by age group



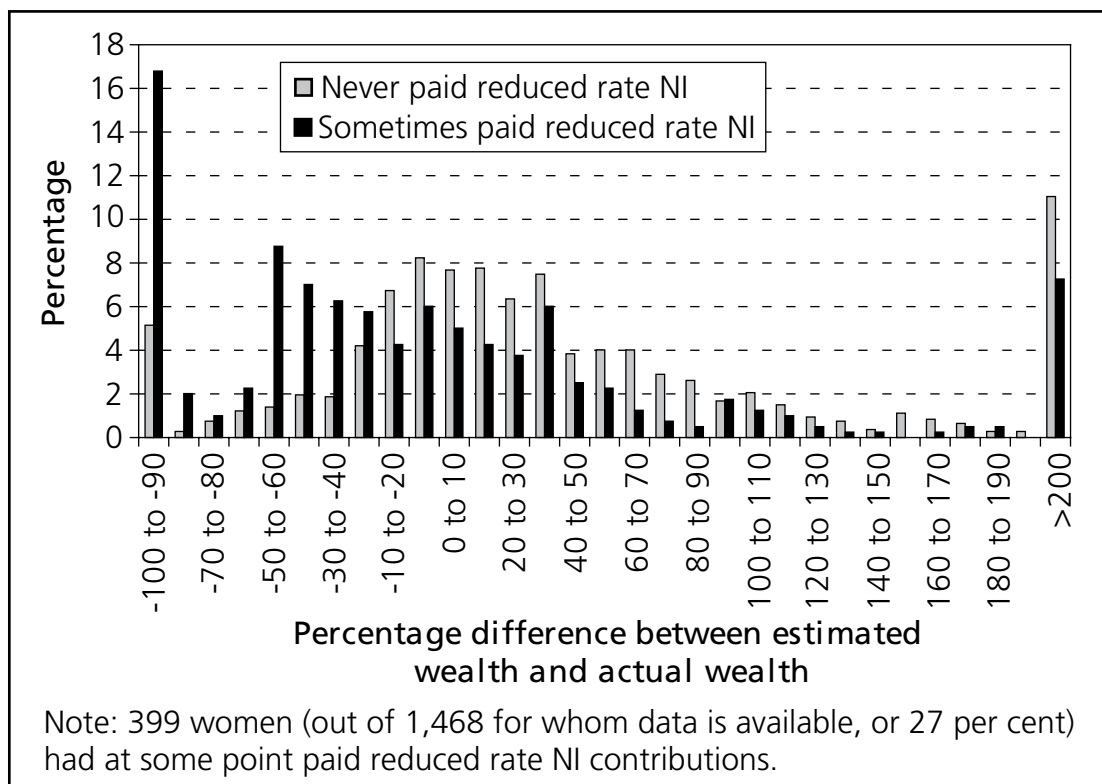
**Figure 3.6** Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by age group



Note: Previously married includes separated/divorced and widowed individuals.

Accrued state pension wealth for women will be affected by whether or not they had paid the married women's reduced rate of NI (sometimes known as the half stamp) at any point between 1975 and 2002. Women do not accrue entitlement (in their own right) to state pensions during any periods when they paid reduced rate NI contributions. Figure 3.7 shows the distribution of errors in estimated state pension wealth for women, split by whether or not the NI records show that they had ever paid reduced rate NI contributions. Figure 3.7 suggests that the previous estimates of state pension wealth tended to under-estimate the state pension entitlement of those women who had, at some point, paid the reduced rate of NI. This is what we would expect given the assumptions made in calculating the previous estimates. The earlier estimates assumed that women had always paid the reduced rate of NI if they reported ever having paid it; this means the earlier estimates of BSP entitlement will have been the lowest possible amount that these women could have had (given what we had assumed about their husbands' entitlement, where applicable).

**Figure 3.7 Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by whether sometimes or never paid reduced rate NI contributions**



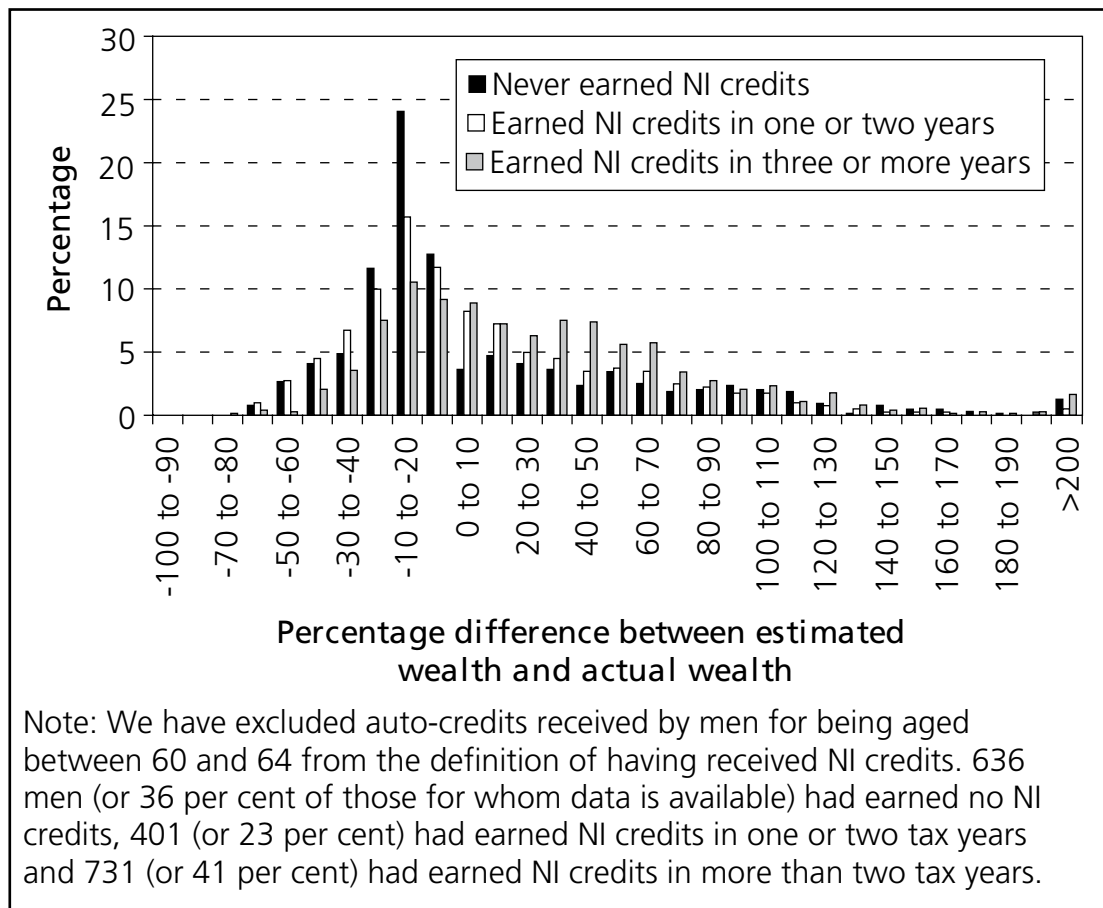
For both men and women, another potential source of error in the earlier estimates might have been the failure to take into account state pension entitlement accrued as a result of NI credits earned (rather than contributions paid). Figures 3.8 and 3.9 show, for men and women respectively, the distribution of errors in estimated state pension wealth for three groups: those who have never earned any NI credits, those who earned NI credits in one or two tax years and those who had earned some NI credits in at least three tax years since 1975.

Figure 3.8 shows that, for men, there was a tendency for the previous estimates to have slightly overstated state pension wealth for men who had ever been credited with NI, and particularly those who had been credited with NI in three or more years. Again, this is perhaps what we would expect given the assumptions previously made. The previous estimates were based on the assumption that men worked between leaving full-time education and the end of their last reported job at the time of interview, earning some estimated wage. This will tend particularly to have over-stated state pension wealth for men who had gaps in their employment histories. Since NI credits are earned for (among other things) receipt of certain out-of-work benefits, the receipt of NI credits is an indicator of a potentially broken work history.<sup>7</sup> Conversely, Figure 3.8 suggests that the errors in estimated state pension wealth were much smaller for those men who had never earned any NI credits. The pattern is less clear for women in Figure 3.9. However, receipt of NI credits (compared with not having received them) may well be a less good indicator of a broken work history for women in this age group than men.

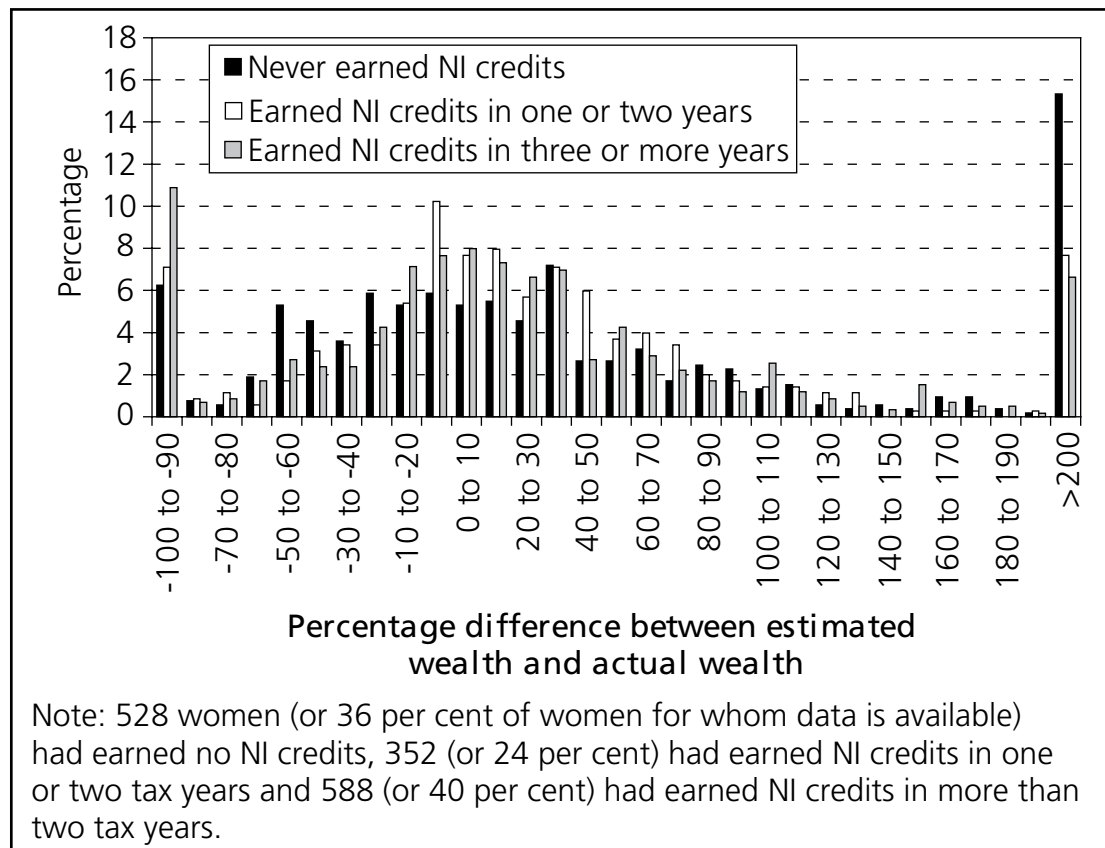
---

<sup>7</sup> NI credits are also earned for a number of other reasons, including: periods spent in full-time education and training, for being aged 16 or 17 (or, for men, aged 60-64) and not having paid other NI contributions in the relevant week, and periods in receipt of maternity pay.

**Figure 3.8 Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: men aged 50 to SPA in 2002/03, by whether sometimes or never earned NI credits**



**Figure 3.9 Distribution of the previous over-estimate of accrued state pension wealth, as a percentage of actual accrued state pension wealth: women aged 50 to SPA in 2002/03, by whether sometimes or never earned NI credits**



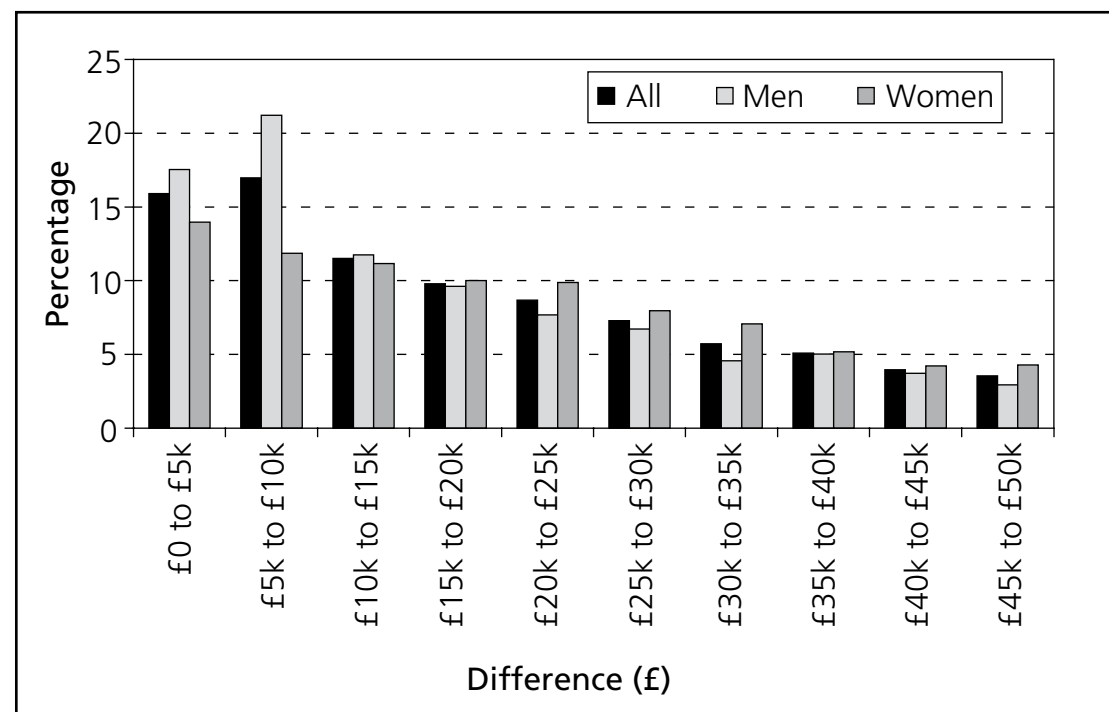
Finally, we examined the correlation between the percentage error made in estimating the state pension wealth between individuals within couples. This was found to be extremely close to zero (correlation co-efficient =  $-0.0011$  and not statistically significant).

### 3.3 Average absolute errors in estimated state pension entitlements

The previous section described the distribution of errors in estimated state pension rights measured as a percentage of the figure computed from the NI records. Large percentage errors might not reflect large absolute errors in estimated rights, rather they could simply reflect errors that, while large in relative terms, are actually very small in absolute terms since the true pension rights are small. While the proportional size of errors is interesting for some questions, the absolute size of the errors made may be more relevant when considering, for example, the extent to which earlier figures over- or under-estimated future pension income adequacy. To shed light on this latter question, this section looks at the distribution of absolute errors.

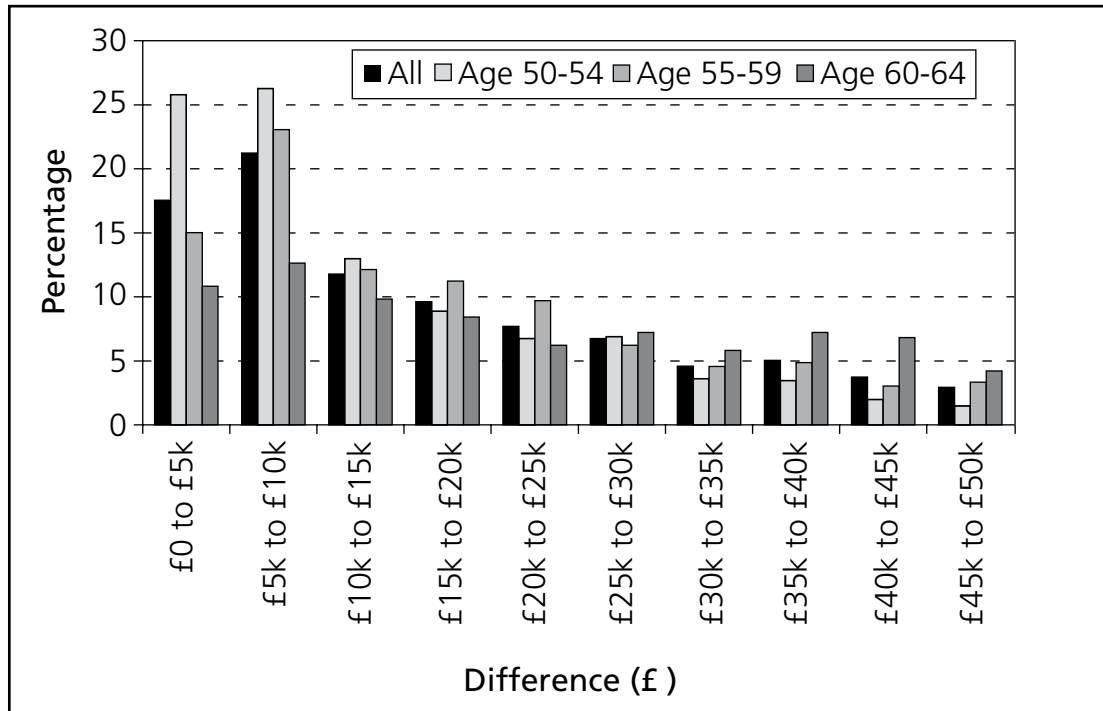
The distribution of absolute errors, divided into £5,000 bands and broken down by sex, is shown in Figure 3.10. A £5,000 error would, assuming an annuity rate of five per cent, work out as an error of just under £5 per week of pension income (with a lower assumed annuity rate leading to a smaller error in £ per week). On average, the absolute errors made for women are larger than those made for men (as was the case with errors measured in percentage terms, and shown in the previous section). For 60 per cent of men and 47 per cent of women the absolute error was below £20,000 (or, roughly, less than £20 per week). At the other end of the scale, for nine per cent of men and 14 per cent of women the absolute error was in excess of £45,000 (or, roughly, more than £45 per week). The median absolute error, split by sex, age group and current marital status is presented in Table C.2. The distribution of absolute errors shown separately for accrued BSP wealth and accrued S2P wealth is shown in Figure C.6. In both cases large absolute errors are relatively uncommon. This suggests that the very large percentage under- and over-estimates for S2P wealth (as shown in Figure C.5) are often due to actual entitlements being relatively small (meaning that a small absolute error still translates into a large percentage error).

**Figure 3.10 Distribution of absolute errors in estimated accrued state pension wealth, all aged 50 to SPA in 2002/03, by sex**

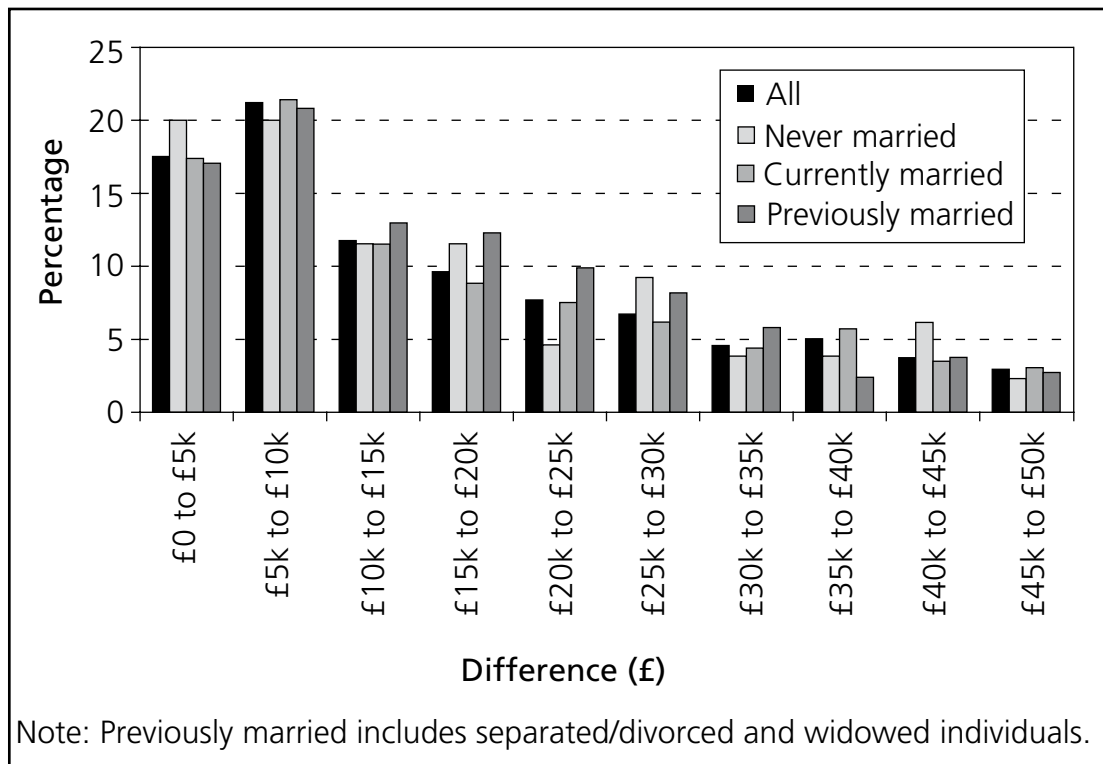


The distribution of the absolute errors for men is broken down by age group in Figure 3.11 and by current marital status in Figure 3.12. The age pattern is little changed from the analysis of errors measured in percentage terms: on average, errors among those aged 50 to 54 and those aged 55 to 59 are smaller than those made for the group within five years of the SPA. There is, however, little evidence of any difference in the typical size of absolute errors between married, previously married and never married men.

**Figure 3.11 Distribution of absolute errors in estimated accrued state pension wealth, men aged 50 to SPA in 2002/03, by age group**

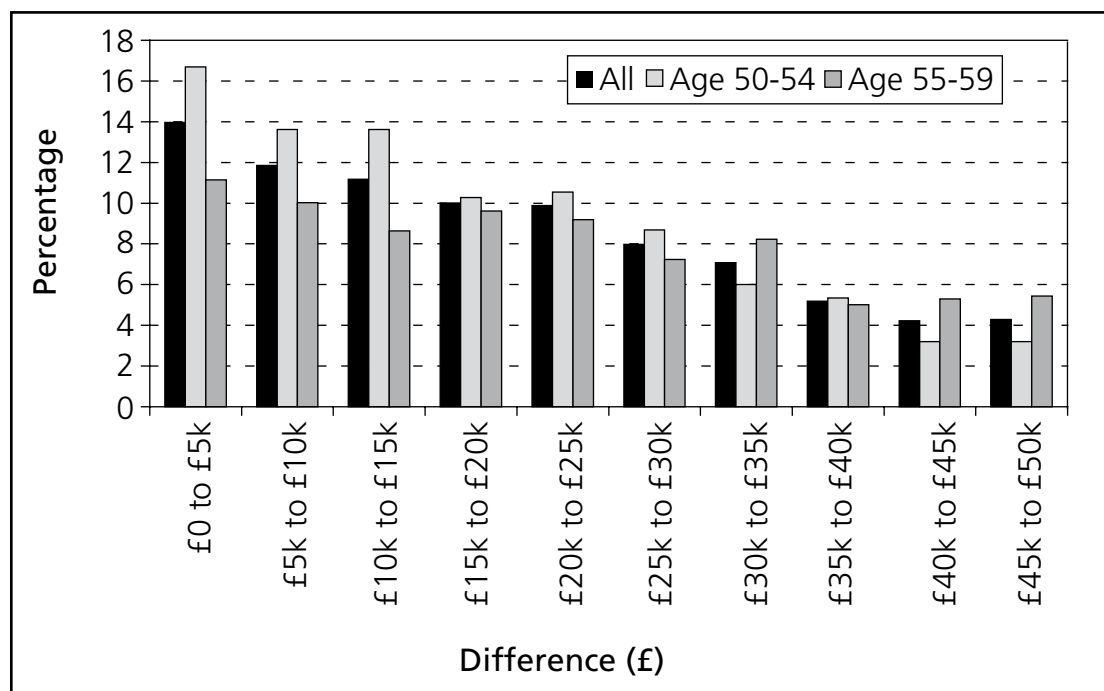


**Figure 3.12 Distribution of absolute errors in estimated accrued state pension wealth, men aged 50 to SPA in 2002/03, by current marital status**



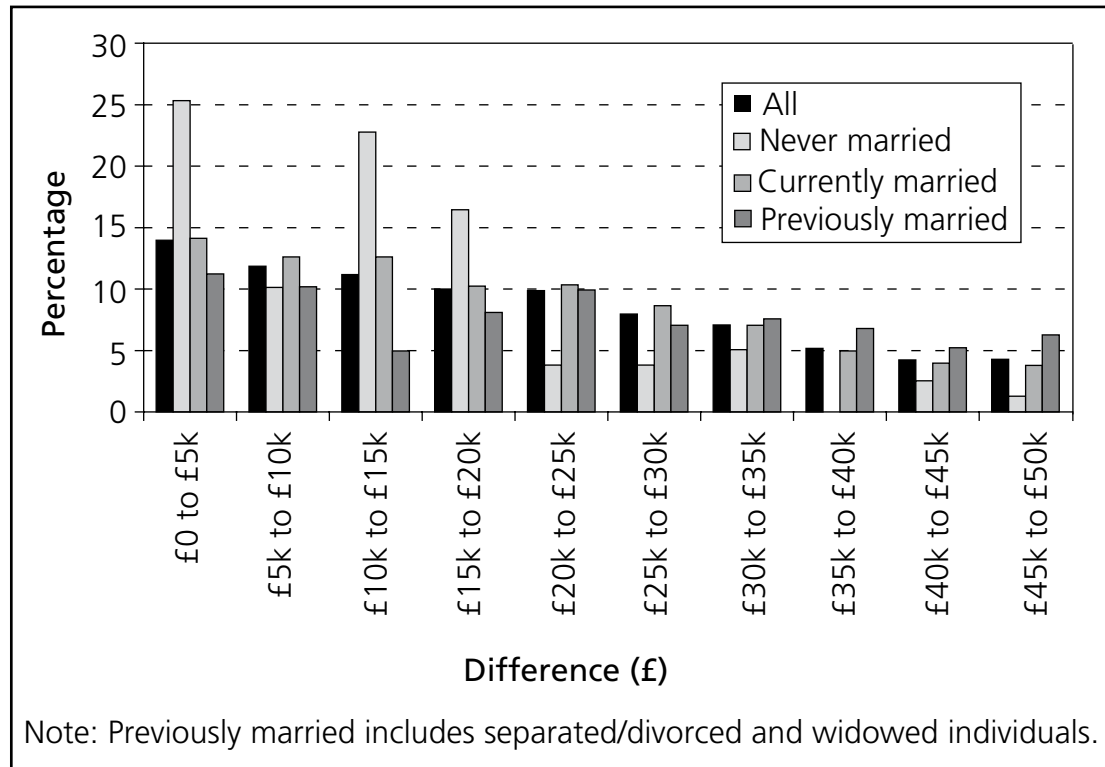
The distribution of the absolute errors for women is broken down by age group in Figure 3.13 and by current marital status in Figure 3.14 (see overleaf). As with men (and also as with the findings from looking at errors measured in percentage terms) absolute errors among women aged between 50 and 54 are found to be typically smaller than those observed among women aged within five years of the SPA. Unlike men, it is clear from Figure 3.14 that there is a pattern of typical size of error in the previous estimates of state pension wealth by current marital status. Smaller errors are much more common among those women who have never been married than among currently married or previously married (and now separated or widowed) women.

**Figure 3.13 Distribution of absolute errors in estimated accrued state pension wealth, women aged 50 to SPA in 2002/03, by age group**





**Figure 3.14 Distribution of absolute errors in estimated accrued state pension wealth, women aged 50 to SPA in 2002/03, by current marital status**



Finally we examined the correlation between the absolute error made in estimating the state pension wealth between individuals within couples. This was found to be positive – i.e., there is a tendency for individuals for whom it was relatively difficult to estimate state pension wealth to be married to each other (correlation co-efficient = +0.0788, statistically significant at the 95 per cent level).

### 3.4 Conclusions

This chapter has provided an assessment of how accurate the estimates of accrued state pension entitlements (that were made before information from the NI records was available) were. The two distributions are found to be very similar up to around the 30th percentile, after which they start to diverge, with the distribution of previously estimated state pension rights being above that of true state pension rights.

The estimates have been found to be more accurate for men and never married women than they are for currently married women or women who were previously married and are now separated or widowed. Among men there is little difference in the accuracy of the previous estimates by current marital status. Among women there is a tendency for the earlier estimates to have under-estimated previously

married women's entitlements to state pensions and to have over-estimated currently married women's entitlements. Among both men and women the previous estimates are found to have been more accurate for younger groups than they are for those within five years of the SPA.

A key issue that could be addressed by future research is how the improved estimates of state pension wealth derived from the NI data affect the estimates of the adequacy of retirement resources derived using information from the ELSA survey alone (Banks, Emmerson, Oldfield and Tetlow, 2005). Given that, on average, the estimates of state pension wealth from the ELSA data were an over-estimate of actual entitlements this might suggest that the previous work understated the number of individuals with retirement resources that might be considered inadequate. But this might not be the case. The impact will depend on the extent to which the revised estimates of state pension wealth moves individuals from above to below the adequacy benchmark and the extent to which this is offset from other individuals from being moved from below to above the threshold. For example if those who had their state pension wealth over-estimated tended to be below the adequacy threshold, or a long way above it, while those who had their state pension wealth under-estimated tended to be slightly below the adequacy threshold, the new information would reduce the estimated numbers thought to be at risk of having inadequate retirement resources.



## 4 Retirement outcomes and lifetime earnings

The rules of the state pension system mean that there is a direct relationship between earnings during working life and income in retirement from state pensions, as mentioned in Chapter 3. However, the system tends to redistribute from higher earning individuals to lower earning individuals and so the relationship between lifetime earnings and state pension income is not linear. When considering the relationship we would expect between lifetime earnings and other sources of retirement income (such as private pensions, other financial investments and means-tested benefits), the pattern is potentially even more complicated. In particular, it may depend on a number of factors, including individual preferences for retirement consumption compared with consumption during working life, individuals' exposure to unfavourable and unexpected events during their lives and possibly individuals' ability to manage their finances successfully.

This chapter aims to shed some light on how a broader measure of retirement resources (as measured by total annual income in retirement) is related to lifetime earnings recorded in the NI records. To this end, we present a descriptive analysis of the distribution of lifetime earnings and retirement income.

NI data provides information on earnings histories from 1975 onwards, while ELSA data offers information on retirees including various individual and household characteristics and retirement income. The limitation of the NI data is that it does not provide information on earnings prior to 1975, nor does it provide information on earnings above the Upper Earnings Limit (UEL), as this is not needed for the calculation of state pension entitlements. We present here only information based on the earnings data that is available, without trying to estimate missing earnings information. In particular, earnings histories from 1975 to 2002 are only a subset of life-time earnings for most cohorts and earnings are reported up to the UEL, therefore leading to a truncated distribution. Future work (to be carried out under the auspices of the IFS Retirement Saving Consortium, which includes DWP and will report in summer 2010) will examine possible methods of addressing these missing data. The analysis in this chapter is carried out at the family level (i.e. the

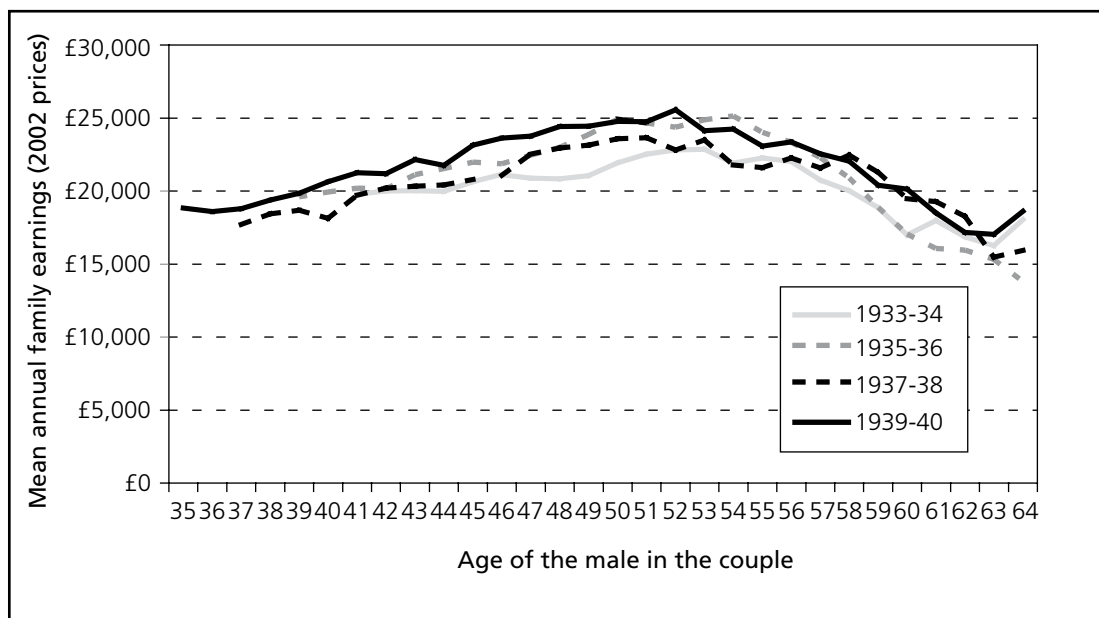
individual and, where relevant, their partner) on cohorts born between 1933 and 1940 for which we have complete earnings histories from age 35 to SPA. (Earlier cohorts are excluded as we do not have information on earnings at younger ages and later cohorts are excluded as we do not have information on earnings at older working ages.)

#### 4.1 Distribution of lifetime earnings and retirement income

Earnings histories from the NI data for the cohorts born between 1933 and 1940 provide a precise description of the earnings of individuals in the last 30 years of their career. Figures 4.1, 4.2 and 4.3 plot mean earnings profiles by age for cohorts born between 1933 and 1940, according to different family types (couples, single men and single women, respectively). The 'family type' of a particular individual is defined based on their status when interviewed in 2002/03. Their actual family composition in each past year may have been different. What we focus on here is the relationship between a single person's (or couple's) income in retirement, compared with the earnings of that person (or those people) in the past, regardless of whether those people were actually a couple at the time they were earning.

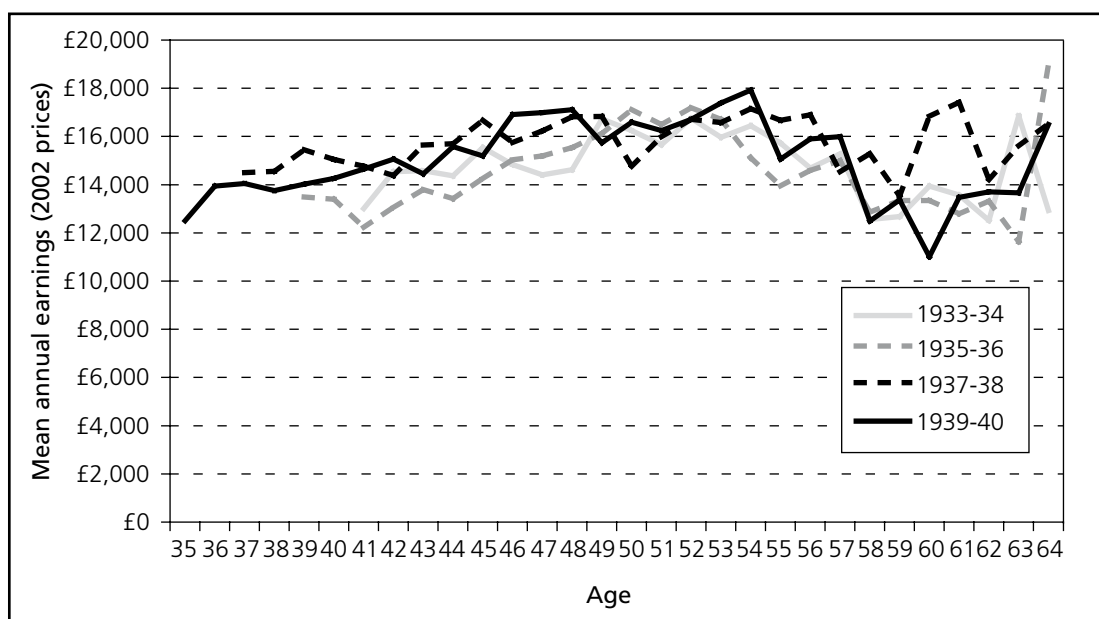
Figures for earnings are shown in 2002 prices (inflated using the Retail Price Index (RPI)). Later cohorts tend to have higher earnings for a given age, which reflects real earnings growth over time. The profile is generally hump shaped, with earnings increasing with experience up to the mid-50s and then earnings decreasing through the late-50s and early 60s, reflecting retirement and perhaps also reduced hours worked as individuals get older. The decline in average earnings through the 50s and 60s is more pronounced for couples as we find that, overall, at least one member of the couple is more likely to retire early.

**Figure 4.1 Earnings profile for couples from 1975 to 2002, by cohorts (in 2002 prices)**



The comparison between single men and single women highlights the fact that these two groups are very different. Single men are found to have higher earnings than single women in the same cohort but they have experienced much slower earnings growth across cohorts. Cohort effects appear to be very sizeable for single women, reflecting the increased participation of women in the labour market over time.

**Figure 4.2 Earnings profile for single men from 1975 to 2002, by cohorts (in 2002 prices)**



**Figure 4.3 Earnings profile for single women from 1975 to 2002, by cohorts (in 2002 prices)**

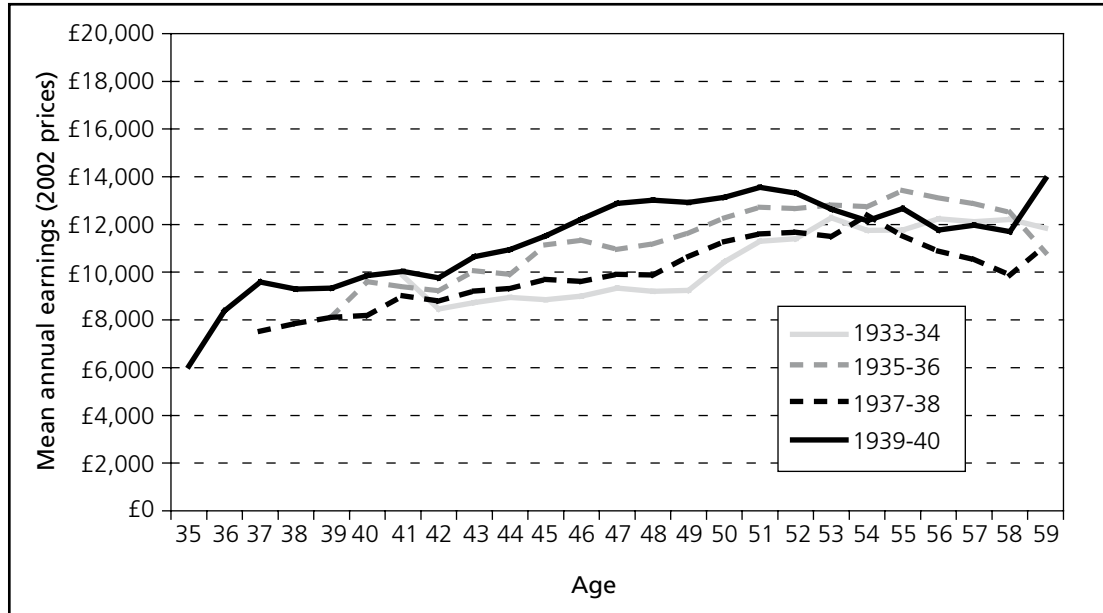


Figure 4.4 presents the cumulative distribution of the sum of yearly earnings from 1975 to 2002, decomposed by family type. For couples, the earnings of each member of the couple have been added up and divided by two in order to compare the figures with those for singles.<sup>8</sup> Because many high earning individuals will have partners who have lower earnings than they do, earnings per head in couples is less dispersed for couples than it is for single men. Single men are found to have had higher lifetime earnings than single women: median total earnings between 1975 and 2002 for currently single men born between 1933 and 1940 amounted to £250,000 while for currently single women in the same cohort, median total earnings over this period was just £110,000.

<sup>8</sup> If there are returns to scale in households (that is, if two people do not need twice as much income to maintain the same standard of living as a single person), then a couple with a given income per head may be better off than a single person with the same income per head.

**Figure 4.4 Cumulative distribution of total lifetime earnings (up to UEL) per head from 1975 to 2002 (measured in 2002 earnings terms)**

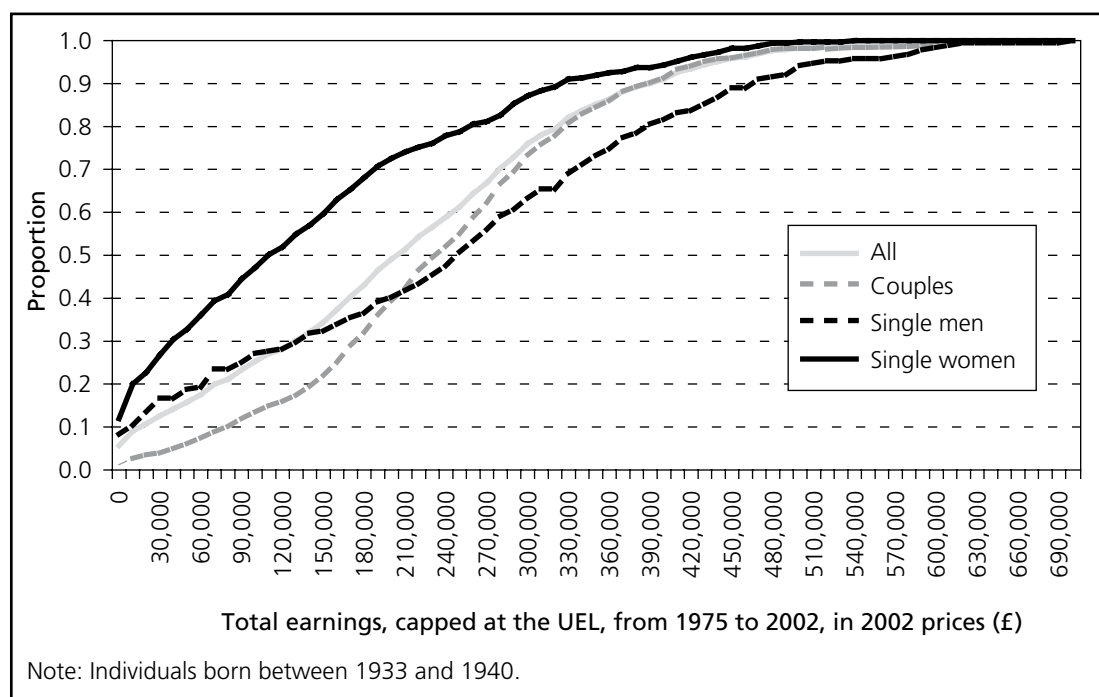


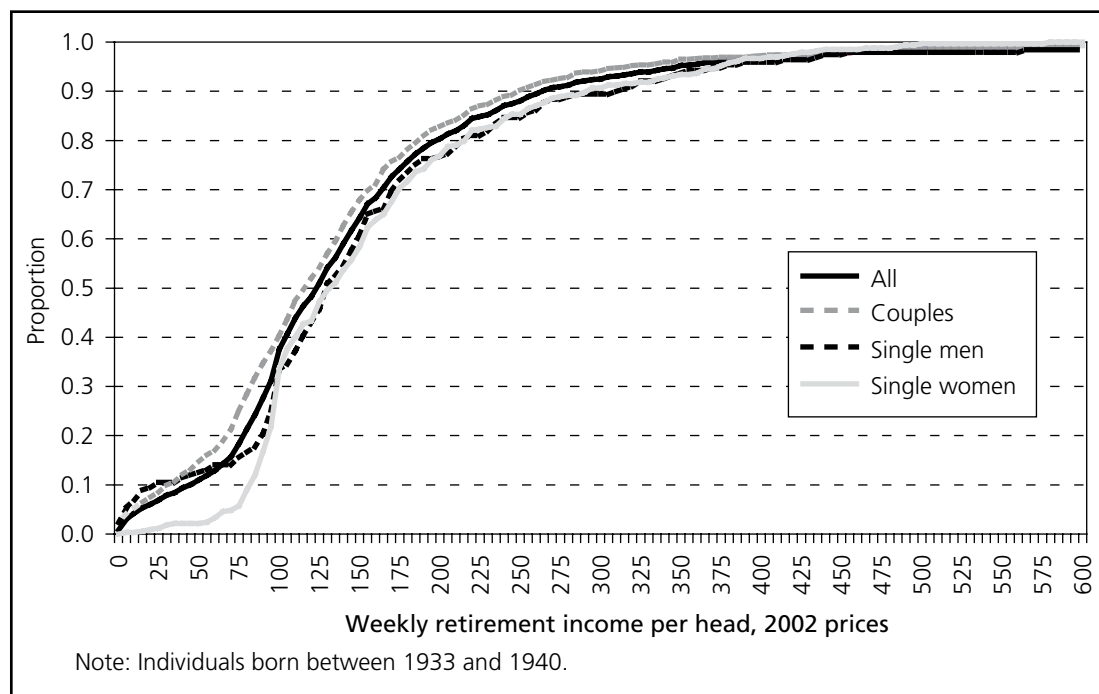
Figure 4.5 presents the cumulative distribution of weekly retirement income (per head), from the ELSA data, computed as total weekly income less earned income, divided by the number of people in the family (i.e. one for singles and two for couples). It thus includes both public and private pension income and other unearned income (including other state benefits and investment income).

Single men are more likely to have reported very low retirement income (i.e. below the level of a full BSP) than single women. In part this will be because the figure includes individuals aged between 62 and 69 (since it is those born between 1933 and 1940 who are then observed in ELSA in 2002/03) and all women are aged over the SPA (and therefore potentially in receipt of the BSP) while men aged between 62 and 64 are aged below the SPA (and therefore cannot receive the BSP). However, above that level, the distribution of retirement income is very similar for all groups. For all groups, and especially single women, there is a peak in the distribution of retirement income at the level of the full BSP.<sup>9</sup>

<sup>9</sup> A full BSP was worth £75.50 a week in April 2002.



**Figure 4.5 Cumulative distribution of weekly retirement income (per head) in 2002**



Figures 4.4 and 4.5 draw attention to several important aspects of the distribution of retirement income and lifetime earnings. First, women who are single in retirement but were previously married (i.e. they have become separated or widowed) might have had low earnings during their career and yet gained pension rights through their former partner's NI contributions and contributions to private pensions. Single men in this cohort, on the other hand, are much less likely to have gained pension income through their marriage. In the case of state pensions, this reflects the fact that men whose (former) wife reached SPA before 2010, gain no entitlement to additional state pension income on the basis of their wife's contributions, even if they were higher than their own. In the case of private pensions, men in this cohort are probably less likely to have inherited rights from their former wife simply because employment rates and earnings were lower on average for married women in these cohorts than married men.<sup>10</sup> Therefore, we would expect single men in this cohort to have pension income much more in line with their lifetime earnings than single women. That this is indeed borne out by the data is shown in the next section.

<sup>10</sup> Earlier cohorts of married women working part-time may also be less likely to have built up occupational pension rights since prior to the European Court of Justice ruling in May 1995, part-time employees could be excluded from their employer's pension scheme.

## 4.2 Relationship between lifetime earnings and retirement income

This section presents some simple descriptive statistics of the ratio of annual retirement income to lifetime earnings (measured, as described already, as the sum of earnings between 1975 and 2002 reported in the NI data). We present here a preliminary analysis of the relationship between a simple measure of earnings during a period of working life and subsequent retirement income. More detailed analysis of the relationship between a broader measure of 'lifetime earnings' and various different measures of retirement income, for a larger group of individuals, will be contained in another report to be published in summer 2010.

Table 4.1 presents summary statistics of the distribution of the ratio of annual retirement income to average annual earnings measured over 1975 and 2002 (inclusive), by different family types. This is an unconventional measure of 'replacement rates' and readers should be cautious when interpreting the magnitude of the figures shown in Table 4.1. Standard replacement rates measure retirement income as a fraction of **final** salary, which will typically be higher than average earnings (especially if final salary is measured prior to any partial withdrawal from the labour market). It should also be noted that the ratio of retirement income to average earnings presented here is sensitive to how earnings are updated to 2002; we have updated using the RPI but under an alternative assumption of using nominal wage growth measured average earnings would be higher and the 'replacement rate' commensurately lower. What is probably of more interest is how the size of the ratio differs between the groups shown and how dispersed the distribution of these ratios is within each group.

The median ratio of annual retirement income to 'lifetime earnings' is higher for single women (157 per cent) than for single men (87 per cent) or couples (81 per cent), reflecting the fact that (as discussed above) single women's own lifetime earnings are not necessarily a good predictor of their retirement income. The last column in Table 4.1 presents a measure of dispersion in the distribution – the ratio of the 75th percentile to the 25th percentile.

**Table 4.1 Distribution of the ratio of retirement income in 2002 to average earnings from 1975 to 2002 (percentages)**

	p25	Median	p75	Ratio p75/p25
All	59	95	168	2.9
Couples	48	81	126	2.6
Single men	53	87	168	3.2
Single women	90	157	364	4.0

Note: Individuals born between 1933 and 1940, average earnings taken over all years from 1975 to 2002 including zeros.

Table 4.2 presents the distribution of the ratio of retirement income to lifetime earnings only for singles, split by previous marital status: never married and previously married. For singles who have never been married (around 15 per cent of the singles in the sample), the ratio of retirement income to lifetime earnings is very similar for men and women. However, single women who have previously been married have much higher ratios of retirement income to lifetime earnings than their male counterparts. This supports the argument above that previously married women in this cohort are more likely to have inherited pension rights from a former spouse than previously married men in this cohort.

**Table 4.2 Distribution of the ratio of retirement income in 2002 to lifetime earnings from 1975 to 2002, by marital status (percentages)**

	p25	Median	p75	Ratio p75/p25
Single men, never married	56	78	185	3.3
Single men, previously married	53	92	171	3.2
Single women, never married	56	104	146	2.6
Single women, previously married	98	176	437	4.5

Table 4.3 presents the median ratio of retirement income to lifetime earnings by quintile of lifetime earnings, split by level of numeracy.<sup>11</sup> An individual's numerical ability might be a potential indicator of an individual's ability to plan for retirement appropriately.<sup>12</sup> The 20 per cent of individuals with the lowest lifetime earnings have a very high median ratio of retirement income to lifetime earnings; the families in this group may have had low earnings but in retirement they still have access to some state pension income and means-tested or health-related benefits. The ratio falls as lifetime earnings increase. However, in each quintile, those with high numeracy have on average higher ratios of retirement income to lifetime earnings than those with low numeracy. This difference is very large at the bottom of the lifetime earnings distribution but is also still sizeable at the top of the lifetime earnings distribution.

<sup>11</sup> ELSA respondents were asked up to five questions to gauge their general numerical ability. These questions ranged from assessing whether an individual could calculate the change he or she would receive from paying £1 for an item costing 85p, to assessing whether an individual could calculate compound interest. Based on their responses to these questions, individuals have been categorised into two categories - high (answered at least four questions correctly) and low (less than four correct answers) numeracy.

<sup>12</sup> See Banks and Oldfield (2007) for analysis of the extent to which numeracy is correlated with wealth and other retirement outcomes.

**Table 4.3** Distribution of the ratio of retirement income in 2002 to lifetime earnings from 1975 to 2002 by numeracy level (percentages)

Quintiles of lifetime earnings	All	High numeracy	Low numeracy
Poorest	548	1,450	502
2	130	139	128
3	88	89	87
4	75	107	72
Richest	58	63	57

Note: Individuals born between 1933 and 1940. For couples we give both individuals the numeracy score of the most numerate partner (which might seem appropriate if, for example, the most numerate member of the couple was responsible for financial planning).

### 4.3 Conclusions

This chapter has presented descriptive statistics on the relationship between lifetime earnings and retirement incomes, using ELSA data matched to individual NI records. The NI records provide detailed information on earnings, capped at the UEL, from 1975 to 2002. We have focused on the group for whom earnings are observed over the longest period, that is cohorts born between 1933 and 1940.

Single women tend to have had relatively low levels of lifetime earnings. However, on average their retirement incomes are higher relative to their lifetime earnings than for single men and couples, reflecting that previously married women may have benefitted from the pension rights of their former partners.

On average, those with low levels of lifetime earnings experience retirement income that is higher relative to their lifetime earnings than individuals with higher lifetime earnings. This reflects the redistribution inherent in the state pension rules and other benefits. Interestingly, at every level of the lifetime earnings distribution, those with higher numeracy levels tend to have higher retirement income relative to their lifetime earnings than less numerate individuals.



## 5 Conclusions

A key policy issue is the adequacy – or otherwise – of working age individuals' provision for their own retirement. An excellent resource for researchers looking at the circumstances of those aged 50 and over in England is ELSA, a biennial longitudinal survey that has been conducted since 2002/03, with the first wave sampling 12,099 individuals.

Previous estimates of pension wealth using data on respondents to the first (2002/03) wave of ELSA were based on relatively limited information on employment histories and no information on prior earnings (Banks, Emmerson, Oldfield and Tetlow, 2005). However, as part of the ELSA survey respondents were also asked for permission to link to their NI records. Among those responding to the first wave of ELSA who were aged between 50 and the SPA, 79 per cent gave permission for their records to be linked. This paper is the first to use the detailed information on ELSA respondents' current circumstances collected in the survey combined with the rich information on these individuals' past economic activities contained in the NI records.

The paper has looked at three issues: First, it documented the completeness of the information from the NI records and the extent to which the subset of ELSA respondents for whom information from the NI records is available differ in terms of observed characteristics from all ELSA respondents. Second, it assessed the accuracy of previous estimates of state pension entitlements, which used only the information available without recourse to NI records. Third, the paper illustrated the extent to which individuals' retirement income is associated with a measure of their lifetime earnings taken from the NI records, and the extent to which this relationship differs by other observed characteristics such as sex, current marital status and measures of numeracy.

## 5.1 Representativeness of the ELSA – NI linked subsample

In total, 72 per cent of respondents to the first wave of ELSA have been successfully matched to their NI records. The matched subsample is broadly representative of the entire ELSA sample. However, if particular subsets are of interest – or are thought to be particularly likely to influence any findings – caution should be exercised when using the matched subsample. There are some observed characteristics that are found to be statistically significantly associated with whether or not an individual has been successfully matched, which could have implications for certain areas of potential future analyses using these data. In particular, older people (especially those at very old ages) and the self-employed are both severely underrepresented in the linked subsample. Particular care would need to be taken with any analyses that looked specifically at these subgroups.

## 5.2 Accuracy of previous state pension wealth estimates

The accuracy of the estimates of accrued state pension entitlements made before information from the NI records was available is found to vary considerably by different groups. Overall, the two distributions are found to be very similar up to around the 30th percentile, after which they start to diverge, with the distribution of previously estimated state pension rights being above that of true state pension rights.

The previous estimates were more accurate for men and never married women than for currently married women or women who were previously married and are now separated or widowed. Among men there is little difference in the accuracy of the previous estimates by current marital status. Among women there is a tendency for the earlier estimates to have under-estimated previously married women's entitlements to state pensions and to have over-estimated currently married women's entitlements. Among both men and women the previous estimates are found to have been more accurate for younger groups than they are for those within five years of the SPA.

## 5.3 Retirement outcomes and lifetime earnings

Chapter 4 has presented descriptive statistics on the relationship between lifetime earnings (as measured in the NI data) and a broader measure of retirement income, which includes private pension income and other non-earned income, as well as state pension income.

Single women (many of whom were previously married) in the cohorts we examine are found to have had relatively low levels of 'lifetime earnings' but appear to have benefitted from pension rights inherited from their former partners.

On average, at low levels of lifetime earnings, retirement incomes are higher relative to lifetime earnings than at higher levels of lifetime earnings. This, at least in part, reflects the progressivity of the state pension system and the availability of other benefits for low income pensioners. Interestingly, at every level of the lifetime earnings distribution, those with higher numeracy levels tend to have a higher level of retirement income than lower numeracy individuals.

## 5.4 Future research

This research was commissioned by DWP to improve the evidence base on individual retirement saving behaviour, and thereby to aid public policy decision making. This paper presents the first two outputs from this research. The third, and final, output will be a derived dataset containing some of the key variables that were constructed for the purposes of the studies presented here. In addition, we will be publishing a report in summer 2010 examining, in more detail, the relationship between individuals' lifetime earnings and their subsequent retirement income. This will build on the work presented in this paper and is funded by the IFS Retirement Saving Consortium (of which DWP is a member).

Another example of future research that could make use of this analysis would be further investigation into the extent to which individual retirement savings were adequate. Specifically, for the subsample of individuals for whom NI data are available, a comparison could be made between the proportion thought to have inadequate retirement resources using the previous estimates of state pension wealth with the proportion thought to have inadequate retirement resources derived from the NI data. Furthermore, for the whole ELSA sample the estimates of state pension wealth (and potentially private pension wealth) could be improved drawing on the findings presented in this paper. While the former piece of work would provide a better picture of retirement saving of those approaching the SPA in 2002/03 the latter piece could also be used to produce updated analysis of more recent waves of ELSA (2004/05, 2006/07 and 2008/09). Any further work examining the more difficult issue of the optimality of individual retirement saving decisions (rather than an ex-post test of whether resources were above or below a somewhat arbitrary adequacy threshold) could also make use of the NI data, in particular exploiting the relatively detailed information on earnings over the lifetime that these data provide.





# Appendix A

## Representativeness of the ELSA – NI linked subsample

**Table A.1** Characteristics in the full ELSA sample and the group that could not be linked when individuals aged 75 and over are excluded

	Full ELSA Proportion of sample	Data problems
Female	53.5	52.7
Age 50 to 54	21.9	24.5
Age 55 to 59	24.2	27.8
Age 60 to 64	18.7	16.4
Age 65 to 69	18.9	15.3
Age 70 to 74	16.3	16.0
Single	72.2	72.2
Married	5.5	7.2
Separated or divorced	12.4	12.5
Widowed	9.9	8.1
Employed	36.2	40.3
Self-employed	8.2	9.4
Retired	38.4	31.5
Unemployed	7.1	6.6
Permanently sick/disabled	1.1	1.1
Looking after family/home responsibilities	8.3	10.1
Other activity	0.6	0.9

Continued

Table A.1 Continued

	Full ELSA Proportion of sample	Data problems
Not worked since 1948 <sup>a</sup>	0.0	0.0
Degree	12.4	14.0
Higher	11.9	12.9
A level	6.7	6.8
O level	17.6	16.4
CSE	4.6	4.4
Foreign qualifications	8.6	8.3
No qualifications	38.0	37.0
Owner-occupier	82.0	80.1
Excellent health	13.7	12.5
Very good health	29.9	30.6
Good health	30.7	33.3
Fair health	17.8	16.8
Poor health	6.8	6.6
Missing health data	1.1	0.2
		<b>Mean</b>
Employment income (£ pa)	3,606	2,972
Self-employment income (£ pa)	2,907	2,470
State pension income (£ pa)	8,378	10,159
Private pension income (£ pa)	1,845	2,996
Total equivalised income <sup>b</sup> (£ pa)	13,693	14,958
Total net (non-pension) wealth <sup>b</sup> (£)	220,645	255,555

<sup>a</sup> Excludes those individuals who had worked at some stage but were unable to report the end date of their last job.

<sup>b</sup> Income/wealth of the individual and, where relevant, their partner.

**Table A.2 Characteristics in the full ELSA sample and the group that did not give consent when widows and the self-employed are excluded**

	Full ELSA	No consent
	Proportion of sample	
Female	51.4	52.1
Age 50 to 54	19.5	17.5
Age 55 to 59	21.4	17.9
Age 60 to 64	16.4	15.9
Age 65 to 69	16.1	17.1
Age 70 to 74	12.5	14.3
Age 75 to 79	8.1	9.7
Age 80 to 84	4.4	5.8
Aged 85 and over	1.8	1.7
Single	6.8	8.1
Married	80.6	78.5
Separated or divorced	12.6	13.4
Employed	36.3	30.4
Retired	45.6	51.9
Unemployed	1.1	1.1
Permanently sick/disabled	7.2	6.7
Looking after family/home responsibilities	9.2	9.3
Other activity	0.6	0.6
Not worked since 1948 <sup>a</sup>	0.3	0.3
Degree	11.5	11.6
Higher	11.7	11.5
A level	6.1	4.9
O level	16.6	15.8
CSE	5.0	5.5
Foreign qualifications	8.8	9.5
No qualifications	40.0	40.9
Owner-occupier	81.1	81.6

Continued

Table A.2 Continued

	Full ELSA	No consent
	Proportion of sample	
Excellent health	12.8	11.1
Very good health	28.2	25.0
Good health	30.9	32.4
Fair health	18.9	21.2
Poor health	7.8	9.4
Missing health data	1.4	0.9
	<b>Mean</b>	
Employment income (£ pa)	8,186	6,741
Self-employment income (£ pa)	514	573
State pension income (£ pa)	3,453	3,735
Private pension income (£ pa)	3,810	3,658
Total equivalised income <sup>a</sup> (£ pa)	12,982	12,986
Total net (non pension) wealth <sup>a</sup> (£)	203,927	221,319

<sup>a</sup> Income/wealth of the individual and, where relevant, their partner.

# Appendix B

## Calculating accrued state pension wealth

In order to compare figures for state pension wealth using the NI data with the earlier estimates of state pension wealth published in Banks, Emmerson and Tetlow (2005), we use exactly the same assumptions as was used in this earlier work, with the exception of individuals' employment and earnings histories. In particular, we assume that the accrual and indexation rules for state pensions were as they were as of 2002, rather than taking into account subsequent policy changes. A detailed description of the earlier calculations is available on pages 4-19 of Banks, Emmerson and Tetlow (2005).

The present value of accrued state pension entitlement, described in Chapter 3, is calculated as follows:

$$W_t = \delta^R \sum_{i=0}^T \delta^i Y_i^S$$

Where  $\delta$  = discount rate (2.5 per cent)

$R$  = number of years from 2002 to SPA

$T$  = number of years between SPA and death

$Y^S$  = state pension income to which the individual will be entitled at SPA, based on contribution history up to 2002

All quantities are expressed in real terms (2002 prices). All individuals are assumed to die at their sex- and age-specific life expectancy, on a cohort basis, published

by the Government Actuaries Department.<sup>13</sup> The sensitivity of pension wealth figures to the choice of discount rate is discussed in detail in Section 5 of Banks, Emmerson and Tetlow (2005). The state pension rules applying (as of 2002) to the cohort considered in this paper – which determine what pension income these individuals would have been entitled to on reaching the SPA – are also described in detail in Banks, Emmerson and Tetlow (2005).

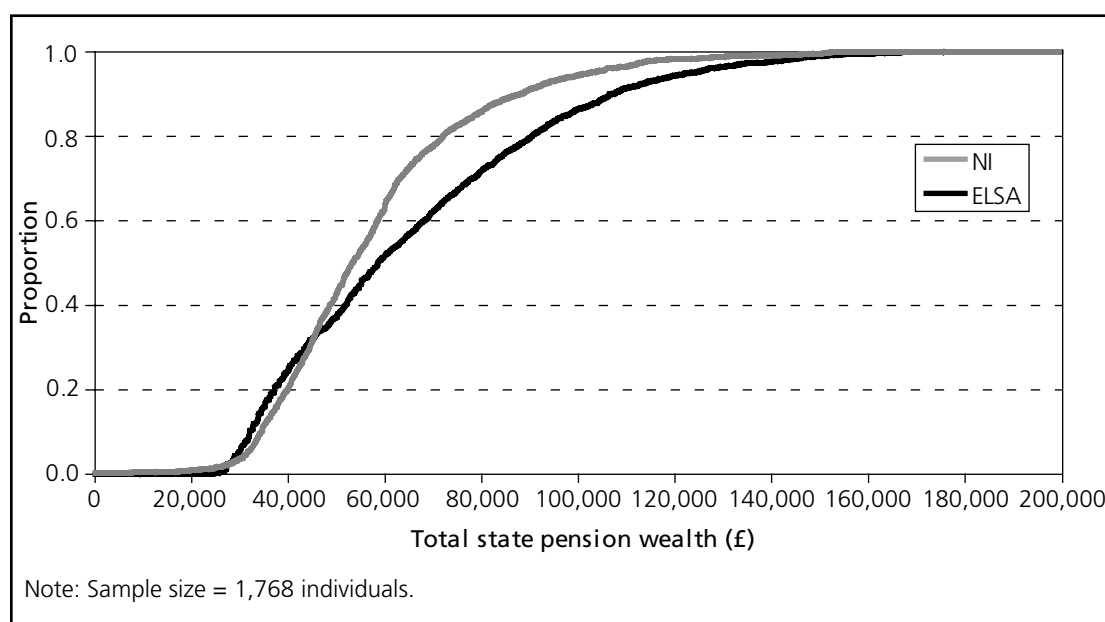
---

<sup>13</sup> Government Actuary's Department website, [http://www.gad.gov.uk/Demography%20Data/Life%20Tables/Period\\_and\\_cohort\\_eol.html](http://www.gad.gov.uk/Demography%20Data/Life%20Tables/Period_and_cohort_eol.html). (In order to be able to compare our new calculations to the previous ones, we used the same GAD estimated life expectancies as we had previously used, rather than updating to the latest ONS 2008-based projections.)

# Appendix C

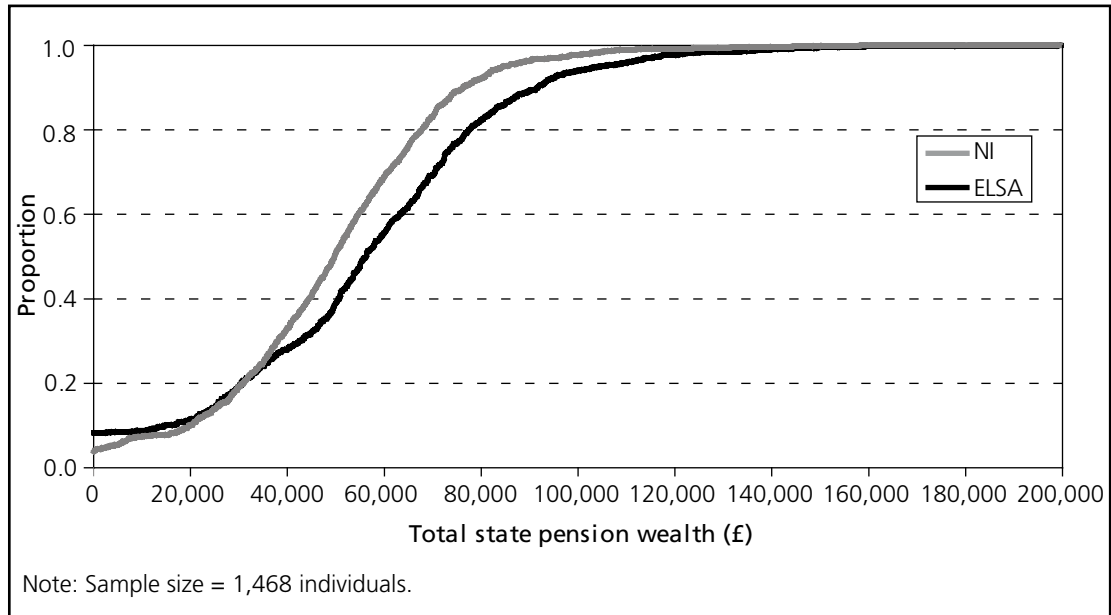
## Accuracy of previous state pension wealth estimates

**Figure C.1** Distribution of accrued state pension wealth, estimates using ELSA data only compared with those utilising information from NI records – men aged 50 to SPA in 2002/03

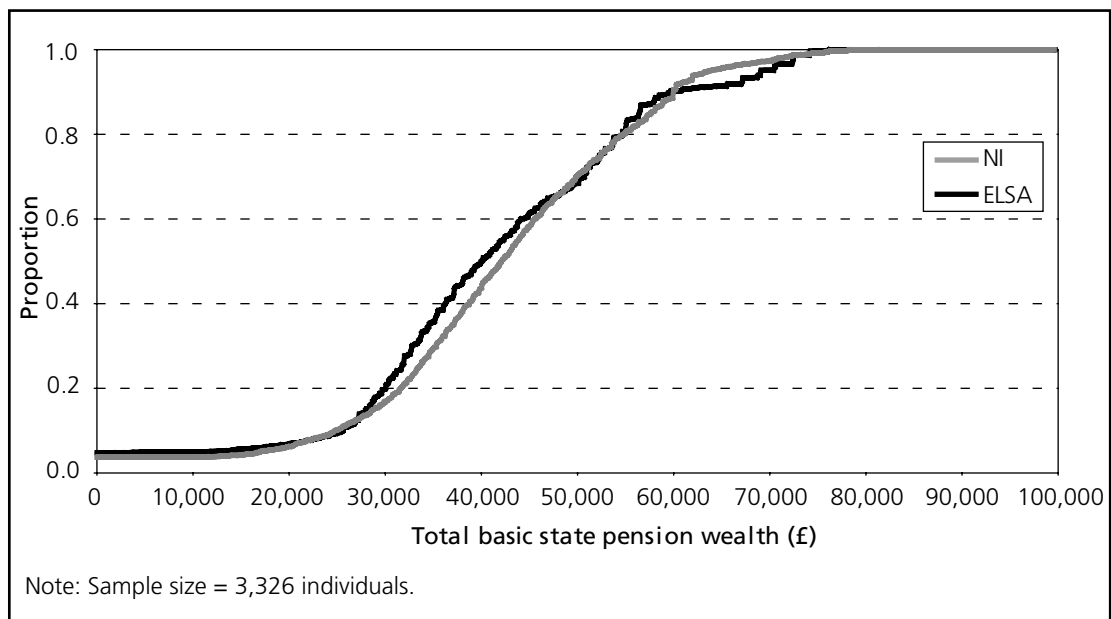




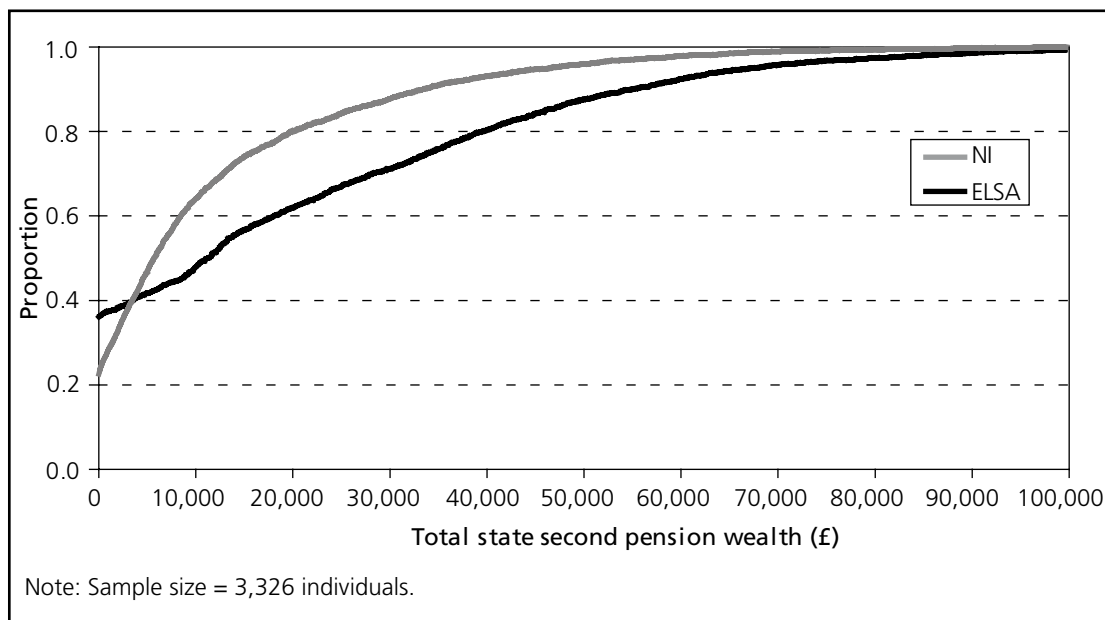
**Figure C.2** Distribution of accrued state pension wealth, estimates using ELSA data only compared with those utilising information from NI records – women aged 50 to SPA in 2002/03



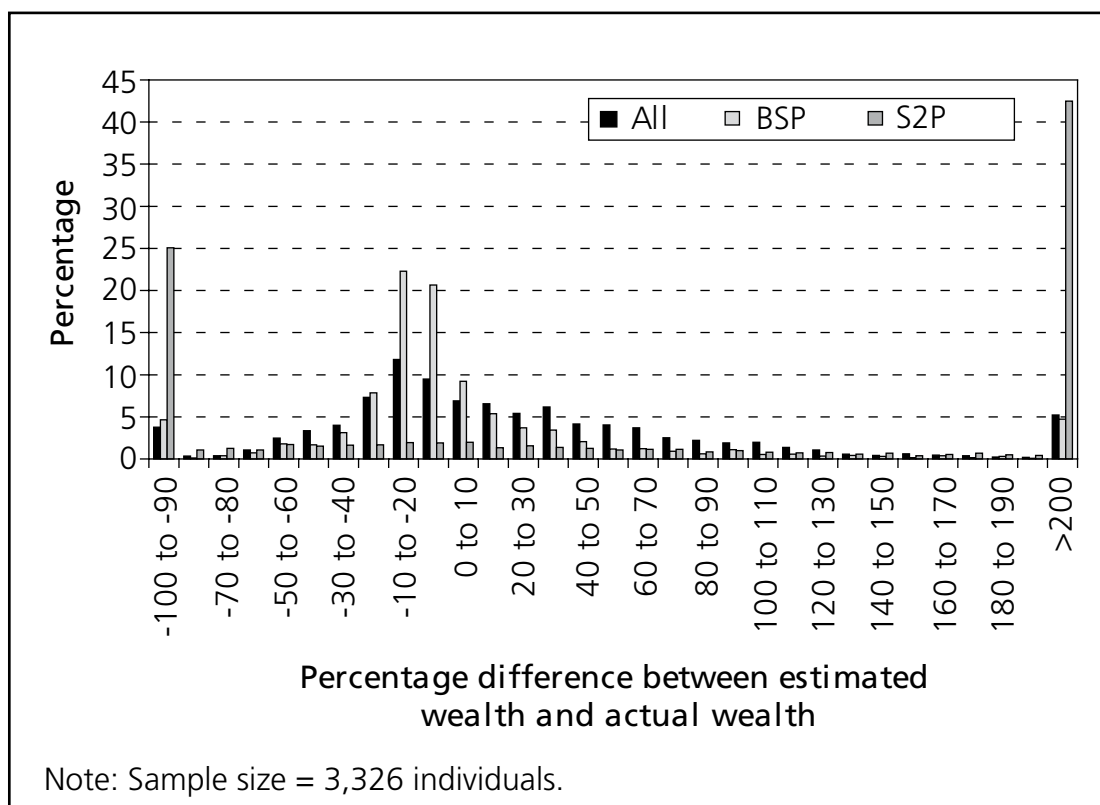
**Figure C.3** Distribution of accrued BSP wealth: estimates using ELSA data only compared with those utilising information from NI records, all aged 50 to SPA in 2002/03



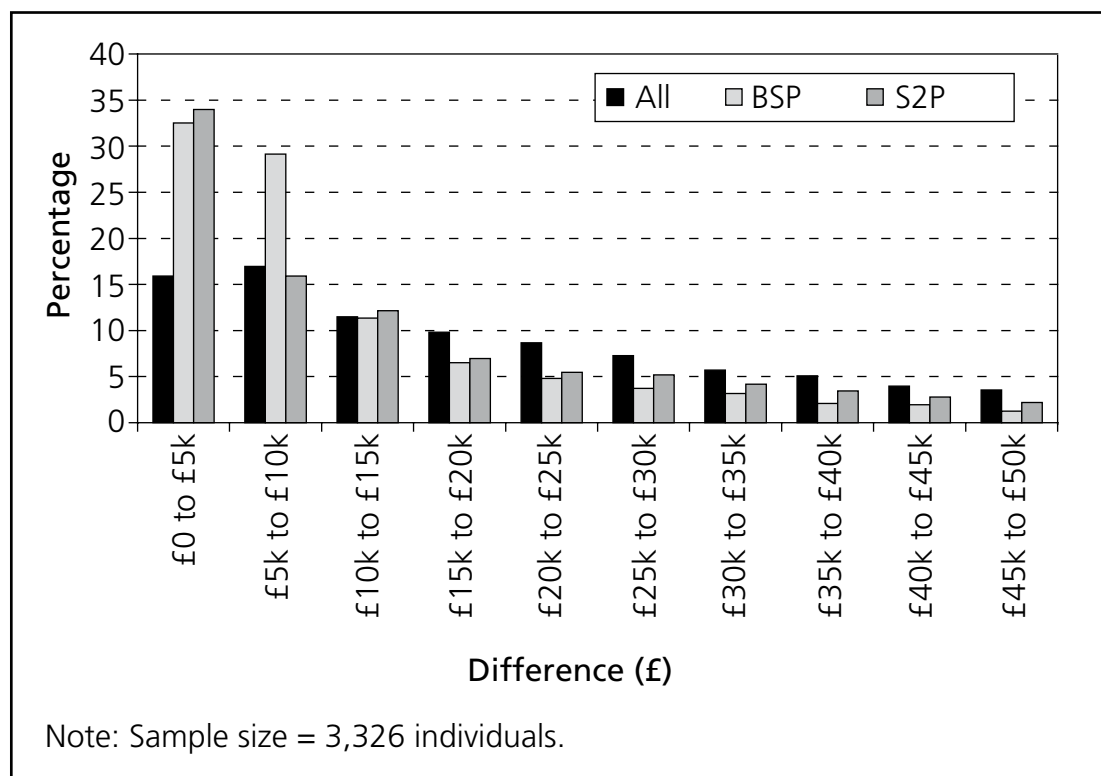
**Figure C.4 Distribution of accrued S2P wealth: estimates using ELSA data only compared with those utilising information from NI records, all aged 50 to SPA in 2002/03**



**Figure C.5 Distribution of errors in estimated accrued state pension wealth, all aged 50 to SPA in 2002/03, by component of state pension wealth**



**Figure C.6 Distribution of absolute errors in estimated accrued state pension wealth, all aged 50 to SPA in 2002/03, by component of state pension wealth**



**Table C.1 Distribution of accrued state pension wealth, estimates using ELSA data only compared with those utilising information from NI records – those aged 50 to SPA in 2002/03, by sex**

	p25	p50	p75	Mean
All (n=3,236)				
ELSA	£38,927	£57,442	£78,176	£60,856
NI	£39,242	£51,539	£65,460	£53,697
Men (n=1,768)				
ELSA	£40,150	£58,465	£83,646	£65,103
NI	£42,054	£53,162	£67,016	£57,450
Women (n=1,468)				
ELSA	£36,004	£56,208	£73,240	£55,740
NI	£35,032	£49,732	£64,406	£49,177

**Table C.2 Median percentage error in estimated accrued state pension rights using ELSA data only – those aged 50 to SPA in 2002/03, by sex, age group and marital status (percentages)**

	<b>Men</b>	<b>Women</b>	<b>All</b>
All	3.4	12.5	7.1
Currently married	1.1	17.9	8.5
Previously married	7.8	4.4	6.5
Never married	13.1	-8.3	-2.5
Aged 50 to 54	-5.7	10.7	1.4
Aged 55 to 59	0.1	13.4	7.5
Aged 60 to 64	26.7	27.3	26.9

**Table C.3** Distribution of average absolute error in estimated accrued state pension rights using ELSA data only – those aged 50 to SPA in 2002/03, by sex, age group and marital status (£)

	p25	p50	p75	Mean
All (n=3,236)	£7,614	£17,612	£34,207	£23,510
Currently married	£7,480	£16,941	£33,419	£23,082
Previously married	£8,523	£21,928	£38,672	£26,343
Never married	£5,832	£13,601	£27,958	£19,167
Aged 50 to 54	£6,135	£13,406	£26,480	£18,600
Aged 55 to 59	£8,770	£20,008	£37,605	£25,658
Aged 60 to 64	n/a	n/a	n/a	n/a
Men (n=1,768)	£6,497	£14,714	£30,609	£20,998
Currently married	£6,598	£14,764	£32,241	£21,728
Previously married	£6,870	£14,707	£25,591	£18,358
Never married	£5,832	£14,813	£28,616	£19,394
Aged 50 to 54	£4,912	£9,265	£20,576	£14,215
Aged 55 to 59	£7,036	£14,961	£28,152	£19,720
Aged 60 to 64	£10,813	£26,462	£45,224	£30,849
Women (n=1,468)	£9,762	£21,654	£37,725	£26,535
Currently married	£9,585	£20,175	£34,451	£24,891
Previously married	£13,733	£28,823	£47,659	£32,451
Never married	£4,584	£12,238	£22,372	£18,795
Aged 50 to 54	£8,393	£17,178	£31,084	£22,166
Aged 55 to 59	£12,198	£25,857	£45,520	£31,107
Aged 60 to 64	n/a	n/a	n/a	n/a

# References

Banks, J., Emmerson, C., Oldfield, Z. and Tetlow, G. (2005). *Prepared for retirement? The adequacy and distribution of retirement resources in England*, October 2005, 106 pp., Report R67. London: Institute for Fiscal Studies ([http://www.ifs.org.uk/publications.php?publication\\_id=3443](http://www.ifs.org.uk/publications.php?publication_id=3443)).

Banks, J., Emmerson, C. and Tetlow, G. (2005). *Estimating pension wealth of ELSA respondents*, Working Paper no. 05/09. London: Institute for Fiscal Studies ([http://www.ifs.org.uk/publications.php?publication\\_id=3369](http://www.ifs.org.uk/publications.php?publication_id=3369)).

Banks, J. and Oldfield, Z. (2007). 'Understanding Pensions: Cognitive Function, Numerical Ability and Retirement Saving', *Fiscal Studies*, vol. 28, no. 2, pp. 143–170 (<http://www.ifs.org.uk/publications/4060>).

Bozio, A., Crawford, R. and Tetlow, G. (2010). *The history of state pensions in the UK: 1948 to 2010*, Briefing Note No. 105. London: Institute for Fiscal Studies (<http://www.ifs.org.uk/publications/5000>).

Department for Work and Pensions (2002). *Simplicity, Security and Choice: Working and Saving for Retirement*, Cm. 5677. The Stationery Office, London (<http://www.dwp.gov.uk/docs/gp.pdf>).

Marmot, M. *et al.*, *English Longitudinal Study of Ageing: Wave 0 (1998, 1999 and 2001) and Waves 1-4 (2002-2009)* [computer file]. 13th Edition. Colchester, Essex: UK Data Archive [distributor], January 2010. SN: 5050.



This working paper presents findings from analysis undertaken by The Institute for Fiscal Studies on behalf of the Department for Work and Pensions (DWP). The research combined information from the English Longitudinal Study of Ageing (ELSA) on individuals' circumstances at or near retirement, matched with information on their lifetime earnings from administrative records, to examine how retirement incomes relate to lifetime earnings.

If you would like to know more about DWP research, please contact:  
Paul Noakes, Commercial Support and Knowledge Management Team,  
3rd Floor, Caxton House, Tothill Street, London SW1H 9NA

[www.dwp.gov.uk/asd/asd5/rrs-index.asp](http://www.dwp.gov.uk/asd/asd5/rrs-index.asp)