NatCen
National Centre for Social Research

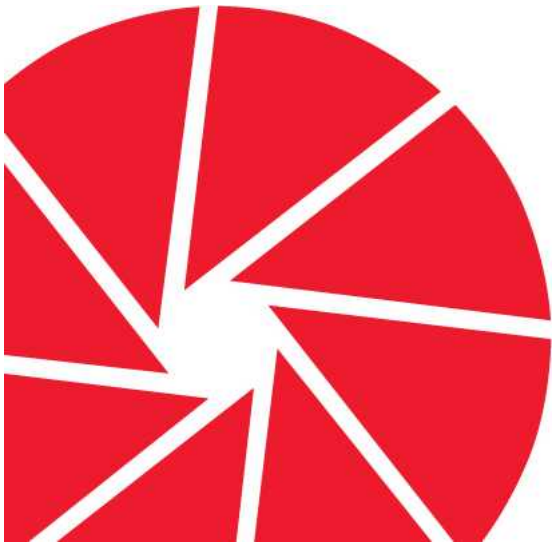
Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing

Technical Report

Shaun Scholes, Rebecca Taylor, Hayley Cheshire, Kate Cox, and Carli Lessof

November 2008

P2808



Contents

1 INTRODUCTION 1

2 SAMPLE DESIGN 4

2.1 Health Survey for England to wave 1 4

2.1.1 Health Survey for England 4

2.1.2 Selecting the ELSA sample for issuing in wave 1 5

2.1.3 Checking eligibility in wave 1 fieldwork and identifying new partners 9

2.2 Wave 2 (2004-05) 10

2.2.1 Eligibility for wave 2 10

2.2.2 Nurse visit 12

2.2.3 End-of-life interview 12

2.2.4 Institutional interviews 12

3 DEVELOPMENT OF THE WAVE 2 MAIN INTERVIEW AND NURSE VISIT 13

3.1 Pilot surveys in wave 2 14

3.1.1 Development of main interview instruments 14

3.1.2 Development of nurse visit 15

3.2 Structure and content of wave 2 interview 16

3.3 New questionnaire topics 20

3.4 Structure and content of wave 2 nurse visit 21

4 FIELDWORK PROCEDURES 23

4.1 Follow-up rules 23

4.2 Tracing movers 25

4.3 Methods to encourage response 25

4.4 Proxy interviews 27

4.5 Sample allocation 28

4.6 Setting up the nurse visit 28

4.7 Quality checking of interviews 29

4.8 Feedback to participants 29

4.9 Editing and coding 29

4.10 End-of-Life interview 30

5 FIELDWORK RESPONSE IN WAVE 2 31

5.1 Defining fieldwork response 31

5.2 Full, proxy and partial interviews achieved 33

5.2.1 Proxy interviews 33

5.2.2 Partial interviews 35

5.3 Module and item non-response 35

5.3.1 Module non-response 35

5.3.2 Item non-response 36

5.4 Stages of non-response 38

5.5 Fieldwork contact and co-operation rates 40

5.6 Individual response rate 41

6 STUDY RESPONSE 43

6.1 Defining and measuring study response 43

6.2 Differential non-response in wave 2 47

6.2.1 Main interview 48

6.2.2 Nurse visit 54

6.2.3 Blood sample 57

6.2.4 Self-completion questionnaire 59

7 AN ALTERNATIVE RESPONSE RATES FRAMEWORK 63

7.1 Background 65
7.2 Cross-sectional response rates 69
7.2.1 Unconditional response rates (HSE sampling frame: including persons of unknown age within non co-operating households) 69
7.2.2 Unconditional response rates (ELSA sampling frame: persons with known age within HSE co-operating households) 71
7.2.3 Conditional response rates 72
7.3 Longitudinal response rates (HSE as starting point) 73
7.3.1 Unconditional response rates 74
7.3.2 Conditional response rates 75
7.4 Longitudinal response rates (wave 1 as starting point) 76

8 REFERENCES 77

Appendix A INCOME AND WEALTH ITEM NON-RESPONSE 80

Appendix B MODEL OF RESPONSE TO MAIN INTERVIEW 82

Appendix C MODEL OF RESPONSE TO NURSE VISIT 86

Appendix D MODEL OF RESPONSE TO BLOOD SAMPLE 89

Appendix E MODEL OF RESPONSE TO SELF-COMPLETION QUESTIONNAIRE 92

Appendix F KEY ELSA ESTIMATES 95

List of Tables

Table 2-1 Wave 1 respondents by sample type 10
Table 4-1 Proxy interview modules 27
Table 5-1 Respondents in wave 2, by sample member type 33
Table 5-2 Full interview and proxy respondents, by age and sex 34
Table 5-3 Full interview and proxy respondent sample, by limiting long-standing illness and sex 35
Table 5-4 Full interview and proxy respondent sample, by work activity and sex 35
Table 5-5 Response rates to key sections 36
Table 5-6 Reasons for ineligibility, by age 40
Table 5-7 Individual response rate 41
Table 5-8 Reasons for non-response, by age 42
Table 6-1 Components of longitudinal response rates (core members) 43
Table 6-2 Wave 2 respondents, by age and sex 48
Table 6-3 Wave 2 main interview response, by age in wave 1 and sex 49
Table 6-4 Wave 2 main interview response, by (non-housing) wealth quintile and sex 50
Table 6-5 Weighted comparison of wave 1 and wave 2 achieved samples, by age and sex 51
Table 6-6 Weighted comparison of wave 1 and wave 2 achieved samples, by educational status in wave 1 53
Table 6-7 Respondents to nurse visit, by age and sex 54
Table 6-8 Achieved nurse visits as a proportion of wave 2 full/partial interviews, by age 55
Table 6-9 Reasons for non-response to nurse visit 55
Table 6-10 Nurse visit response, by (non-housing) wealth quintile in wave 2 and sex 56
Table 6-11 Respondents to blood sample, by age and sex 57
Table 6-12 Achieved blood sample measurements as a proportion of nurse visits, by age 58
Table 6-13 Blood sample respondents, by (non-housing) wealth quintile in wave 2 and sex 58
Table 6-14 Respondents to self-completion questionnaire, by age and sex 60
Table 6-15 Returned self-completion questionnaires as a proportion of wave 2 full/partial interviews, by age 60
Table 6-16 Self-completion respondents, by (non-housing) wealth quintile in wave 2 and sex 61
Table 7-1 Response rates from wave 0 to ELSA wave 2 64
Table 7-2 Response to ELSA 68
Apx. Table A-1 Income variable data type 80
Apx. Table A-2 Wealth variable data type 81
Apx. Table B-1 Model of response to main interview 83
Apx. Table B-2 Summary statistics for interview weight 85
Apx. Table C-1 Model of response to nurse visit 87
Apx. Table C-2 Summary statistics for nurse visit weight 88
Apx. Table D-1 Model of response to blood sample 90
Apx. Table D-2 Summary statistics for blood sample weight 91
Apx. Table E-1 Model of response in wave 2 (self-completion) 93
Apx. Table E-2 Summary statistics for self-completion weight 94
Apx. Table F-1 True standard errors (SE) and 95% confidence intervals for socio- economic variables 97
Apx. Table F-2 True standard errors (SE) and 95% confidence intervals for self- completion variables 99
Apx. Table F-3 True standard errors (SE) and 95% confidence intervals for self- reported memory status 99
Apx. Table F-4 True standard errors (SE) and 95% confidence intervals for self- assessed health, number of falls in last 12 months, mean Body Mass Index (BMI) and BMI status 100
Apx. Table F-5 True standard errors (SE) and 95% confidence intervals for mean systolic and diastolic blood pressure, mean total cholesterol and mean fibrinogen levels 101

List of Figures

Figure 2-1 ELSA sample definition 6
Figure 2-2 Eligibility criteria for wave 1 interview 10
Figure 3-1 Main interview modules wave 2 18
Figure 3-2 Benefit and financial units 19
Figure 4-1 Methods of encouraging response in wave 2 26
Figure 5-1 Response tree from wave 1 to wave 2 39
Figure 6-1 Response rate measure A 44
Figure 6-2 Response rate measure D 45
Figure 6-3 Response rate measure B 46
Figure 6-4 Response rate measure C 47
Figure 7-1 Pattern of response from HSE to ELSA wave 2 (age-eligible sample members) 67

ACKNOWLEDGEMENTS

The authors would like to acknowledge the contribution that many people have made to the ELSA study. The following people were involved in the development of wave 2 in the three collaborating institutions. At the National Centre for Social Research (NatCen): Bob Erens, Laura Conway, Michelle Lee, and Dan Philo. The past inputs of Lisa Calderwood, now at the Institute for Education, are gratefully acknowledged. At the Institute for Fiscal Studies (IFS): James Banks, Richard Blundell, Maria Casanova, Gemma Tetlow and Zoe Oldfield with additional advice from Carl Emmerson, Orazzio Attanasio, Richard Disney and Costas Meghir. At University College London (UCL): Professor Sir Michael Marmot, Elizabeth Breeze, Edlira Gjonca, Martin Hyde, Mary Janevic, Saffron Karlsen, Meena Kumari, Anne McMunn, Panayotes Demakakos, Faiza Tabassum, Paola Zaninotto, and Mary Pierce with additional advice from Mel Bartley, Paul Higgs and Mike Wadsworth. James Nazroo at the University of Manchester (formerly at UCL) is also a lead researcher on the study.

We have benefited from significant contributions from a number of academics based in other universities including: Felicia Huppert, Brenda McWilliams and David Melzer (University of Cambridge), Nicholas Steel (University of East Anglia), David Blane (Imperial College, London) and Peter Lynn (Institute for Social and Economic Research at the University of Essex). We would like to thank our international advisers Mike Hurd and Jim Smith (RAND, California), Beth Soldo (University of Pennsylvania), David Weir (University of Michigan), Bob Wallace (University of Iowa), Bob Willis and the ELSA advisory group, chaired by Baroness Sally Greengross, and including Sir Tony Atkinson, Michael Bury, Julian Ferrand, Tom Kirkwood, Tom Ross, Jacqui Smith, Anthea Tinker, Christina Victor and Alan Walker. In addition, we would like to thank Jibby Medina for her contribution as editor of this report, and both Martina Portanti at the Office for National Statistics (ONS) and Danielle Mason at the Department for Work and Pensions (DWP) for their helpful comments on drafts of this report.

Thanks also are due to Sarah Tipping, Gerry Nicolaas, Julia Hall and Dave Hussey at the Survey Methods Unit, and to all members of the computing and operations departments at the NatCen who have worked so hard to implement the study and to our interviewers and survey nurses who carry out the fieldwork. The people who matter most to us are our participants. They have given generously of their time and most have agreed to be recontacted. We hope that they find participation in the study interesting and that they will help us to track through the changes that happen as people age. We are very grateful to them.

1 INTRODUCTION

The English Longitudinal Study of Ageing (ELSA) is a study of people aged 50 and over and their partners. ELSA is a large multi-centre and multidisciplinary study that has been developed through collaboration between three primary institutions: University College London (UCL), the Institute of Fiscal Studies (IFS) and the National Centre for Social Research (NatCen), with academics at the Universities of Manchester, Cambridge, Nottingham, Exeter and East Anglia.

Funding for the first four waves of ELSA has been provided by the US Institute on Aging (NIA) and a consortium of British Government departments, specifically: Department for Education and Skills, Department of Environment, Food and Rural Affairs, Department for Work and Pensions, HM Treasury, HMRC (formerly Inland Revenue), Office of the Deputy Prime Minister and Office for National Statistics. ELSA has been modelled on the US Health and Retirement Study (HRS), although with the important addition of biomedical, genetic, performance and psychosocial measures. Its primary objective is to collect longitudinal data on health, disability, economics, and social participation and networks. ELSA provides a unique resource for exploring issues relating to ageing and has already been shown to be important both for scientific understanding and for the development of policy. Examples of the issues that ELSA covers include:

- the nature and timing of retirement and post retirement labour market activity;
- the determinants of economic well-being at older ages;
- cognitive functioning and its impact on decision-making among older people;
- disability and the compression of morbidity;
- economic, social and health inequalities in an ageing population; and
- social participation and social productivity at older ages.

By its nature and design, ELSA is set up to examine the interrelation of these six areas. The focus is multidisciplinary and international. The first allows for the examination of the inter-relationships between the different elements of the ageing processes and for the exploration of how these relationships develop and change. The second allows for the examination of institutional and cultural influences. ELSA data is being used to explore the dynamics of ageing, to inform policy debates and for comparative analysis with the HRS in the US and the Survey of Health and Retirement in Europe (SHARE). The comparison between the UK and US is particularly valuable because of similarities in the demographic, economic and social contexts alongside important differences in institutional systems, for example in relation to health and social care, retirement provision and retirement incentives.

The ELSA sample was drawn from households who had responded to the Health Survey for England (HSE) in 1998, 1999, and 2001. Detailed eligibility criteria are provided in Chapter 2. In brief, the majority of those aged 50 and over ('sample members') was selected[1] as were any young partners living with the sample member at the time of the HSE interview who were not age-eligible. Partners of sample members who had joined the household since the HSE

[1] Sample members were excluded from the ELSA wave 1 sampling frame if all HSE respondents aged 50 years and older within the household had refused, when asked, to being recontacted in the future.

interview entered the ELSA study as 'new partners'. At wave 1 a face-to-face interview and self-completion questionnaire was attempted with all those still living in private households in England during the fieldwork period (2002-03). 11,391 eligible sample members successfully interviewed in wave 1 were later renamed 'core members'. 636 interviews were conducted with young partners, 72 with new partners.

Respondents in wave 1 represented the baseline and were approached two years later for wave 2 (2004-05), with a nurse visit in addition to the face-to-face interview and self-completion questionnaire. 9,433 main interviews were conducted in wave 2. 8,781 interviews (93% of the total) were conducted with core members, 652 (7%) were partners. The median time lapse between wave 1 and 2 interviews for core members was 27 months (interquartile range 26-29 months, minimum time lapse 23 months, maximum 38 months).

7,666 core members went on to complete the nurse visit. The next nurse visit is scheduled at wave 4 (2008-09). A 'refresher' cohort of people just entering their 50s was added to the sample in wave 3 (2006-07)[2]; a larger cohort of people aged 50-74 has been added in wave 4. Both refresher cohorts were selected from later years of the HSE (2001-04 and 2006 respectively). All those who were recruited for the first wave or have since become partners of such people are known as Cohort 1. The refresher cohorts in waves 3 and 4 will be known as Cohorts 3 and 4 respectively. This technical report focuses on Cohort 1 only. Ethical approval for waves 1 and 2 was granted by the Multi-centre Research and Ethics Committee (MREC).

In wave 2 the core questionnaire was administered by Computer Assisted Personal Interviewing (CAPI). A paper self-completion questionnaire was also given to respondents. The topic areas covered in wave 2 included: individual and household characteristics; physical, cognitive, mental and psychological health; social participation and social support; housing, work, pensions, income and assets; and expectations for the future. A shorter interview was attempted with a proxy informant if the core member was unable to respond because of physical or mental ill health, or cognitive impairment. In waves 1 and 2 all those interviewed in person were asked to provide their National Insurance Number (NINO) and give permission for the ELSA team to link their survey data to official records of National Insurance contributions, welfare and benefit receipt, and also details of any tax credits they were claiming. Permissions were collected for both prospective and retrospective linkages. During the HSE interview respondents were asked to give permission to link their records to mortality and cancer registration data. At the ELSA interview respondents were reminded of the permission they had given and, if they had not given permission to link to mortality records they were again asked for consent. In addition, respondents were asked for permission to link their records to Hospital Episode Statistics (HES).

Preliminary findings from the wave 1 survey can be found in the report entitled "Health and lifestyles of the older population in England: The 2002 English Longitudinal Study of Ageing" (Marmot et al., 2003). Findings from the wave 2 survey can be found in "Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing" (Banks et al., 2006). Wave 3 findings can be found in "Living in the 21st century: older

[2] The addition in wave 3 of the refresher cohort of people just entering their 50s is to ensure a continuing sample of the household population aged 50 and older that is representative cross-sectionally and longitudinally. Note that due to ageing the wave 2 sample is representative of the household population *aged 52 and older*.

people in England: The 2006 English Longitudinal Study of Ageing" (Banks et al., 2008). Further analyses and publications are listed at the ELSA web site, www.ifs.org.uk/elsa.

This technical report focuses specifically on the study's methodology and conduct of the second wave. Information about the wave 1 methodology can be found in Taylor et al. (2007). Throughout, this report is based on the most up-to-date available data. As a result the numbers involved may in some cases differ slightly from those presented in the methodology chapter of the wave 2 report (Cheshire et al., 2006).

This technical report should be used in conjunction with the extensive materials deposited at the UK Data Archive http://www.data-archive.ac.uk/, study number 5050 and Economic and Social Data Service http://wwww.esds.ac.uk/longitudinal/access/elsa/5050.asp. These include a User Guide, which shows how to analyse the data and provides information about weights and other information needed for analysis. The UK Data Archive also provides the route to access core ELSA data. Some sensitive data, such as geographical information, is not available through the Data Archive but can be applied for directly from the study team by emailing elsadata@natcen.ac.uk.

2 SAMPLE DESIGN

The ELSA wave 1 sample was designed to represent people aged 50 and over (persons born before 1 March 1952), living in private households in England and was selected from households that had previously responded to the Health Survey for England (HSE) in 1998, 1999 and 2001. This chapter provides background information about the HSE and ELSA wave 1 sampling designs (Section 2.1) followed by information on the sample members followed-up for interview in wave 2 (Section 2.2).

2.1 Health Survey for England to wave 1

2.1.1 Health Survey for England

The HSE is an annual cross-sectional household survey that collects a wide range of health data and biometric measures. The HSE has been carried out since 1994 (the series began in 1991) by the Joint Health Surveys Unit of the Department of Epidemiology and Public Health, University College London, and NatCen, on behalf of the National Health Service Information Centre for health and social care. The HSE series is primarily designed to:

- monitor trends in the health of the population of England using data from nationally representative samples;
- estimate the proportion of people in England who have specified health conditions;
- estimate the prevalence of certain risk factors associated with certain health outcomes; and
- examine subgroup variations (including regional populations) in specified conditions or risk factors.

Each of the main HSE samples is designed to be representative of the English population living in private households.[3] Interviewing for HSE is continuous and the sample is issued to interviewers evenly throughout the year. The HSE response rates are relatively constant from year to year.[4] Further details about the HSE are available from its Technical Reports (Erens and Primatesta, 1999; Erens, Primatesta and Prior, 2001; Prior et al., 2003).

Three HSE years, 1998, 1999 and 2001 were selected as the sampling frame for ELSA wave 1. HSE 1998 and 2001 had a single general population ('core') sample that was nationally representative. The HSE 1999 sample design had two components: a 'core' sample that was nationally representative and a boost sample that represented ethnic minorities. The ethnic minority boost sample was discarded since there was insufficient resource to include a sufficient sample to boost the representation of minority ethnic groups in ELSA.

Each HSE sample is drawn in two stages. The method ensures that every address on the small users Postcode Address File (PAF) in England has an equal chance of inclusion. First, postcode sectors are selected from the PAF. Postcode sectors are stratified by health

[3] People living in institutions, who are likely to be older and, on average, in poorer health than those in private households are not covered by the HSE.
[4] For the three HSE surveys chosen, the household response rate ranged from 74% to 76% and the adult individual response rate ranged from 67% to 70%.

authority and the proportion of households in the non-manual socio-economic groups. Sectors are selected with probability proportional to their size, measured by delivery point count. Interviewing for each HSE year is continuous over a twelve-month period. The sample for each year is systematically sub-divided, where each postcode sector is assigned to a month of the year. The fieldwork conducted in each quarter of the year is carried out with a fully representative sub-set of the total sample.

Second, a fixed number of addresses are selected systematically from each postcode sector. Within each address, households are identified and up to three households randomly selected. A specified number of adults and children in each household are deemed eligible for interview. Eligible individuals are asked to participate in a personal interview followed by a nurse visit.

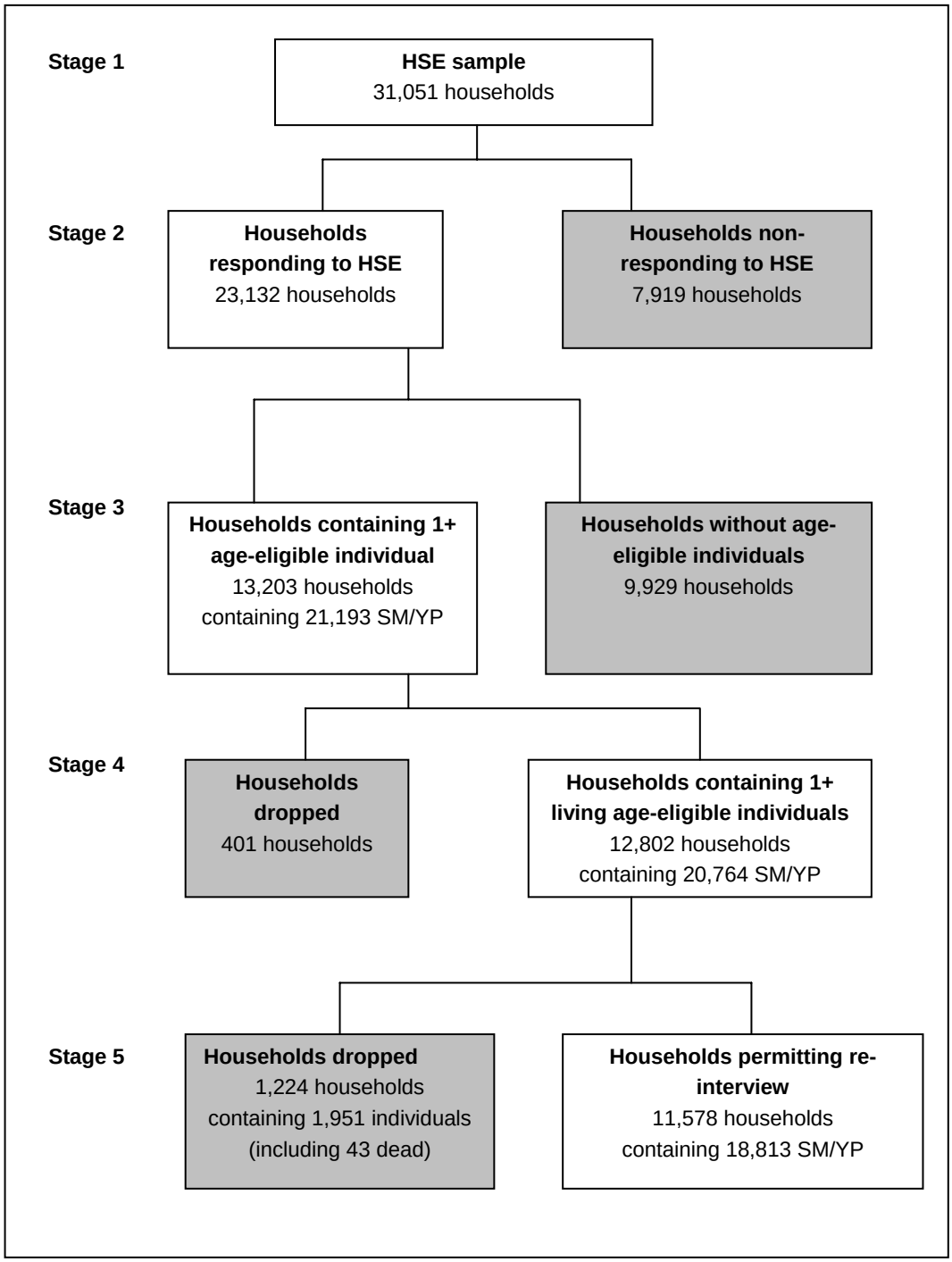
Around 16,000 adult respondents are typically included each year, almost 90 per cent of whom agree to a follow-up visit by a nurse. Different annual rounds of the survey focus on different health outcomes (e.g. cardiovascular disease in 2003 and 2006) or on different subgroups of the population (e.g. ethnic minorities in 1999 and 2004, those living in institutions in 2000, and older people in private households in 2005).

2.1.2 Selecting the ELSA sample for issuing in wave 1

The process of selecting the ELSA sample for wave 1 (2002-03) from the HSE 1998, 1999 and 2001 is summarised in the tree diagram Figure 2-1 which should be read from the top to the bottom. The shaded areas of Figure 2-1 show the number of households that were not issued in wave 1.

Figure 2-1 ELSA sample definition

SM Age-eligible sample member
YP Young partner



At the top of the tree were the sample of 31,051 households issued for HSE 1998, 1999 and 2001 – this is represented as Stage 1 and has been described in the section above. Following this, four stages took place. In brief, the wave 1 sample was only selected from households that responded to HSE (Stage 2). Furthermore, households were only issued to field if they included at least one age-eligible individual (Stage 3) who, according to administrative records, remained alive (Stage 4) and gave permission to be recontacted in the future (Stage 5).

Age-eligibility meant being born before 1 March 1952 living in a private household in England at the time of the HSE interview. Note, therefore, that *not* all age-eligible individuals were included in the ELSA sampling frame. Inclusion was conditional on at least one living age-eligible individual agreeing to further contact post HSE (Stage 5). The result of this was that a sample of 11,578 households was eventually issued for wave 1.

The following paragraphs describe Stages 2 to 5 in more detail and present the characteristics of individuals *issued* in the wave 1 fieldwork period (2002-03).

Stage 2

In the early stages of the HSE interview, all responding households were asked to provide the date of birth for every resident regardless of whether each went on to complete a full individual HSE interview. This meant that all age-eligible individuals could be identified in responding households. On the other hand, non-responding households were not included in the ELSA sampling frame because there was no available information about residents that would have made it possible to identify those who were aged 50+, or indeed would make it possible to trace those who were resident in the household at the time of the HSE interview to collect this information belatedly.

A sampling frame was constructed from the HSE responding households using information about the residents at the time of HSE interviewing. Overall, 23,132 households responded to HSE 1998, 1999 and 2001 and so formed the foundation of the ELSA sample while a further 7,919 households did not respond to HSE and so were not included in the sampling frame. These two groups are shown as Stage 2 in Figure 2-1.

From the available HSE information two sample member types were identified for the ELSA wave 1 interview:

- First, potential **sample members** (SM) were identified. These were defined as individuals who were living within an HSE responding household and were born before 1 March 1952. This date was chosen to ensure that all sample members would be aged 50 or over at the beginning of the planned fieldwork (in March 2002). In total, 19,924 age-eligible individuals were identified. Potential sample members who successfully took part in ELSA wave 1 were later designated as ‘core members’.

- Second, cohabiting spouses or partners of sample members who were younger than 50 years old were identified. These potential **young partners** (YP) were defined as the cohabiting young spouses/partners of sample members, who were living within the

household at the time of the HSE interview and were born after 29 February 1952. In total, 1,269 young partners from HSE were identified.[5]

Stage 3

Taking potential sample members and young partners together, Stage 3 in Figure 2-1 shows that there were 13,203 households that contained one or more age-eligible individuals and a total of 21,193 sample members or young partners within these households (comprised of the 19,924 potential sample members and 1,269 young partners mentioned above). The shaded box in Stage 3, Figure 2-1 also shows that a further 9,929 households that responded to HSE were not included in the final ELSA sample because they did not contain an age-eligible individual.

Two restrictions applied to the individuals selected, set out in Stages 4 and 5.

Stage 4

First, potential sample members and young partners were not issued in wave 1 if it was known that they had died since their HSE interview. This check was carried out before wave 1 fieldwork began to reduce the number of attempts to contact people who had died, since this could cause unnecessary distress for relatives and, in the case where there were no longer any eligible individuals to approach, would also improve fieldwork efficiency. All HSE participants in 1998 and 1999 who gave their permission (95%) were 'flagged' with the National Health Service Central Register (NHSCR) run by the Office for National Statistics (ONS). This register keeps track of registrations with general practitioners but also with official death registrations and with people who leave the UK health system. No check was conducted on the HSE 2001 sample as little time had passed since that interview.

Occasionally, not issuing individuals who were known to have died meant that there were no remaining potential sample members within the household (e.g. only a young partner would remain). In these cases, the whole household was removed from the final wave 1 sample. This is depicted in Stage 4 of Figure 2-1 which shows that of the 13,203 households who contained one or more age-eligible individuals, 401 households were removed from the final sample issued to field: leaving a total of 12,802 households who contained one or more *living* age-eligible individuals.

Stage 5

Second, potential sample members and young partners were not included in the final ELSA sample if *all* HSE respondents aged 50 years or older within the household had refused, when asked, to being recontacted in the future. Even though these people had not directly refused to take part in ELSA (they would not have been aware of the study at the time of HSE) it would have been unethical to have recontacted them. Using this criterion meant a further subset of HSE responding households containing age-eligible individuals were removed from the final ELSA sample. This is depicted in Stage 5 of Figure 2-1 which shows that of the 12,802 households who contained one or more living age-eligible individuals, 1,224 households were removed from the final ELSA sample because no living age-eligible

[5] The main focus of ELSA is on age-eligible sample members. Young partners were not included in the sample for analysis as individuals in their own right. Rather, they were included in the study so that more complete information is available about the sample member and their partnership. Furthermore, their

individual had consented to recontact post HSE. That said, if at least one age-eligible sample member did consent to recontact, the *household* was issued to field, though only individual 'consenters' within that household were directly approached, with an advance letter. Nevertheless, an implication of this is that 'refusing' age-eligible sample members that lived with at least one other age-eligible individual who did give consent to recontact post HSE still had a chance of being interviewed in wave 1. This left 11,578 households, containing 18,813 sample members or young partners. These individuals constituted the final sample issued for interview in ELSA wave 1.

2.1.3 Checking eligibility in wave 1 fieldwork and identifying new partners

The final ELSA wave 1 sample reflected the household composition at the time of the HSE interview. However, the ELSA interview was conducted between one and four years after the HSE interview took place. As a result, some changes were anticipated (e.g. relationships between individuals would change; individuals would join the household or had left to form a new household, as well as entire households moving). There were three particular ways in which the status of an individual could change between HSE and wave 1:

- The status of the selected individuals needed to be checked during fieldwork to ascertain whether they were living in a private residential address in England at the time of the wave 1 interview. Any who had moved out of England or out of the private residential sector (e.g. nursing care home or institution) were not interviewed.

- The status of young partners was also checked. Young partners were approached for interview if, at the time of the wave 1 interview, they were still living with an age-eligible sample member. That is to say, young partners identified from HSE who had split from the age-eligible sample member before the wave 1 interview were no longer eligible to be interviewed.

- A further subgroup of individuals was identified during wave 1 fieldwork. **New partners** (NP) were defined as the cohabiting spouses or partners of sample members at the time of the first ELSA interview, of any age, who had joined the household since the HSE.

Identification of new partners during fieldwork meant that there were three types of individual who were eligible to take part in ELSA wave 1, as illustrated in Figure 2-2.

inclusion makes it possible to carry out analyses of a representative sample of couples where at least one spouse is 50 or older.

Figure 2-2 Eligibility criteria for wave 1 interview

- **Eligible sample members** were individuals who were living within the household at the time of the HSE interview in 1998, 1999 and 2001, were born before 1 March 1952 and were still living at a private residential address in England at the time of the ELSA wave 1 interview. Those successfully interviewed in wave 1 were later renamed 'core members'.
- **Young partners** were the cohabiting spouses or partners of eligible sample members, who were living within the household at the time of the HSE in 1998, 1999 and 2001, and were still cohabiting with the sample member in wave 1. Young partners were born after 29 February 1952.
- **New partners** were the cohabiting spouses or partners of eligible sample members at the time of the first ELSA interview, of any age, who had joined the household *since* the HSE interview.

Achieved interviews ELSA wave 1

12,099 interviews were conducted in wave 1. The majority of interviews (11,391: 94%) were with core members (Table 2-1) (previously named eligible sample members). A significant number of interviews were conducted with young and new partners (708: 6%).

Table 2-1 Wave 1 respondents by sample type

All wave 1 respondents

Sample member type	Number of respondents
Core member	11391
Young partner	636
New partner	72
Base (unweighted)	*12099*

The wave 1 interviews provided the baseline for the ELSA study.

2.2 Wave 2 (2004-05)

2.2.1 Eligibility for wave 2

Core members were eligible (i.e. considered to be part of the target population) in wave 2 unless they had since died, had moved out of Britain or moved out of the private residential sector (e.g. into a nursing care home or institution). Eligible core members were not *issued* in wave 2 if all wave 1 respondents in the household had explicitly asked at the end of the interview not to be recontacted.[6] Eligibility, therefore, did not necessarily lead to inclusion in the final wave 2 sample (2004-05).

[6] As explained in Section 4.2, wave 1 respondents who explicitly asked not to be recontacted in the future were asked to rejoin the study in wave 2 if someone else in the household had implicitly consented to be recontacted.

Several other categories of individuals were also eligible for an interview in wave 2. These were the partners of core members (core partners, new partners or young partners, as described in Figure 2-3).

Figure 2-3 Eligibility criteria for wave 2 interview

- **Core members (CM)** were individuals who had been living within the household at the time of the HSE interview in 1998, 1999 and 2001, were born before 1 March 1952 and were subsequently interviewed as part of wave 1 at a private residential address in England. They were no longer eligible if they had since died or moved out of Britain. Core members living in a household where all wave 1 respondents explicitly refused further contact post wave 1 were not issued for follow-up in wave 2.

- **Core partners (CP)** were individuals who, like core members, had been living within the household at the time of the HSE interview and were born before 1 March 1952. They were non-respondents in wave 1 (although established to be present in the household), so missing the baseline survey. Consequently, they were only approached in wave 2 by virtue of their being the partner of a core member.

- **Young partners (YP)** were the cohabiting spouses or partners of eligible sample members, who were living within the household at the time of the HSE, and were still cohabiting with the sample member at the time of the wave 1 interview. They were born *after* 29 February 1952.

- **New partners (NP)** were the cohabiting spouses or partners of eligible sample members at the time of *either the first or second* ELSA interview, of any age, who had joined the household since HSE.

Core, young and new partners identified in wave 1 were eligible for a full wave 2 interview even if they were no longer living with a core member at the time of the second ELSA interview. That is to say, all partners who had been living with a core member at the time of wave 1 and had since been separated or divorced from them, or had been widowed, were followed up for interview in order to understand their circumstances after this event had occurred. The only circumstances in which partners who had separated from the core member were not approached were if they had died, had explicitly asked at the end of their first ELSA interview not to be recontacted, had left Britain or moved into an institution. ELSA's following-up rules stipulate that ex-partners are only followed up once after leaving the core member's household.

New entrants who had joined the household of a core member since the wave 1 interview were only eligible for interview if they were the cohabiting spouse/partner of a core member, regardless of their age ('new partner').

Over the wave 2 fieldwork period (2004-05) 9,433 main interviews were conducted. As in wave 1 the majority of interviews (8,781: 93%) were with core members. 652 (7%) interviews were conducted with partners (83% of whom also took part in wave 1). Full details on response to wave 2 are provided in Chapters 5-7.

2.2.2 Nurse visit

A notable addition in wave 2 was the collection of biomedical and physical performance measures from respondents by a trained nurse, including the taking of blood samples. Core members who completed a wave 2 main interview were eligible for a nurse visit. Young and new partners (those identified in both waves 1 and 2) were not eligible. 7,666 nurse visits were completed (nearly nine-in-ten of those core members who completed a wave 2 main interview). Full details on the data collected in the nurse visit are provided in Chapter 3; response to the nurse visit is discussed in Chapters 5-6.

2.2.3 End-of-life interview

An "End-of-Life" CAPI interview was developed in wave 2 for those core members who took part in wave 1 and implicitly agreed to be recontacted, and who had died since the wave 1 interview.

Interviewers approached a partner, close friend or relative of the core member to conduct an interview about the deceased. The HRS in the US successfully adopted this approach, and the content of their interview was revised for use in ELSA.

The aim of the end-of-life interview was to bring closure to the information collected in ELSA wave 1. It is possible to link the answers given by the late respondent in wave 1 to those given in their end-of-life interview to find out how their lives may have changed in the two years preceding their death. Of main interest is their health, social circumstances, and financial situation over this time, and what happened to their assets after they died.

133 end-of-life interviews were completed in wave 2 with core members.

2.2.4 Institutional interviews

A disadvantage of using the HSE as the sampling frame for ELSA is that the study concentrates on individuals living in private households, as is the case for many national surveys. This meant that individuals living in institutions such as residential and nursing homes were not included in the ELSA sample. Instead, ELSA aims to look at the circumstances surrounding the move into an institution. In wave 2 the ELSA team began to follow the moves of core members from a private household at the first ELSA interview into a residential care home or similar institution. Institutional interviews began in wave 3 (2006-07).

3 DEVELOPMENT OF THE WAVE 2 MAIN INTERVIEW AND NURSE VISIT

The ELSA wave 2 interview covered a wide range of topics. It was similar to the questionnaire used in wave 1, although every module was reviewed to ensure that it would provide data that measured change over time. This was achieved by repeating some measures exactly (e.g. to measure income and assets), by asking directly about change (e.g. to capture perceived changes in memory and concentration) and by adapting questions to allow respondents to update or amend past responses (e.g. about work, pensions and specific health conditions).

In wave 1 there was a face-to-face interview and self-completion questionnaire. The main change for wave 2 was the addition of a nurse visit. Following the main interview, appointments were made for core members to be visited in their homes by a qualified nurse to carry out a series of biomedical and physical performance measures. The content of the nurse visit was similar to the one that many respondents had as part of the HSE.

The health and functioning measures collected in the main interview were primarily self-report - with the exception of a timed walk for gait speed and a number of objective memory and cognitive function tests. The nurse visit added objective measures of risk factors for cardiovascular diseases in the form of blood analytes and blood pressure, and also included anthropometric measures (from height, weight, waist and hip). Finally, some objective physical function measures were included, namely lung function, muscle strength (grip strength) and lower limb mobility (balance tests, chair rises).

The topic areas covered in the wave 1 main interview and self-completion questionnaire included: individual and household characteristics; physical, cognitive, mental and psychological health; social participation and social support; housing, work, pensions, income and assets; and expectations for the future. The same broad areas were covered in wave 2 but there were changes in some of the details. Questions were added about different forms of expenditure (for example, on fuel, leisure, clothing and transfers). Questions about quality of healthcare were added. Numeracy was added to the section measuring cognitive function but one memory test was removed. There were new sections on relative deprivation, life satisfaction and on the way people perceive ageing and their own age. There was enhancement about the relationship between effort and reward in people's lives and the motivation and satisfaction (or lack of them) they feel when caring for others or undertaking voluntary work.

In terms of methodology, the wave 2 interviews reflected back on information collected in the first wave so that respondents could update their information rather than start again from the beginning. This method ('dependent interviewing') applied in particular to diagnosed diseases, employment and membership of pension schemes.

This chapter provides background information about the comprehensive piloting undertaken before the mainstage for both the main interview and nurse visit (Section 3.1), the structure and content of the wave 2 main interview (Section 3.2) and new questionnaire topics (Section 3.3); and concludes with the structure and content of the wave 2 nurse visit (Section 3.4).

3.1 Pilot surveys in wave 2

Extensive discussion took place with ELSA collaborators about necessary changes to the wave 1 interview. The intention was for the content to remain broadly the same (to allow for the analysis of change between the two waves), and allow respondents the opportunity to update information given at their previous interview. Early pre-tests helped with the development of the nurse visit and physical performance measures. A full pilot was conducted in August 2003 and a dress rehearsal in January 2004. For wave 1 a sample of respondents was selected from HSE 2000 to help with survey development. This group was also followed up two years later in order to reflect the experiences of those in the main study. The aim of the pilot and dress rehearsal was to fully test the CAPI instrument, self-completion questionnaire, associated documents and fieldwork approach for the main interview and all aspects of the nurse visit.

3.1.1 Development of main interview instruments

Piloting provided an opportunity to gain feedback from interviewers on the use of dependent interviewing in the questionnaire. Dependent interviewing (DI) is a term used to describe how substantive answers collected during a past interview are fed into the current interview in order to improve data quality. This differs from traditional independent interviewing, where respondents are typically asked the same questions about their situation at different points in time, without reference to previous answers (Lynn et al., 2005). Wave 2 represented a key stage in questionnaire development for ELSA, as wave 1 data collected for respondents was available which could be incorporated into their wave 2 interview. Previous answers could be used to formulate questions or to determine routing (proactive DI) or to prompt post-response edit checks (reactive DI).

Lynn et al. (2005) mention four ways in which dependent interviewing can increase data quality:

- To verify apparent changes through post-response edit checks if the answer is inconsistent with the previous answer (this is mainly to catch keying errors, but also includes reminding respondents of items mentioned in the previous but not the current interview to reduce under-reporting).

- To remind respondents of previous reports. Providing a memory aid and temporal boundary is likely to improve respondent recall and thereby reduce omissions and misclassifications.

- To ask respondents whether their situation is still the same, instead of inferring change from different status reports.

- To route around follow-up questions if circumstances have not changed, in which case previous data can be brought forward. For coded answers to open-ended questions, such as industry and occupation, this reduces coding variability.

A proactive style was mostly adopted for ELSA, for example, respondents were reminded about health conditions reported at the previous wave, and asked to confirm whether they still had the condition now. This method prompted an ‘update’ of their previous status, and in doing so reduces trivial error and saves interviewing time (by not recollecting details already known). The main use of DI is to detect change which can then be explored further using follow-up questions. It was also used reactively at some points in the questionnaire, for example to re-ask items that were either refused or not known at the previous interview, or to exclude some questions from being asked if the information was already collected at a prior interview.

Interviewers found the use of dependent interviewing made the interview flow well, and reduced repetitiveness. However, piloting helped to identify a need for a consistent approach to dealing with disputes (i.e. when respondents disagreed with the information being fed-forward).

The inclusion of a Computer Aided Self Interviewing (CASI) element was tested in the wave 2 pilot. This method allows the respondent to answer sensitive questions without input from the interviewer. Respondents were given the laptop and asked to complete, among other things, sensitive questions about urinary incontinence. However, moving the computer took a lot of time and disruption for only a few questions, and some older respondents expressed concern at using the computer. Concerns about confidentiality were also raised with many couples sharing their answers with each other. As a result, the CASI element was dropped from the wave 2 mainstage and the incontinence questions placed in the Health module of the main interview.

The dress rehearsal was used to provide an indication of likely response rate and provide a thorough test of fieldwork procedures prior to the mainstage. The household and individual response rates were 82% and 66% respectively. The majority of respondents remembered their wave 1 interview, so there was little need for interviewers to ‘sell’ the study on the doorstep. Having the same interviewer as wave 1, however, was felt to assist with co-operation due to the rapport that was already established.

At wave 1 incentive cheques were given to respondents at the end of their interview. In the wave 2 dress rehearsal a different approach was adopted by sending the £10 cheque at the same time as the advance letter. Therefore receiving payment was not conditional on participation. Interviewers felt sending the cheque in this way 'eased' the interview, and meant respondents were more accepting of the interview length. However, for the wave 2 mainstage approval from the Multi-centre Research and Ethics Committee (MREC) was not granted for sending the incentive cheque in this way. More experimental work is needed to assess the impact of pre-paid incentives on participation, and the intention of NatCen is to explore this further during piloting for further waves.

3.1.2 Development of nurse visit

Many of the biomedical measures used in the HSE nurse visit were also included in ELSA. Where possible, the ELSA protocols for each measure followed those already developed. Emphasis was placed on checking the exclusion criteria for each test, and carrying out the measures accurately and consistently. Physical performance measures such as tests of lower

limb functioning and grip strength offer an objective marker of functioning, free from differences in attitudes to reporting difficulties (Melzer et al., 2006). The physical performance measures were new to surveys conducted in Britain so these were developed for use on the aged 50+ population in consultation with academics from the University of Cambridge.

The dress rehearsal identified level of consent to the nurse visit to be high. Of the 96 households with at least one productive interview, just four households refused to do the nurse visit.

Nurse interviewers also found that mentioning the blood samples up-front in the dress rehearsal did not negatively affect participation, but agreement to provide the fasting sample was more likely if appointments for the visit were made in the morning. For the wave 2 mainstage it was not possible to restrict nurses to morning-only appointments due to length of fieldwork and overall fieldwork capacity.

The dress rehearsal was also used to assess reactions to providing a DNA sample. A separate genetics leaflet was produced which outlined the reason for collection, and how respondents' DNA would be stored and analysed. Respondents were also asked to sign a consent form. Overall, nurses felt able to handle this element of the study as the genetics leaflet covered all the necessary information.

3.2 Structure and content of wave 2 interview

As in the first wave, the wave 2 main survey comprised a personal face-to-face interview and self-completion questionnaire. Overall, the intention in wave 2 was to collect data on the same topics as in wave 1 to analyse change between the two waves. There were, however, some additions to the main interview content to respond to new areas of enquiry (these are set out in Section 3.3). Some questions from wave 1 were omitted as it was decided that they did not need to be asked at every wave. Furthermore, several elements of the questionnaire were amended to take account of responses given during the previous wave.

The ELSA programme allowed flexibility in administering the interview. Respondents could be interviewed individually, or in households with more than one eligible respondent, interviewed at the same time (in a single session) using concurrent interviewing techniques. In a concurrent session the same block of questions was asked alternately of each person. Concurrent interviews tended to be quicker than two separate individual interview sessions, and were generally more convenient for respondents.

The ELSA main interview contains various modules each covering a different area of enquiry. The content and major routing of each module is described below. Although interviews tended to follow the same module order, some flexibility was given to the interviewer. For example, the walking 'gait' speed test could be administered at any time after the Health (HE) module, and it was possible for interviewers to skip the Income and Assets (IA) or Housing (HO) modules if it was more convenient to do them at another time.

Five sections formed the 'private modules' block:

- Cognitive Function (CF);
- Expectations (EX);

- Effort and Reward (ER);
- Psychosocial Health (PS); and
- Final Questions (FQ).

Wherever possible, these modules were administered with no other household members present. If two respondents were being interviewed concurrently, whilst the first respondent was being asked the private block, the second responding individual was asked to fill in the self-completion questionnaire in a separate room. The two respondents then switched places.

The structure of the main interview was the same as it had been for wave 1. In brief:

- In households with one respondent, or where two respondents were interviewed separately, each interview followed the course set out in Figure 3-1 though some flexibility was given in the order of the timed walk, IA, and HO modules.

- In households where more than one eligible respondent agreed to take part, two individuals could be interviewed in a single session, unless they kept their finances separately and were not prepared to share this information. In these concurrent sessions, the two respondents were interviewed alongside each other, but were separated during the course of the interview so that the five modules set out above could be administered in private.

- The self-completion questionnaire was normally concluded after the face-to-face interview was over and the interviewer had left the household (if the eligible individual was interviewed alone), or while the other person in the concurrent interviewer session completed the ‘private’ modules described above.

Figure 3-1 Main interview modules wave 2

Household Demographics (HD) – collection or updating of demographic information about everyone living in the household, including sex, age and relationships to each other, and collection or updating of information about children.

Individual Demographics (ID) – collection or updating of details about respondents' legal marital status, parent's age and cause of death, and number of living children.

Health (HE) – collection or updating of self-reported general health, chronic illness or disability; eyesight, hearing; specific diagnoses and symptoms; pain; difficulties with activities of daily living (ADLs); smoking; mental health, urinary incontinence; falls and fractures; quality of healthcare respondents received for particular health conditions.

Social Participation (SP) – much shorter than the wave 1 SP module, and only asked about the use of public transport. Questions on caring for others were moved to the new **Effort and Reward** module and the questions on cultural capital (e.g. how often the respondent eats outside the house or goes to the theatre) were asked in the **self-completion questionnaire**.

Walking ('gait') speed test (MM) – all respondents aged 60 years and over completing the main interview on their own behalf were eligible for the walking speed test, which was performed as part of the main ELSA interview. The test involved timing how long it took to walk a distance of eight feet. Respondents began with both feet together at the beginning of the course. The interviewer started timing as soon as the respondent placed either foot down on the floor across the start line. They were asked to walk (not race) to the other end of the course at their usual speed, just as if they were walking down the street to the shops, and to walk all the way past the other end of the tape before stopping. Timing was stopped when either foot was placed on the floor across the finish line. Respondents were then asked to repeat the test by lining up their feet and walking back along the course, all the way past the other end.

Work and Pensions (WP) – collection or updating of current work activities; current and past pensions; reasons for job change and health-related job limitations.

Income and Assets (IA) – assessment of the income that respondents received from a variety of sources over the previous 12 months: wages, state pensions, private pensions, other annuity income and state benefits; and collected financial and non-financial assets. Couples decided who the respondent would be for a single financial unit, although the interviewer was instructed to suggest to the couple that the person who answered the IA module in wave 1 did so again in wave 2.

Housing (HO) – collection or updating of current housing situation (including size and quality), housing-related expenses, ownership of durable goods and cars; consumption including food in and out of home, fuel, durables, leisure, clothing and transfers. Only one eligible ELSA respondent in the household answered the module. Respondents decided themselves who the household respondent should be, but again, the interviewer was instructed to suggest that the person who answered the HO module in wave 1 answered this module again in wave 2.

Cognitive Function (CF) – measured different aspects of the respondent's cognitive function, including memory, speed and mental flexibility; and assessed literacy.

Expectations (EX) – measured expectations for the future in a number of dimensions; financial decision-making; relative deprivation and subjective views of ageing.

Psychosocial Health (PS) – measured how the respondent viewed his or her life across a variety of dimensions.

Effort and Reward (ER) – new questions to assess motivations behind voluntary work and caring for others; and the relationship between effort and reward.

Final questions and consents (FQ) – collection of any missing demographic information and updating of contact details and consents as described below.

- Where households contained two or more eligible individuals one was nominated as the informant for that household. Similarly, one individual was asked to be the informant on income and assets on behalf of each benefit unit (BU). Benefit and financial units are defined in Figure 3-2.

Figure 3-2 Benefit and financial units

Benefit units (BUs) – are defined from individuals within the same household using their age and marital status. A BU is a single adult or couple plus any dependent children. A couple is defined as two adults that are married or living as married. An adult is defined as an individual who is aged 19+ or aged 16-18 and married. Any children are included in the BU with the appropriate adult parent. Many of the financial derived variables in the ELSA dataset are derived at the BU level. The IA section, however, is asked once per **financial unit**.

Financial units – are equivalent to BUs with the exception that couples who keep their finances separate are defined as *two* financial units and each answers the IA module on their own behalf. Hence the BU can be different to a financial unit. For couples that keep their finances separate, income and assets information reported separately by each member of the couple is combined to obtain a BU definition of income and wealth.

The interview ended with a request for confirmation – or amendment – of consent to obtain health and economic data from administrative sources. In waves 1 and 2 all those interviewed in person were asked to provide their National Insurance Number (NINO) and give permission for the ELSA team to link their survey data to official records of National Insurance contributions, welfare and benefit receipt, and also details of any tax credits they were claiming. Permissions were collected for both prospective and retrospective linkages. During the HSE interview respondents were asked to give permission to link their records to mortality and cancer registration data. At the ELSA interview respondents were reminded of the permission they had given and, if they had not given permission to link to mortality records they were again asked for consent. In addition, respondents were asked for permission to link their records to Hospital Episode Statistics (HES). Consent was also collected for a nurse visit. Contact details were requested for a stable address and for a nominated individual who might respond if a proxy, institution, or end-of-life interview were needed in the future.

3.3 New questionnaire topics

One of the key aims of ELSA is to continue to test innovations in questionnaire design, sharing new developments with collaborative studies, such as the HRS in the US. Listed below are a number of new topics that were added to the wave 2 main interview.

Health

The main addition to the Health module was a section of questions used to measure the quality of healthcare. The majority of these questions represented technical healthcare processes, such as blood sugar monitoring for diabetics (see Steel et al., 2006). The questions determined whether or not the respondent received the healthcare set out in 44 quality indicators. These indicators were developed using the RAND/UCLA method for combining the best available research evidence with expert opinion (known as evidence-based care standards: see Brook et al., 1986).

Cognitive Function

Literacy was assessed for the first time in a UK population sample of people aged 65 and over. The literacy measure assessed how well respondents understood written instructions about taking an Aspirin tablet (see Huppert et al., 2006). This replaced the numeracy measure that was included in wave 1.

Housing

Two partial measures of household spending were covered in wave 1: housing costs and food expenditures. A more detailed set of questions on spending patterns was added in wave 2. These included spending on clothing, leisure, fuel, and transfers of money to people outside the household (e.g. charitable donations).

Work and Pensions

New questions were included to: (1) understand reasons why respondents changed jobs, (2) discern health-related job limitations, and (3) obtain a better measure of respondents expected income after retirement. These questions had been used successfully in the US but were new to surveys in Britain.

Expectations

This module was expanded to include questions about ‘relative deprivation’ (that is, how well off or badly off people feel relative to others) and subjective views of ageing.

Effort and Reward

New questions were added to assess motivations behind voluntary work and caring for others, and the relationship between effort and reward.

Self-completion

A number of additions were made to the wave 2 self-completion questionnaire. Questions about social participation were moved from the main interview to the self-completion, as were questions used to measure life satisfaction and loneliness. New questions were also included to measure alcohol consumption.

3.4 Structure and content of wave 2 nurse visit

After conducting the interview, the interviewer made an appointment for the nurse to visit the respondent, or set up contact between the nurse and respondent. The nurse then visited the respondent to carry out a series of measurements listed in Figure 3-3. These were only obtained if the appropriate consents were given and the respondent was able to respond affirmatively to relevant safety questions.

Figure 3-3 Nurse visit measures

The nurse visit included the taking of several standard measures including:

Blood pressure

Lung function – a measure of how much air respondents could exhale from lungs, and was measured using a spirometer.

Blood sample – most respondents under the age of 80 were asked to fast before giving the sample. A list of the uses to which the sample was put is given in Figure 3-4.

Saliva sample – respondents were asked to supply saliva samples over a 24-hour period to measure cortisol, which is an indicator of stress.

Anthropometric measures – weight, sitting height, standing height, and waist and hip measurement (to assess the distribution of body fat across the body).

In addition, nurses took four **physical performance** measures: grip strength, chair rises, balance and leg raises. Taken together with the gait speed (or timed walk) measure carried out during the main interview, these provide an excellent way of tracking change in physical well-being over time. The four measures are set out below:

i) Grip strength – a measure of upper body strength, during which the respondent was asked to squeeze a grip gauge up to three times with each hand.

ii) Chair rises – a measure of lower body strength, during which respondents were asked to stand up from a firm chair without using their arms. If they succeeded, they were asked to stand up and sit down as quickly as they could for either five rises if aged 70 years and over, or up to ten rises if aged 69 years and under.

iii) Balance – respondents were asked to stand in three different positions for up to 30 seconds.

(iv) Leg raises – respondents under 70 years old were asked to lift one foot off the ground for up to 30 seconds.

Figure 3-4 Blood sample measures

Fibrinogen – a protein necessary for blood clotting. High levels are also associated with a higher risk of heart disease.

Total cholesterol – cholesterol is a type of fat present in the blood, related to diet. Too much cholesterol in the blood increases the risk of heart disease.

HDL cholesterol – this is 'good' cholesterol which protects against heart disease.

Triglycerides – together with total and HDL cholesterol, triglycerides provide a lipid profile, which can give information on the risk of cardiovascular disease.

Ferritin and haemoglobin – these are measures of iron levels in the body, related to diet and other factors.

C-reactive protein – the level of this protein in the blood gives information on inflammatory activity in the body and is also associated with risk of heart disease.

Apolipoprotein E – this is involved in the transport of cholesterol and plays a protective role.

Fasting glucose and glycated haemoglobin – both indicate the presence or risk of type 2 diabetes, which is associated with an increased risk of heart disease.

Genetics – genetic factors are associated with some common diseases, such as diabetes and heart disease, and relate to general biological aspects of the ageing process.

During the nurse visit a sample of one-in-ten core member respondents was asked to complete an experimental questionnaire, designed by Carol Ryff, about how they felt about themselves and their lives, in the form of 43 statements with which the respondent was asked to agree or disagree (Ryff and Keyes, 1995). This was in addition to the self-completion questionnaire that all core member respondents (except proxy informants) were asked to complete during or after the main interview. Completion of the additional booklet was entirely voluntary. The aim of using the experimental questions in this additional questionnaire was to help determine whether a standard measure of mental health could be successfully included in the study without respondents being overloaded, or feeling that the questions asked were repetitive. The questionnaire was *not* included in the wave 3 main interview.

As described above, a blood sample was collected from core member respondents who gave consent for this in order to examine the items set out in Figure 3-4.

4 FIELDWORK PROCEDURES

Fieldwork for the second wave of ELSA began in June 2004 and spanned 14 months, finishing in July 2005. Eligible individuals satisfying a number of criteria were sent an advance letter inviting them to take part. Interviewers then visited the households to explain the study and to interview willing individuals straight away, or to make appointments to call at a convenient time.

215 interviewers worked over the course of wave 2. Before starting work, all new interviewers underwent a two day personal briefing by a researcher. Wave 1 interviewers underwent a one day refresher briefing. The briefings covered all fieldwork procedures including training on how to administer the assessments (walking speed and cognitive function), fully explained the documents needed for the study and provided an introduction to all questions within the CAPI interview. Interviewers were provided with written study guidelines to reinforce the briefing.

Addresses within the same postcode sectors were clustered and issued to interviewers. Before starting to carry out their visits, all interviewers were instructed to report to the police station local to where they were working and were expected to show a copy of the ELSA advance letter, leave their name and NatCen's contact details and explain how long they would be carrying out interviews in the area.

This chapter provides background information about the fieldwork procedures employed in wave 2: the follow-up rules (Section 4.1); tracing procedures adopted if respondents could not be contacted (Section 4.2); methods to encourage response (Section 4.3); the use of proxy informants where a core member was too sick or cognitively impaired to respond directly to questions themselves (Section 4.4) and a summary of the approach taken to allocating fieldwork (Section 4.5). Sections 4.6-4.9 outline other aspects of the fieldwork procedures. The chapter concludes with a brief outline of the end-of-life interviews introduced in 2004-05 (Section 4.10).

4.1 Follow-up rules

With longitudinal surveys – much more so than with other surveys – issues of sample design tend to be intimately bound up with issues of definition of the study population. Longitudinal populations require definition in time as well as the other usual dimensions (Lynn et al., 2005). For ELSA the initial sample design of the HSE in combination with the set of follow-up rules defines the longitudinal population represented by the continuing sample.

Wave 1 respondents (i.e. core members and their partners) provided the baseline for the ELSA study. Three main reasons for *not* following-up core members in wave 2 were:

- deaths;
- moves out of Britain; and

- living in a household where *all* eligible respondents refused to be recontacted after wave 1.[7]

Deaths were reported through two methods. All participants who gave their permission (95%) in HSE/wave 1 were 'flagged' with the National Health Service Central Register (NHSCR) run by the Office for National Statistics. This register keeps track of registrations with General Practitioners (GPs) but also with official death registrations and with people who leave the UK health system. Most of the deaths were confirmed through the NHSCR. In addition, some deaths were reported to NatCen by relatives of ELSA participants and by interviewers who learnt of the deaths when trying to contact the household.

All households issued for the wave 2 main interview had at least one core member (by definition, therefore, a respondent in wave 1) and contained at least one respondent in wave 1 who had implicitly consented to be recontacted. Therefore, it was quite possible that within an issued household some of the other eligible individuals had refused to be recontacted after their wave 1 interview and/or were partners of core members who had not themselves taken part in wave 1.

Four groups of eligible respondents were represented in the sample of issued households followed up in wave 2:

- Those personally interviewed in wave 1 and agreed implicitly to be recontacted (core members and young/new partners). All were sent an 'advance letter' advising them of the second wave of the study, and informing them that an interviewer would be visiting shortly. Their wave 1 data was fed-forward to their wave 2 interview. If they had moved or their household had split since wave 1, the interviewer attempted to trace (see Section 4.2) and interview them, even if they had moved to Wales or Scotland.[8]

- Individuals who had not completed a wave 1 interview. A minority of individuals were not successfully interviewed in wave 1, although a different member of the household was successfully interviewed. An advance letter was not sent to this group, leaving the task of persuasion to the interviewer. By definition this group of wave 1 non-respondents were only followed up in wave 2 by virtue of their being the partner of a core member.

- Individuals who completed a full wave 1 interview but did not agree to be recontacted for wave 2, although a different person in their household had given implicit consent. Like the individuals who had not completed a wave 1 interview, no advance letter was sent, and interviews were briefed that they should not assume that these individuals would want to take part. On the other hand, it would not have been appropriate to exclude them from the study if they showed an interest. If they agreed to take part in wave 2 their individual wave 1 or HSE feed-forward data was *not* used. This approach meant that a number of core members were given a valuable opportunity to rejoin the study. 9 core members not agreeing to recontact post wave 1 were successfully interviewed in wave 2. Continuing to

[7] No direct recontact question was asked of respondents in wave 1, but some spontaneously requested not to be approached again.
[8] Unlike wave 1, core member respondents were eligible (and so followed-up for interview) if they had moved to Wales and Scotland.

request information from partners, even those who explicitly refused to be recontacted, is important as some analyses of ELSA data are at the household level.

- New partners in wave 2 were the cohabiting spouses or partners of core members who had joined the household since wave 1.

If a core member had died since their wave 1 interview an end-of-life interview was conducted with surviving spouses/partners or other relatives (further details of the end-of-life interviews are provided in Section 4.10). Core member respondents in wave 1 who had moved out of the private residential sector (e.g. nursing care home or institution) by wave 2 were *not* interviewed. Contact details were collected so that they could receive an institutional interview at subsequent waves. Institutional interviews began in wave 3 (2006-07).

4.2 Tracing movers

A key element of survey design which appears to have most effect on the success of attempts to contact sample units are the procedures established to track respondents (Lynn et al., 2005). In the UK it is estimated that around 10% of households change addresses each year (Laurie et al., 1999). To minimise the attrition that this causes, procedures are in place to track respondents who move between waves to ensure that the more mobile sections of the ELSA sample are not lost.

If the whole household had moved since the wave 1 interview, or a core member who had consented to be recontacted in future waves had moved away, interviewers were directed to attempt to find a follow-up address. Interviewers approached the present occupants, neighbours, or friends to obtain the new address. Interviewers also approached the person(s) living at the 'stable address' provided previously by the respondent. Wave 1 respondents were asked to give the name and contact details of someone who could be contacted if they moved. If a whole household had moved then the interviewer made contact with the stable address contact in person.

A 'mover letter' was offered if interviewers identified a member of the public who was aware of the core member's new address but was reluctant to reveal it to the interviewer. This letter, which was forwarded with a pre-paid envelope by the member of the public who had been identified, asked the core member to contact the office with their new address.

The Department for Work and Pensions (DWP) assisted with the tracing of core members using their state pension databases. The respondent's name, date of birth and address were provided to DWP and they matched this to their databases in order to identify the most up-to-date contact details. If a new address was found, an advance letter was sent to the respondent.

4.3 Methods to encourage response

A number of different approaches were used to encourage participation among the issued sample, including the measures outlined in Figure 4-1.

Figure 4-1 Methods of encouraging response in wave 2

- Each respondent was sent an advance letter and given an information leaflet. The advance letter offered an incentive payment in the form of a £10 gift voucher which was provided at the end of the ELSA interview.
- Where possible, respondents were assigned to the same interviewer in wave 2 as they had been in wave 1.
- Interviewers initially made contact by a personal visit with respondents. Interviewers were asked to make at least four calls at varying times of the day and on different days of the week (with at least one call at the weekend).
- Interviewers were asked to return to the address a few weeks or months later if they found someone to be temporarily away, or if one of the core members was unwell at the time of their first visit.
- In cases where households had split, interviews were sought at both the old and new households to ensure that all eligible individuals had a chance to respond.
- In cases where a core member had moved and the new occupant was reluctant to provide the address of their predecessor, interviewers provided a 'mover letter', which could be forwarded by the new occupant to the individual, asking them to make contact with the survey organisers.
- A thorough strategy for tracing and contacting eligible individuals who had moved since wave 1 was developed including tracing through state pension databases (described in Section 4.2).
- Where an eligible individual was unable to participate in the interview due to a cognitive, physical or mental impairment, an interview with a proxy informant was attempted (see Section 4.4).
- Many households for which the first interview attempt had not been successful were reissued to another interviewer. The second approach was preceded by a new letter, explaining the importance of interviewing persons in the respondent's age bracket. The letter offered a £20 gift voucher.
- Self-completion questionnaires that had not been returned by respondents were also followed up. Non-respondents were first sent a reminder letter with a new questionnaire and, if this was unsuccessful, they were then called by the NatCen Telephone Unit who offered to complete the form with the respondent by telephone.

4.4 Proxy interviews

A personal interview was attempted with all eligible respondents. If cognitive impairment, physical or mental ill health prevented a respondent from conducting a face-to-face interview, a proxy interview was attempted. Likewise if the respondent was away in hospital or temporary care throughout the whole fieldwork period, a proxy interview was permitted. Reasons such as refusal to carry out the interview, or a low level of proficiency in spoken English[9], were not grounds for conducting proxy interviews.

The proxy informant (i.e. the person who answered on behalf of the eligible respondent) was any adult aged 16 and over who knew enough about the respondent's circumstances to be able to provide information about them. Where possible, a close family member such as a partner, son or daughter was approached, but other people such as carers sometimes fulfilled this role. Table 4-1 lists the modules included in the proxy interview. Proxy respondents were asked to provide information but were *not* asked to second-guess more subjective information such as attitudes, perceptions of ageing or expectations of the future. Only respondents conducting a full/partial main interview were given the self-completion questionnaire.

Table 4-1 Proxy interview modules

Module	Description
HD*	Household Demographics
ID	Individual Demographics
HE	Health (variant on main module)
WP	Work and Pensions
IA*	Income and Assets
HO*	Housing
FQ	Final questions and consents

All proxy interviews included questions on individual demographics, health, work and pensions and final questions/consents. However, the three modules asterisked in Table 4-1 were asked only in specific circumstances:

- In cases where there was at least one other person in the household eligible for interview, the HD and HO would already be completed, and would therefore not be asked of a proxy informant. In cases where there was no-one else in the household eligible for interview, these two sections were completed as part of the proxy interview.

- In cases where there was no-one else in the financial unit eligible for interview, the proxy interview included the IA section.[10] If one member of a couple needed a proxy interview, the other member was automatically asked the IA section on behalf of the couple when they were interviewed in person. The question normally included, about whether or not they share finances, was not asked. If both members of a couple needed a proxy interview, the IA section was only asked in one of their proxy interviews, and referred to

[9] Individuals with a low level of proficiency in spoken English were classified as non-respondents.
[10] Benefit and financial units were defined in Section 3.2.

both of their finances. For single people requiring a proxy, the IA section was always asked as part of the proxy interview.

Proxy interviews, therefore, were conducted in certain circumstances, and future analyses are likely to make good use of the data obtained in this way. In the wave 1 report (Marmot et al., 2003) information from 158 proxy interviews with core members was excluded (in addition to the 17 proxies already excluded because they were new or young partners) because many of the questions asked of individual respondents are not asked of proxy informants. 125 proxy interviews were conducted in wave 2 and 92 of these were with core members. As in wave 1, a number of analyses in the wave 2 report (Banks et al., 2006) excluded proxies.

Although proxy informants were a small group in waves 1 and 2 it is important to be aware of the characteristics of these respondents and to check for any issues that might arise from their exclusion from analyses of ELSA data. In Section 5.2.1 the characteristics of proxies are compared with wave 2 core members who completed a full main interview.

4.5 Sample allocation

Those to be contacted at each address were allocated to one of four two-month time periods by referring to the wave 1 interview date and selecting the period closest to two years from that interview.[11] To create the most efficient grouping for interviewers, addresses were 'bunched' and assigned to one of the two-month time periods. The median time lapse between wave 1 and 2 interviews for core members was 27 months (interquartile range 26-29 months, minimum time lapse 23 months, maximum 38 months).

4.6 Setting up the nurse visit

As described in Section 3.4, all core members who had completed the main wave 2 interview in person (i.e. not by proxy) were eligible for a nurse visit. Each element of the nurse visit was entirely voluntary, so it was possible for respondents to agree to some measures and not others.

The nurse interviewers telephoned the respondent in all cases before the visit in order to arrange or confirm the appointment and to discuss preparation for the visit. If the respondent was willing, the nurse highlighted the following key points (which were also on the respondent's appointment record card):

- That they should not eat, smoke, drink alcohol or do any vigorous exercise for 30 minutes before the visit.

- That they should wear light, non-restrictive clothing and avoid wearing thick belts or long garments that would prevent them from seeing their feet (important for the physical performance measures).

Nurses established whether respondents were eligible to have a blood sample taken by asking if they: (1) had a clotting or bleeding disorder, (2) ever had a fit or convulsion, (3)

[11] The median time lapse between wave 1 and 2 interviews for core members was 27 months (interquartile range 26-29 months, minimum time lapse 23 months, maximum 38 months).

were taking anticoagulant drugs (such as Warfarin, Protamine or Acenocoumarol) or (4) were pregnant.

If they were eligible to have a blood sample, nurses then determined whether they were eligible to fast. Respondents were not eligible to fast if they: (1) were aged 80 or over, (2) were diabetic and on treatment, or (3) were malnourished or otherwise unfit to fast (as judged by the nurse). If they were eligible and willing to fast, nurses then explained the fasting rules as set out in the wave two nurse visit project instructions.[12] The nurses emphasised that respondents could still drink water and that they could take their medication as normal.

Before carrying out each measure, nurses checked the exclusion criteria with respondents and asked for their consent. In total, there were seven different consent forms presented in a booklet that respondents were asked to sign. The consent forms covered the following:

- send blood pressure information to GP;
- send lung function results to GP;
- allow blood sample to be taken;
- send blood results to GP;
- allow remaining blood to be stored for future analysis;
- allow extraction and storage of DNA for use in future medical research studies; and
- allow saliva to be tested for cortisol and future medical research studies of causes, diagnoses, treatment or outcome of disease.

If a cause for medical concern was identified during the nurse visit then the respondent's GP was notified *if* the respondent had given prior permission. The protocols for each of the measures taken can also be found in the project instructions.[12]

4.7 Quality checking of interviews

One-in-ten respondents were contacted by telephone to verify key details given in the interview.

4.8 Feedback to participants

Newsletters represent an important means of keeping in touch with respondents. Wave 1 respondents received the first of these in the Spring of 2004. The newsletter provided a preview of findings emerging from the previous wave of ELSA. A respondent website (www.natcen.ac.uk/elsa) was set-up with information about the second wave. Participants were also sent a summary of the key wave 2 findings in the post, near the time of the launch of the study findings, with a letter of thanks from the Principal Investigator.

4.9 Editing and coding

A code-frame was developed for open-ended variables. Questions with 'other' answers were 'back-coded' to the original answer codes where possible. A few new answer codes were generated for common 'other' answers which did not fit existing codes. The code book and

[12] http://www.ifs.org.uk/elsa/docs_w2/project_instructions_nurse.pdf

editing instructions can be viewed at the UK Data Archive (www.data-archive.ac.uk), study number 5050.

4.10 End-of-Life interview

Setting up the end-of-life interview

An End-of-Life interview was conducted for those core members who took part in wave 1 and implicitly agreed to be recontacted, and who had died since the wave 1 interview. Any close relative, friend or carer of the deceased could complete the interview, however the most common way of identifying an end-of-life respondent was during another household members' main interview (e.g. a cohabiting spouse/partner). If no other members of the household (that lived with the deceased) were eligible for an interview in their own right, interviewers still approached them and asked for consent to conduct an end-of-life interview.

Interview content

The end-of-life questionnaire included the following items:

- physical and mental health of deceased in year preceding death;
- care and support needed in the three months preceding death;
- memory/mood in the twelve months preceding death;
- behavioural problems; and
- financial items (e.g. private health care, funeral expenses, inheritance, other assets).

5 FIELDWORK RESPONSE IN WAVE 2

This chapter presents information about the fieldwork response rates achieved in wave 2 and corresponds with those published in the methodology chapter in the full report of the survey (Cheshire et al., 2006). It shows the progress of the sample whose selection was described in Chapter 2.

The chapter begins with an explanation of how ineligibility and unknown eligibility are treated in the response rate calculations (Section 5.1). It provides a summary of the total interviews achieved and some indicators of data quality such as the number of proxy and partial interviews (Section 5.2) as well as the level of module and item non-response (Section 5.3). A tree diagram is presented which sets out the stages of response from wave 1 to wave 2 and the reasons why 621 core members became ineligible in wave 2 (Section 5.4). The final section (Section 5.5) provides the fieldwork contact, co-operation and household response rates for core members (who are the main group of interest), as well as the individual response rate.

This chapter focuses on response during the wave 2 fieldwork period (2004-05) and is largely based on the *issued* sample. It does *not* take account of other groups, such as individuals who were not issued to field, perhaps because the household did not respond at HSE (Stage 2 in Figure 2-1) or *all* responding members in the household at the end of the wave 1 interview refused to be recontacted subsequently. A discussion of response to the ELSA study as a whole, which takes a broader account by including these other important groups, is presented in Chapter 6.

Chapters 5 and 6 provide the technical background to the response rates presented in the wave 2 report. Chapter 7 presents an alternative approach to measuring response to longitudinal studies using a framework recently developed by Lynn (2005).

5.1 Defining fieldwork response

The way that eligibility for a survey is defined affects the response rate calculation. The response rates presented here are based on the AAPOR (American Association for Public Opinion Research) standard definitions. They have been calculated from a number of sources: outcome codes from fieldwork, sampling recontact information and mortality updates.[13] In order to be clear about how response is calculated, this section describes why 621 core members successfully interviewed in wave 1 became ineligible (i.e. left the target population) in wave 2 and explains how the subgroup of individuals whose eligibility was unknown is treated. Definitions of the contact, co-operation and response rates are presented in Section 5.5.

[13] This was information about deaths of wave 1 respondents who had agreed to have their records linked to the National Health Service Central Register (NHSCR) and was provided by the ONS. The mortality update provided information about deaths before the start of wave 2 fieldwork which was used to determine the composition of the issued sample.

Ineligibility
Core members thought to be eligible for an interview prior to/during wave 2 fieldwork could be reclassified as ineligible if it became known that they had: (1) died, (2) moved outside Britain or (3) moved out of the private residential sector (e.g. into a nursing care home or institution). The response rates presented in this chapter exclude 621 ineligible core members from the denominator (Section 5.4 provides more details on these cases).

Unknown eligibility
Core members in wave 2 not known to be ineligible can be divided into two categories: cases whose eligibility is known and those whose eligibility is unknown. Known eligibility means essentially that the core member remained a member of the target population in wave 2 and should therefore be included in the response rate calculation. In some cases, eligibility may be unknown because the household was unwilling to provide information needed to make that determination or could not be traced.

Since the denominator of any measure of response rate is the number of eligible cases, to compute a response rate an estimate is needed of what proportion of the unknown eligible cases are likely to be eligible (Biemer and Lyberg, 2003). It is good practice, therefore, to isolate the sub-group of individuals whose eligibility is unknown so that they can be split into two groups:

- those likely to have been eligible for interview; and
- those likely to have been ineligible.

For example, it is highly likely that a number of core members not traced in wave 2 would have become ineligible through the events of death, moves out of Britain or moves into a nursing care home or institution.

Response rates can be adjusted to include the sub-group of individuals 'unknown, but likely to have been eligible for interview'. For the ELSA sample, the proportion of outcomes with unknown eligibility in wave 2 was relatively small (2.4% of all core members). Therefore the response rate calculations set out in this chapter make the assumption that most of the sub-group with unknown eligibility were in fact eligible. Different assumptions would not affect the response rate significantly.

Eligible but not issued to field
Three main reasons for *not* following-up core members in wave 2 were: (1) deaths; (2) moves out of Britain and (3) living in a household where *all* eligible respondents refused to be recontacted after wave 1.

- Core members having died or moved out of Britain were treated as ineligible as they had moved outside the target population (i.e. persons born before 1 March 1952 living in private households).

- Core members not known to have died and living in a household whose respondents in wave 1 all refused to be recontacted were considered eligible for the ELSA study (they are considered to still belong to the target population) but were *not* issued to field in wave 2. As with deaths, moves out of Britain and institutional moves such cases were excluded

from the *fieldwork* contact and co-operation response rates presented in this chapter. They are included in the individual response rate.

5.2 Full, proxy and partial interviews achieved

Over the fieldwork period 9,433 interviews were conducted. The majority of these were with core members (8,781: 93% of total interviews) but a significant number of interviews were conducted with core, young and new partners (652: 7% of total interviews). The number of interviews conducted in wave 2 is given in Table 5-1, broken down by sample member type.

Table 5-1 Respondents in wave 2, by sample member type

All wave 2 respondents

Sample member type	Number of respondents
Core member	8781
Core partner	57
Young partner	501
New partner	94
Base (unweighted)	*9433*

Note: Core partners are individuals who were sampled as age-eligible sample members in wave 1 (i.e. persons born before 1 March 1952) but who did not respond in wave 1 (although were established to be present in the household). Hence core partners were only interviewed in wave 2 by virtue of their being the partner of a core member.

Although the figures above provide information about the numbers of people who responded, some study participants did not complete all elements of the main interview, self-completion questionnaire, nurse visit and blood sample. A respondent:

- May not have been capable of responding to the interview but an interview may have been conducted with a 'proxy' instead i.e. someone may have replied on behalf of the respondent.

- May have responded but terminated their interview before all of the questions were asked; these are called partial interviews.

- May not have responded to a particular data collection section (e.g. self-completion questionnaire, nurse visit and/or blood sample) or a particular item/question (e.g. amount of income from current savings).

Proxy and partial interviews are discussed in Sections 5.2.1 and 5.2.2 respectively; item and module non-response are covered in Section 5.3.

5.2.1 Proxy interviews

Where a sample member (e.g. core member) was too sick or cognitively impaired to respond directly to questions themselves, a person whom they had previously nominated as their proxy was asked to provide information but was not asked to second-guess the more subjective information such as attitudes, perceptions of ageing or expectations of the future. Details on the content and structure of the proxy interview were provided in Section 4.4.

125 proxy interviews were conducted in wave 2 (1.3% of total interviews); 92 of these were with core members (1% of core member interviews). These cases are likely to be excluded from some analyses of ELSA data. Although there were only a small number of proxy interviews in wave 2 it is important to be aware of their characteristics and to check whether any issues might arise from excluding them from analyses.

The number of interviews conducted by proxy is expected to grow in future waves as the original ELSA cohort ages (i.e. persons born before 1 March 1952). Table 5-2 compares the full interview and proxy respondents in wave 2, by age and sex (presented for core members only). Just under a half (48%) of female proxy respondents were aged 80 and over, compared with 36% of men. The equivalent figures for those completing a full interview were 13% and 9% respectively.

Table 5-2 Full interview and proxy respondents, by age and sex

Core member full interview and proxy respondents

	Full interview respondents			Proxy respondents		
Age in wave 2	**Men %**	**Women %**	**Total %**	**Men %**	**Women %**	**Total %**
52-54	12	12	12	7	2	4
55-59	21	21	21	16	10	13
60-64	17	16	16	9	8	9
65-69	17	15	16	9	2	5
70-74	14	14	14	14	10	12
75-79	10	10	10	9	19	14
80-84	6	8	7	14	10	12
85+	3	4	4	23	38	30
Base (unweighted)	*3881*	*4770*	*8651*	*44*	*48*	*92*

Note: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork.

Tables 5-3 and 5-4 compare the full interview and proxy respondent sample (core members) by limiting long-standing illness and current work activity respectively. Relative to those core members completing a full interview in person, proxy respondents were more likely to have a limiting long-standing illness and have a current work status of being permanently sick or disabled. 76% of proxy respondents had a limiting long-standing illness and 27% were permanently sick or disabled. The equivalent figures for those completing a full interview were 36% and 5% respectively. Such differences are expected due to the stringent rules employed to qualify for a proxy interview (see Section 4.4).

Table 5-3 Full interview and proxy respondent sample, by limiting long-standing illness and sex

Core member full interview and proxy respondents

	Full interview respondents			Proxy respondents		
Limiting long-standing illness	**Men %**	**Women %**	**Total %**	**Men %**	**Women %**	**Total %**
No long-standing illness	44	42	43	16	21	19
Long-standing illness	22	21	21	5	6	5
Limiting long-standing illness	34	37	36	80	72	76
Base (unweighted)	*3877*	*4767*	*8644*	*44*	*47*	*91*

Table 5-4 Full interview and proxy respondent sample, by work activity and sex

Core member full interview and proxy respondents

	Full interview respondents			Proxy respondents		
Current work activity	**Men %**	**Women %**	**Total %**	**Men %**	**Women %**	**Total %**
Retired/semi-retired	57	53	55	55	53	54
Employed	26	22	24	7	4	5
Self-employed	8	3	5	7	-	3
Unemployed	1	1	1	2	-	1
Permanently sick or disabled	6	5	5	30	26	27
Looking after home or family	2	17	10	-	17	9
Base (unweighted)	*3868*	*4757*	*8625*	*44*	*47*	*91*

Note: '-' represents zero.

5.2.2 Partial interviews

A further subgroup of individuals only responded to part of the wave 2 interview. If respondents did not manage to complete the interview up to the end of the Work and Pensions module, a 'partial interview' outcome code was assigned. Following this definition, a total of 42 individuals gave a partially completed interview (0.4% of total interviews); of these 38 were core members (0.4% of core member interviews). The implication of this for analysis is that there are varying totals of respondents for items depending on the position of the item in the questionnaire and the number of partial interviews accrued at that point.

5.3 Module and item non-response

5.3.1 Module non-response

In addition to response to the main interview overall, an analysis of the level of response to key sections within the survey questionnaire was conducted.[14] However it should be recognised that in the wave 2 interview, not all sections required responses from every individual:

[14] A household or financial unit or individual was classified as responding if data was available for the nominated unit and key questions asked of all respondents within the module were not missing. For the nurse visit, response was defined by the outcome assigned during fieldwork by the nurse conducting the visit.

- The Household Demographics and Housing sections were asked at a household level, that is, one individual was asked to respond on behalf of the household.

- The Income and Assets section was asked at a financial-unit level, that is, one individual from each financial unit was asked to respond on behalf of the whole financial unit (financial units are defined in Section 3.2).

- The sections asked at an individual level were split into those that could be asked concurrently[15] (Individual Demographics, Health, Work and Pensions, and Social Participation) and five modules that were asked privately (Cognitive Function, Expectations, Effort and Reward, Psychosocial Health and Final Questions).

As a result, response rates for different sections were calculated on different bases. Table 5-5 gives the response rates for the three key sections of the main questionnaire (Housing, Income and Assets, self-completion questionnaire) and for the nurse visit and blood sample conducted after the main interview. Note that these are response rates calculated amongst respondents in wave 2. For example, only respondents to the main interview in person were asked to fill in the self-completion questionnaire. Similarly, only respondents to the nurse visit were asked to have a blood sample taken.

Table 5-5 Response rates to key sections

Section	Total eligible	Level	Response rate %
Housing[16]	6246	Household	99.9
Income & Assets (IA)[17]	6712	Financial unit	99.0
Self-completion questionnaire[18]	9307	Individual	89.8
Nurse visit	8688	Individual	88.2
Blood sample	7666	Individual	80.7

The analysis showed that the levels of response for the Housing and Income and Assets sections were very high (above 99%). As in wave 1, the level of response for the self-completion questionnaire (90%) was sufficiently low to warrant some further investigation. 88% of eligible core member respondents successfully took part in the nurse visit. Further information about weighting to address differential non-response to the self-completion, nurse visit and blood sample collection is given in Section 6.2.

5.3.2 Item non-response

Item non-response is the term used to describe missing information from any one data item or question, for example when an individual respondent did not give their date of birth. Whilst it is possible that all data items may suffer from non-response there is an expectation that questions about an individual's finances will suffer from high levels of item non-response. As in wave 1, the discussion and analysis is restricted to financial information because it is

[15] With the individual's partner present when the individual has a partner. Both individuals were asked to respond to the same set of questions one after the other, i.e. concurrently, before moving on to the next set of questions.
[16] The Housing section response rate uses all households containing at least one respondent as a base.
[17] The IA section has a response rate calculated at the financial unit level which includes all financial units that contain at least one individual respondent as a base.
[18] The calculation of the self-completion response rate uses a base of all individuals who responded in person (proxy respondents were excluded because they were not invited to respond to this section).

expected to exhibit higher levels of item non-response than most other items and is, therefore, likely to represent the 'worst case'. Furthermore, replicating the situation in wave 1, a strategy was implemented to try to overcome item non-response within the economic sections of the questionnaire, involving the use of 'unfolding brackets'. This strategy is described here.

Each financial variable was collected by initially requesting an exact answer and then following up with a series of what are commonly referred to as 'unfolding brackets'. Unfolding brackets operate by asking respondents who are unable or refuse to give an exact answer a series of follow-up questions designed to elicit a minimum and maximum number defining a range or 'closed band' within which the value lies.

So, for example, if a respondent did not know how much the last payment they received from a particular pension was, then they would have been asked an unfolding bracket question such as "Was it less than £600, more than £600, or what?" If the respondent said they received "less than £600", then they could have been asked "Was it less than £300, more than £300, or what?"

In a small number of cases, respondents were able to provide a minimum value but not a maximum, and these individuals, along with those who are in the highest bracket, end up in a band that does not have a maximum, which is referred to as an 'open band'. The amount referred to in the first unfolding bracket question for each financial variable was randomly ordered for each respondent. Therefore, any possible anchoring effects from the procedure were averaged across the distribution, and the bracket values were selected to fall at the 25th, 50th, 75th and 99th percentiles of the density of the underlying financial variable.

Unfolding brackets significantly reduce the number of observations for which no information on any one source of income or wealth is collected. Nevertheless, some cases remain (for example, if the respondent refused to or could not answer the unfolding bracket questions), which means that for each financial variable there was a varying quality of data: continuous (i.e. exact answer given by respondent), closed-band (a range), open-band (a band with a minimum but no maximum) or missing.[19]

Table A-1 (income) and Table A-2 in Appendix A report the percentage of cases that fell into each of the categories of data quality. The missing cases are split into cases where there was no information at all on that variable ('missing completely') and cases where the individual had some income or wealth of the relevant type but where there was no information on how much they had ('missing, >0'). The importance of the unfolding bracket follow-ups is apparent from the low numbers of observations that were 'missing completely' in the income from investment and wealth variables.

Imputing missing values

[19] Banded information could also arise when only one member of a couple responded to the survey. The wealth and income data were imputed at the benefit-unit level (a single person or a couple, plus any dependent children that they have), therefore information on income and wealth is ascertained from both members of the couple. This was done by generating banded information for the couple, using the wealth of the responding member as the minimum of an open-banded classification for the couple.

A value was imputed for each variable in all cases with banded or missing information. Most variables required imputation in less than 5% of cases. Noticeable exceptions were income from savings and money held in savings or current accounts.

The imputation procedure used was the 'conditional hot-deck' method. The conditioning variables were broad age band (50 to state pension age, state pension age to 75 and 75+), benefit-unit type (couple or single)[20] and, for singles only, sex. For each missing or banded case, imputation involved choosing a random observation from all observations with matching characteristics in each of these dimensions and, where there was banded information, with income or wealth within the same range. The level of wealth or income from the observation that was chosen at random was then assigned to the missing or banded case.

5.4 Stages of non-response

Having looked at the number of respondents, including proxies and partials, and the level of module and item non-response within key sections of the wave 2 study, this section looks in more detail at who did not respond. A tree diagram (Figure 5-1) demonstrates how response and non-response between waves 1 and 2 occurred in stages. The tree should be read from top to bottom and shows each stage of the process between waves 1 and 2. The greyed boxes show the sub-groups who were not successfully interviewed in wave 2 (Stages 1-3 focus on response at the *household* level; Stage 4 examines *individual* response within responding households).

At the top of Figure 5-1 (Stage 1) were the 7,934 households that contained at least one core member, young partner or new partner who responded in wave 1. The individuals within these 7,934 households comprised the initial sampling frame for wave 2 (i.e. respondents in wave 1 were treated as the baseline for follow-up two years later).

Not all households were issued into the field in wave 2. Key reasons for *not* following-up core members in wave 2 were: (1) deaths known prior to the beginning of fieldwork from mortality updates; (2) moves out of Britain and (3) living in a household where *all* eligible respondents refused to be recontacted after wave 1. Stage 2 shows that 7,591 households were issued for interview at the second wave (96% of the households that contained at least one core member, young or new partner who successfully responded in wave 1).

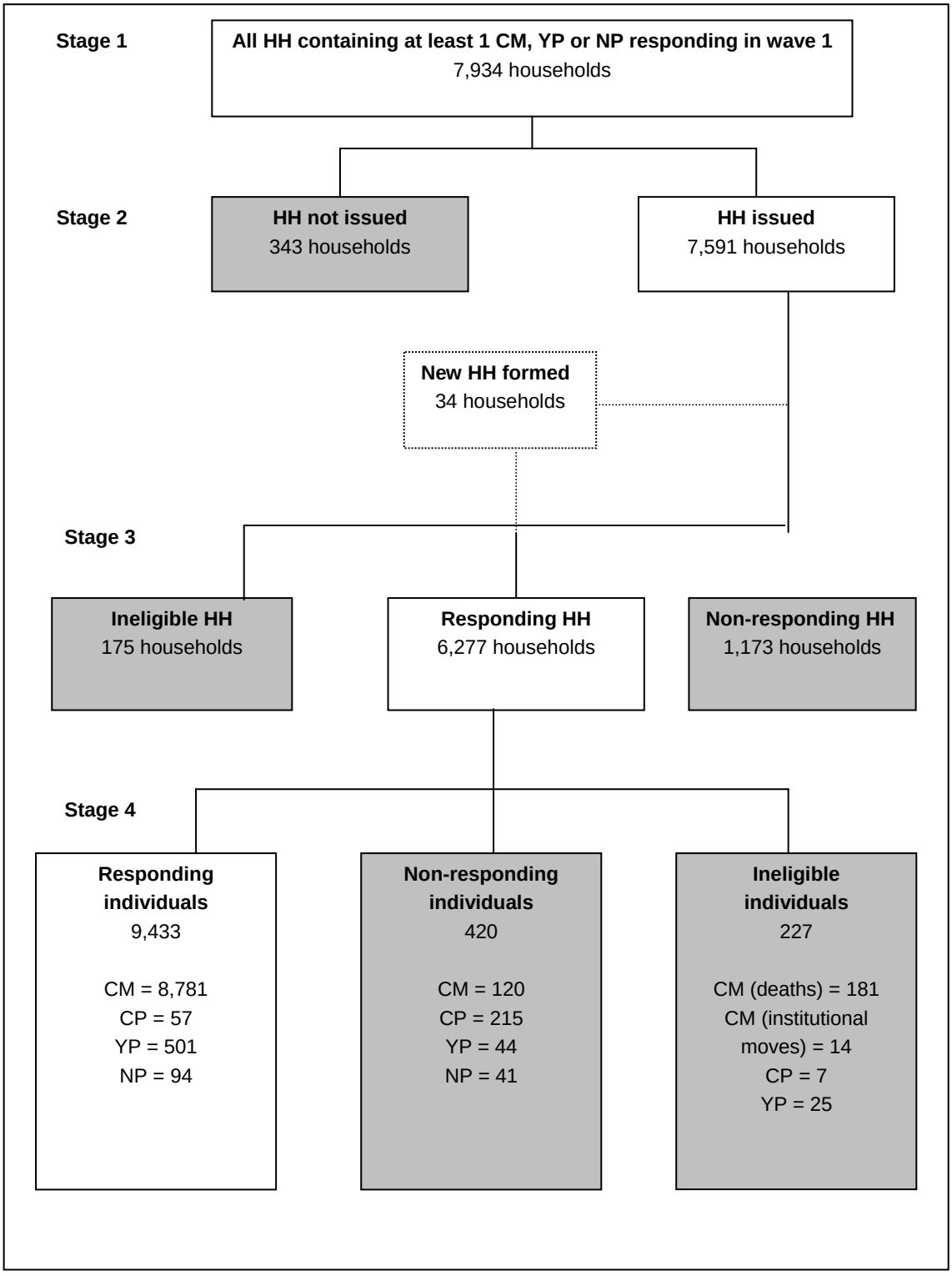
Changes in household composition were discovered during fieldwork: 34 original households at the time of wave 1 had each split into two households (shown as 'new HH formed'). Therefore, during wave 2 fieldwork 7,625 households were identified although they did not all contain individuals who were eligible for an interview[21], and some did not respond at all (Stage 3). Stage 3 shows that 84% of eligible households responded in wave 2.

Within 6,277 responding households the majority of individuals were eligible and responded to the main interview (Stage 4). 181 core members within responding households had died since the wave 1 interview; 14 had moved into an institution.

[20] Financial and benefit units were defined in Section 3.2.
[21] Ineligible households included those where all core members had died, moved out of Britain or into an institution.

Figure 5-1 Response tree from wave 1 to wave 2

CM	Core member
CP	Core partner
YP	Young partner
NP	New partner (entering study at waves 1 and/or 2)



Ineligible core members

Before looking at core member respondents/non-respondents in more detail, core members in wave 1 who became ineligible are reviewed. Core members became ineligible (i.e. left the target population) through the events of death, moves out of Britain or moves out of the private residential sector (e.g. into a nursing home or institution). 621 core members (5% of all 11,391 core members successfully interviewed in wave 1) had become ineligible by the end of wave 2 fieldwork (shown in Table 5-6). The overwhelming reason for becoming ineligible was through death (82%). This is not surprising given the age of the ELSA sample. A number of core members had moved from a private household into an institution, most likely a residential or nursing home (10%), and others had moved out of Britain (8%). Core members who had moved into an institution were not interviewed in wave 2 (institutional interviews began in 2006-07).

Table 5-6 Reasons for ineligibility, by age

Ineligible core members in wave 2

Age in wave 2	Deaths	Moves out of Britain	Institutional moves	Total
	%	%	%	%
52-59	7	61	-	11
60-74	26	33	23	26
75+	67	6	77	63
Base (unweighted)	*508*	*49*	*64*	*621*

Notes: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork. '-' represents zero.

5.5 Fieldwork contact and co-operation rates

This section sets out the wave 2 contact and co-operation rates. When considering contact and co-operation rates the focus is on considering performance at a given wave (i.e. fieldwork activity and the willingness of those households/individuals *issued* for follow-up to take part in the survey). Indeed, it may be misleading to evaluate the quality of the fieldwork effort using the broader study response rates that are discussed in Chapter 6 because interviewers are not given the opportunity to interview all non-respondents. For example, a sub-group of core members were not issued for follow-up in wave 2 because *all* wave 1 respondents in the household refused to give permission to be recontacted (hence the household was not issued). Individuals within these households are effectively treated as ineligible when considering fieldwork contact and co-operation rates – but eligible for considering *study* response rates as they belong to the target population *unless* they were known to have died, moved out of Britain or had an institutional move.

Two measures which summarise wave 2 fieldwork activity and are based on the sub-group of core members who were issued to field are outlined in this section. In both instances, respondents were defined as those who gave a full or partial interview either in person or by proxy. Contact and co-operation are covered in turn.

Fieldwork household contact rate

Over the full fieldwork period, for core members, a household contact rate of 97% was achieved. The contact rate was calculated by dividing the number of households where the interviewer made contact with at least one member of the sample by the number of eligible households found during fieldwork (issued plus newly formed households). This is an

indicator of the combined quality of the contact details from the sampling frame and the processes used to track movers (outlined in Section 4.2).

Fieldwork co-operation rate

Over the full fieldwork period, for core members, an individual co-operation rate of 84% was achieved. The co-operation rate was calculated by dividing the number of achieved individual interviews by the number of eligible individuals contacted by interviewers.

5.6 Individual response rate

The individual response rate was calculated by dividing the number of achieved individual interviews by the number of eligible individuals (core members in wave 1 minus deaths, moves out of Britain and institutional moves). Again respondents were defined as those who gave a full or partial interview either in person or by proxy. In total, a response rate of 82% was achieved (Table 5-7). A small proportion of non-productive interviews were the result of movers remaining untraced (2% of eligible core members) but the majority of non-responders were refusals (14%).

Table 5-7 Individual response rate

Eligible core members in wave 2

Outcome in wave 2	Frequency	% of eligible respondents	% of non-respondents
Total eligible:	**10770**		
Respond	8781	82	
Non-respond	1989	18	
Non-respondents:	**1989**		
Refusal	1529	14	77
Moved – unable to trace	221	2	11
Other	189	2	9
Non-contact	50	0	3

Note: 'Other' groups together such reasons as being ill or away during the survey period.

Reasons for non-response among eligible core members in wave 2 are presented by age in Table 5-8. 29% of core members non-responding through 'other' reasons such as being ill or away during the survey period were aged 80 years and over. Just under a third (32%) of core members refusing to take part were below the age of 60 in wave 2.

Table 5-8 Reasons for non-response, by age

Eligible core members but non-respondents in wave 2

Age in wave 2	Refusal	Moved – unable to trace	Other	Non-contact	Total
	%	%	%	%	%
52-54	10	10	11	26	11
55-59	22	27	15	46	22
60-64	17	14	10	8	16
65-69	15	16	11	10	15
70-74	14	12	13	-	13
75-79	10	9	11	6	10
80-84	8	5	16	4	8
85+	4	8	13	-	5
Base (unweighted)	*1529*	*221*	*189*	*50*	*1989*

Notes: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork. 'Other' groups together such reasons as being ill or away during the survey period. '-' represents zero.

6 STUDY RESPONSE

Fieldwork response rates (set out in Chapter 5) are useful tools to monitor the performance of fieldwork activity, e.g. the ability of survey organisations to successfully contact households issued for interview at any particular wave. Study response rates are broader in outlook in that they relate back to the originally selected sample (excluding those not belonging to the target population): irrespective of whether eligible cases were issued to field for interview. One reason for *not* issuing eligible cases in wave 1 was that all age-eligible sample members in the household refused recontact after their HSE interview. Similarly a number of eligible core members (i.e. not known to have died, moved out of Britain or moved into an institution) were not issued in wave 2 as all responding members in the wave 1 household explicitly refused to be recontacted after wave 1. By relating back to the originally selected sample a focus on study response provides an opportunity to measure *cumulative* response: that is, response in *successive* waves of a longitudinal survey.

Section 6.1 describes in more detail what is meant by 'study response' and sets out four possible measures of study response. Section 6.2 examines the differential nature of non-response to the wave 2 main interview, nurse visit, blood sample and self-completion questionnaire. In each section the age-sex profile of core member respondents is shown. Finally, the weighting strategy undertaken for each stage is described.

6.1 Defining and measuring study response

82% of eligible core members (who, by definition, took part in wave 1) were successfully reinterviewed in wave 2 (shown in Table 5-7). This represents a reasonable measure of the success of this particular phase of the project. However, longitudinal research also depends on the response in *successive* waves – on cumulative response. Unfortunately, there is no single definition of longitudinal response that is applicable in all circumstances. As a result, a number of representations were put forward (Table 6-1) and summarised in the methodology chapter of the wave 2 report (Cheshire et al., 2006). Attention is focused here on core members' responses to the main interview.

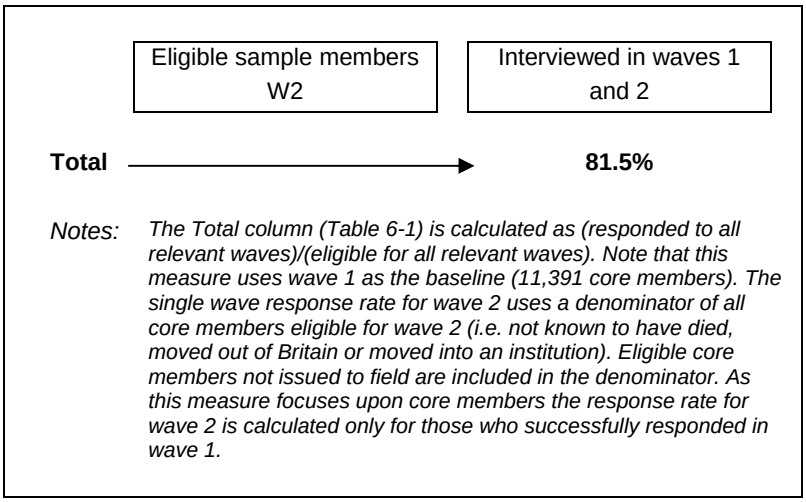
Table 6-1 Components of longitudinal response rates (core members)

Response rate measure	Single wave 0 (HSE)	Single wave 1	Single wave 2	Total
	%	%	%	%
A	n/a	n/a	81.5	81.5
B	95.8	67.1	81.5	52.4
C	93.6	61.1	81.5	46.6
D	71.1	61.1	81.5	35.4

Notes: The response information uses the most up-to-date data sources. This implies that if an individual was believed to have been eligible to respond in a particular wave but are now known to have died beforehand, then they will be classified as ineligible (i.e. having left the target population). The Total column is calculated as the multiplication of the single wave response rates for measures B, C and D, and as (responded to all relevant waves)/(eligible for all relevant waves) for measure A. Measure A uses wave 1 respondents as the baseline: measures B, C and D define the baseline in different ways (see the notes for each measure in Figures 6-1 to 6-4).

The strictest interpretation of longitudinal response based on *eligibility to take part at each stage* takes ELSA wave 1 respondents (11,391 core members) as the baseline sample and considers what happened subsequently. In one sense, this reflects the original intention of the study as implemented by the follow-up rules (only core members, and their partners, were followed up for interview in wave 2), and shows that of those eligible in wave 2, slightly more than eight-in-ten responded (measure A in Table 6-1). Measure A is shown in Figure 6-1.

Figure 6-1 Response rate measure A



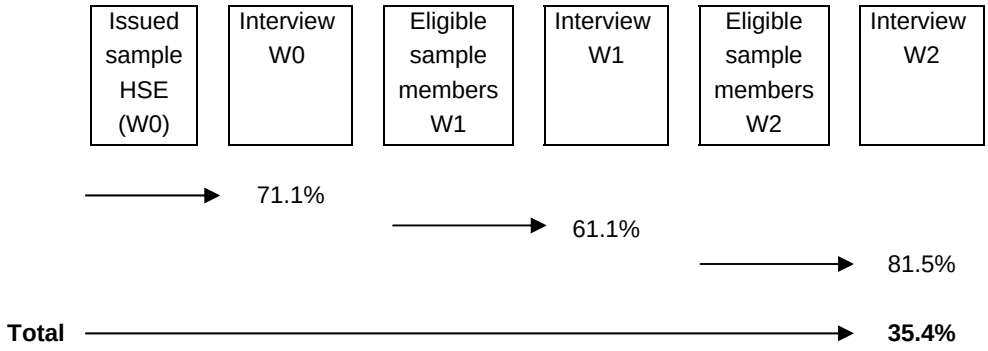
Measure A divides the total number of wave 2 respondents by the number eligible to take part in wave 2; giving a response rate of 8,781/(8,781+1,989) = 82%. (The reasons for ineligibility were set out in Table 5-6). However, it is important to understand that this rate does not consider *any* losses before or during wave 1 (wave 1 respondents are the baseline group).

At the other end of the spectrum, an alternative response rate accounts for all losses of living individuals since interviewers began to identify respondents for the HSE surveys in 1998, 1999 and 2001. A consideration of this kind provides a better indication of how representative the remaining achieved sample is of the population, since it measures the dropout at *every* stage from the origin of the sample in HSE (termed wave 0) through to the wave 2 interview in 2004-05. On the other hand, it could be construed as unreasonable because it makes no allowance for the large number of individuals who belonged to the target population (persons aged 50+ in private households) but could never have been successfully interviewed in wave 1 (e.g. persons living in non co-operating households in wave 0 were not included in the wave 1 sampling frame as there was no available information about residents that would have it made possible to identify those who were born before 1 March 1952 – see Stage 2 in Figure 2-1).

In order to calculate a rate of this kind several practical adjustments needed to be made to the response rates that had previously been reported for the HSE and wave 1 as individual surveys (measure D in Table 6-1). First, the HSE response rate was re-estimated as 71% to take account of the fact that the ELSA sample was drawn from three separate HSE years and to correct for the observation that those aged 50 and over had a higher response rate than adults in general. Second, the wave 1 field response rate was adjusted (from 67% to 61%) to take account of individuals *not issued* for wave 1 because: (1) no age-eligible member in their household agreed to be recontacted post HSE or (2) they responded negatively to an advance letter sent before wave 1 interviewing began. Working on the basis of an estimated

71% response in wave 0, 61% in wave 1 and 82% in wave 2, a cumulative longitudinal response rate of 35% (0.71 × 0.61 × 0.82 = 0.35) was calculated (measure D in Table 6-1). Measure D is shown in Figure 6-2.

Figure 6-2 Response rate measure D



Notes: *The Total column (Table 6-1) is calculated as the multiplication of the single wave response rates. The response rate for wave 0 uses a denominator of all those persons in HSE 1998, 1999 and 2001 estimated to be born before 1 March 1952. The response rate for wave 1 uses all persons in HSE co-operating households eligible for wave 1 (including those not issued in wave 1 because no age-eligible person in the HSE household agreed to recontact) – but excludes estimated deaths, moves out of Britain and moves into an institution between W0 and W1. The single wave response rate for wave 2 uses a denominator of all core members eligible for wave 2 (i.e. not known to have died, moved out of Britain or moved into an institution). Eligible core members not issued to field are included in the denominator. Only core members (and their partners) were followed up for interview in wave 2. Hence the response rate for wave 2 is calculated only for those who successfully responded in wave 1.*

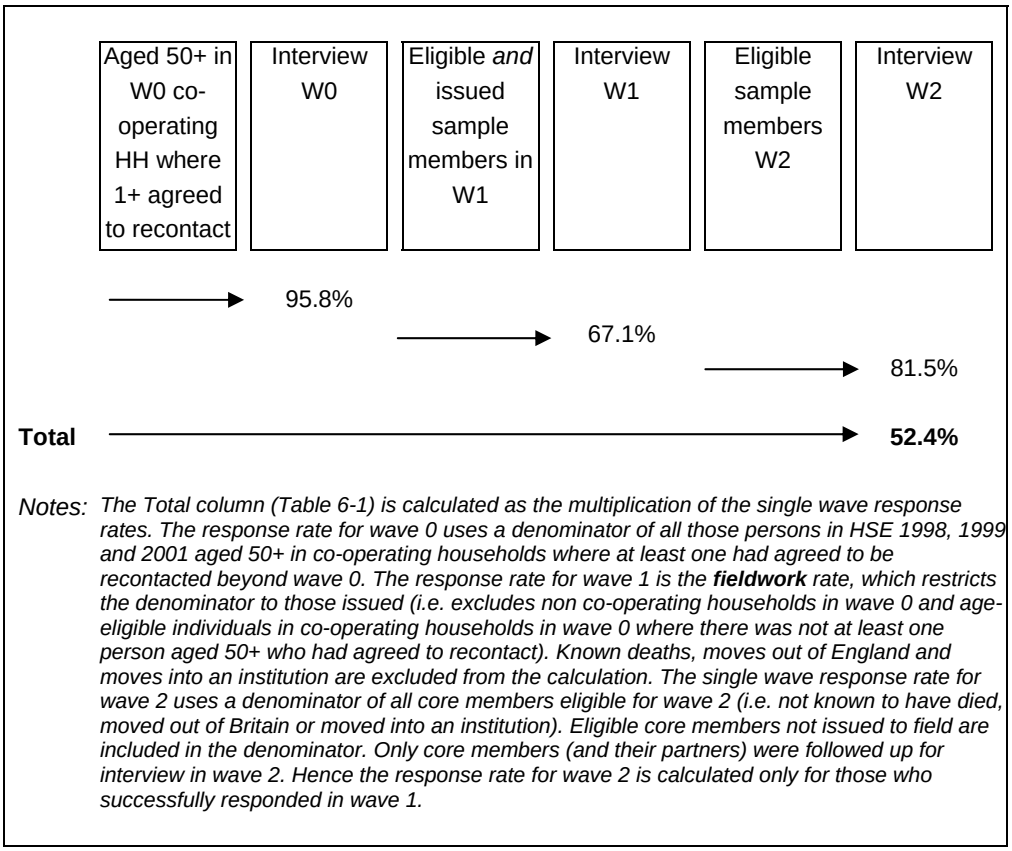
Neither of these two extremes – the 82% response rate in wave 2 based on eligibility of core members to take part in wave 2 (who, by definition, must have successfully responded in wave 1) and the 35% based on the original sampling frame (an estimate of the proportion of persons aged 50+ sampled for the HSE 1998, 1999 and 2001 remaining alive and residing in private households in Britain who responded in wave 2) – gives a true measure of longitudinal response when taken alone. The first takes no account of losses before wave 1 (only sample loss between waves 1 and 2 is considered) and the second takes no account of the many individuals who were not given the opportunity to take part in ELSA.

Two interim measures, therefore, may provide more realistic summaries of response over the early waves of ELSA. The first removes the households for whom age information was never collected (non co-operating households in wave 0) and suggests a response rate of 47% (measure C). The second goes further and also removes the households which did not include a resident aged 50+ who agreed to be recontacted. Reducing the sub-group of interest in this way to reflect these exclusions from the ELSA sampling frame results in an overall response rate of 52% (measure B). Measures B and C are shown in Figures 6.3 and 6.4 respectively.

Measures A and B are perhaps more accurate. All four have value as they represent different ways of looking at the study over time, and all four will be reported in future waves. (In Chapter 7 recent developments in longitudinal survey methodology are drawn upon to present a set of standard response rates that can be compared to other longitudinal studies).

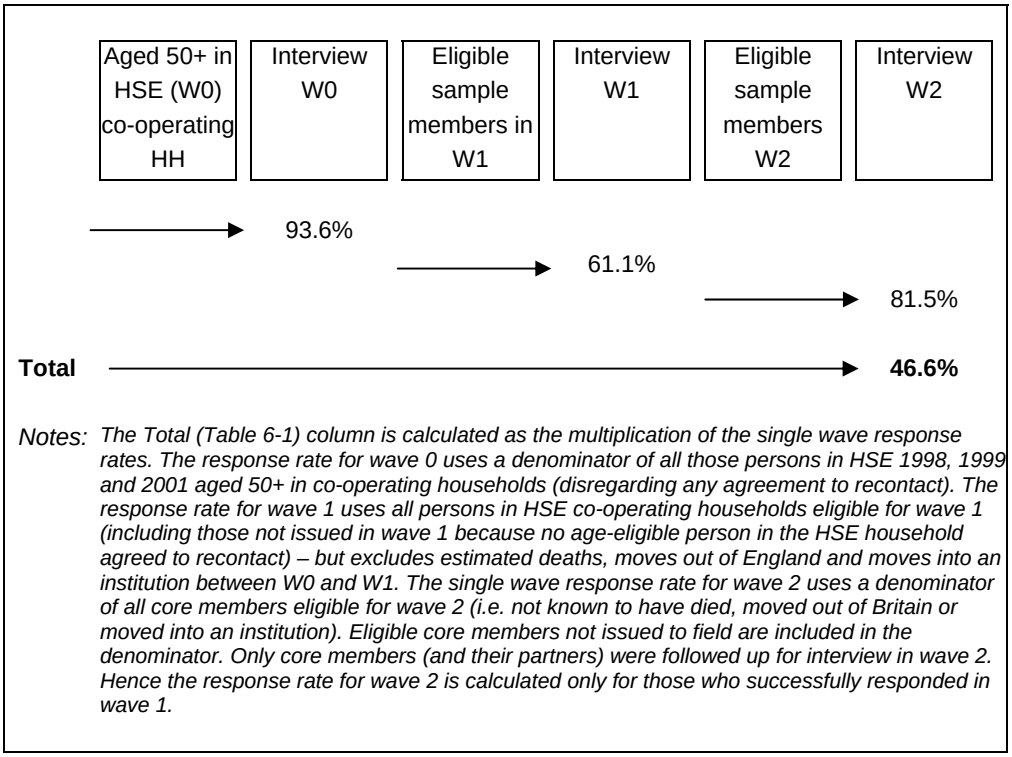
Ultimately, the choice of response rate depends on the perspective taken. Considerations to take into account are whether wave 0 is included in the definition of longitudinal and whether the focus is sample representativeness or feasible participation in the ELSA study.

Figure 6-3 Response rate measure B



Notes: *The Total column (Table 6-1) is calculated as the multiplication of the single wave response rates. The response rate for wave 0 uses a denominator of all those persons in HSE 1998, 1999 and 2001 aged 50+ in co-operating households where at least one had agreed to be recontacted beyond wave 0. The response rate for wave 1 is the* ***fieldwork*** *rate, which restricts the denominator to those issued (i.e. excludes non co-operating households in wave 0 and age-eligible individuals in co-operating households in wave 0 where there was not at least one person aged 50+ who had agreed to recontact). Known deaths, moves out of England and moves into an institution are excluded from the calculation. The single wave response rate for wave 2 uses a denominator of all core members eligible for wave 2 (i.e. not known to have died, moved out of Britain or moved into an institution). Eligible core members not issued to field are included in the denominator. Only core members (and their partners) were followed up for interview in wave 2. Hence the response rate for wave 2 is calculated only for those who successfully responded in wave 1.*

Figure 6-4 Response rate measure C



Notes: *The Total (Table 6-1) column is calculated as the multiplication of the single wave response rates. The response rate for wave 0 uses a denominator of all those persons in HSE 1998, 1999 and 2001 aged 50+ in co-operating households (disregarding any agreement to recontact). The response rate for wave 1 uses all persons in HSE co-operating households eligible for wave 1 (including those not issued in wave 1 because no age-eligible person in the HSE household agreed to recontact) – but excludes estimated deaths, moves out of England and moves into an institution between W0 and W1. The single wave response rate for wave 2 uses a denominator of all core members eligible for wave 2 (i.e. not known to have died, moved out of Britain or moved into an institution). Eligible core members not issued to field are included in the denominator. Only core members (and their partners) were followed up for interview in wave 2. Hence the response rate for wave 2 is calculated only for those who successfully responded in wave 1.*

6.2 Differential non-response in wave 2

Non-response is a problem for longitudinal surveys for two reasons (Uhrig, 2008). As the longitudinal sample decreases in size over its duration, the precision of estimates derived from that sample also decreases. Second, and more importantly, non-response may not be random. Non-random non-response implies that the sample becomes unrepresentative as the longitudinal sample ages and that outcomes of interest may be biased to the extent that the factors associated with non-response are related to them.

When data are not weighted, each respondent is treated as being equally important. However the respondents may not represent the population exactly. If certain types of households or individuals were more or less likely to participate in HSE and/or ELSA waves 1 and 2 then the non-response cannot be considered to be random and failure to take this into account may mean that the analysis of the core members successfully taking part at wave *t* may not represent the intended population.

In the case of longitudinal surveys, all of the survey data collected at any other wave prior to the current wave can be used to understand the nature of non-response subsequent to the first wave. The advantage of this is that there are often a rich range of variables available and at least some of them are likely to be highly correlated with the survey variables of interest (Lynn, 2008).

Making full use of information available for both respondents and non-respondents to the current wave, non-response weights can be calculated to increase the importance of

respondents who are under-represented in the data. The main aim of the weighting for wave 2 was to try to reduce any bias from differential non-response and to be confident that the respondent sample was broadly representative of the ELSA target population (i.e. persons born before 1 March 1952 living in private households in Britain). The equal probability sample design of the HSE samples, and the fact that the ELSA sample did *not* over-sample certain subgroups, eliminated any need for weights to account for varying selection probabilities. However, non-response in HSE, refusals to be recontacted post-HSE, non-response in wave 1, refusals to be re-interviewed post wave 1 and non-response in wave 2 all had the potential to make the respondent sample in wave 2 somewhat unrepresentative of the population.

This section examines the differential nature of non-response to the wave 2 main interview, nurse visit, blood sample and self-completion questionnaire. For each stage of data collection, the age-sex profile of core member respondents is shown. Finally, the weighting strategy undertaken in wave 2 for each stage is described. Advice on using the weights is provided in the "Wave 2 User Guide" available from the UK Data Archive.

6.2.1 Main interview

Profile of main interview respondents

8,781 core members were successfully interviewed in wave 2 (77% of the 11,391 core members interviewed in wave 1; 82% of the 10,770 core members remaining eligible in 2004-05). The age-by-sex profile of core member respondents is presented in Table 6-2. The distribution shows that the achieved sample contained more women than men, as expected, and that there were relatively more older women than men.

Table 6-2 Wave 2 respondents, by age and sex

Core member respondents in wave 2

Age in wave 2	Men	Women	Total	Men	Women	Total
				%	%	%
52-54	470	552	1022	12	11	12
55-59	839	1002	1841	21	21	21
60-64	650	755	1405	16	16	16
65-69	654	740	1394	17	15	16
70-74	549	655	1204	14	14	14
75-79	407	492	899	10	10	10
80-84	253	412	665	6	9	8
85+	128	223	351	3	5	4
Base (unweighted)	*3950*	*4831*	*8781*	*100*	*100*	*100*

Note: *Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork.*

Analysis of response to main interview

An analysis of non-respondents helps to identify the potential for bias in the respondent core member sample. Table 6-3 shows the main interview response rates for core members by age and sex; Table 6-4 shows response by non-housing wealth quintile in wave 1. Non-housing wealth quintile is composed of net financial and physical wealth. Financial wealth includes income from savings or current accounts, ISAs, TESSAs, Premium bonds and National Savings. Physical wealth includes income from second home or other property, from

farms or business properties, or other physical assets.[22] Both tables were computed on data weighted by the wave 1 weight and exclude the 621 core members who became ineligible between waves 1 and 2 (through the events of death, moves out of Britain or institutional moves).

Table 6-3 shows that among women, 82.5% aged 60-74 in wave 1 and 79.0% aged 75+ responded in wave 2. The equivalent figures for men were narrower (80.5% and 80.7%, respectively). Table 6-4 shows response in wave 2 increasing from the lowest wealth quintile to the highest. 84.2% of men in the richest wealth quintile successfully responded in wave 2, compared with 75.7% in the poorest quintile. The equivalent figures for women were 85.0% and 76.9%.

Table 6-3 Wave 2 main interview response, by age in wave 1 and sex

Eligible core members in wave 2

		50-59	60-74	75+	Total
		%	%	%	%
Men	Respondents	82.3	80.5	80.7	81.3
	Non-respondents	17.7	19.5	19.3	18.7
Women	Respondents	81.5	82.5	79.0	81.4
	Non-respondents	18.5	17.5	21.0	18.6
Bases (unweighted)					
Men		*1941*	*2157*	*763*	*4861*
Women		*2285*	*2474*	*1150*	*5909*
Bases (weighted)					
Men		*2124*	*2082*	*752*	*4958*
Women		*2173*	*2332*	*1281*	*5786*

Notes: Age in wave 1 defined as age in 1st April 2002, beginning of wave 1 fieldwork. Response rates weighted by the wave 1 weight.

[22] For further details on the derivation of financial variables see http://www.data-archive.ac.uk/doc/5050/mrdoc/excel/5050_Wave_1_Financial_Derived_Variables_Relationships.xls.

Table 6-4 Wave 2 main interview response, by (non-housing) wealth quintile and sex

Eligible core members in wave 2

Wealth quintile in wave 1	Poorest	2nd	3rd	4th	Richest
	%	%	%	%	%
Men					
Respondents	75.7	78.9	83.2	83.6	84.2
Non-respondents	24.3	21.1	16.8	16.4	15.8
Women					
Respondents	76.9	78.2	82.5	85.1	85.0
Non-respondents	23.1	21.8	17.5	14.9	15.0
All					
Respondents	76.3	78.5	82.8	84.4	84.6
Non-respondents	23.7	21.5	17.2	15.6	15.4
Bases (unweighted)					
Men	*860*	*858*	*953*	*1065*	*1091*
Women	*1195*	*1191*	*1191*	*1129*	*1139*
All	*2055*	*2049*	*2144*	*2194*	*2230*
Bases (weighted)					
Men	*913*	*875*	*968*	*1082*	*1083*
Women	*1188*	*1192*	*1170*	*1090*	*1088*
All	*2100*	*2067*	*2138*	*2171*	*2171*

Notes: All eligible core members in wave 2 (excluding those with a non-responding spouse). Response rates weighted by the wave 1 weight.

Multivariate model of response to main interview

For 10,770 core members eligible for the main interview in wave 2 (irrespective of whether issued to field), response was modelled on a full range of household and individual level information collected from both HSE and ELSA wave 1. The analysis was conducted on data weighted by the wave 1 weight so that the wave 2 non-response adjustment was made contingent on the already derived weight (the final wave 2 weight was a product of these weights).

The results showed significant differences between core member respondents and non-respondents on a number of characteristics.[23] Non-responders in wave 2 were more likely than responders to have the following characteristics:

- not interviewed in HSE[24];
- limiting long-standing illness recorded in HSE;
- head of household in HSE in the lower supervisory and technical, semi-routine or other social classes;
- living in London in wave 1;
- sampled from HSE 1999 (rather than 1998 or 2001);
- non-white ethnicity;
- renting or other 'non-owning' category compared with owner-occupiers (recorded in wave 1, or HSE if missing);
- marital status of single (never married) or married (first and only marriage) in wave 1;

[23] The logistic regression model of response to the main interview is shown in Appendix B.
[24] A small minority (1.6%) of the 11,391 core members successfully interviewed in wave 1 were non-respondents in HSE.

- CSE/other or no educational qualifications compared with those with a degree or equivalent in wave 1 (recorded in wave 1, or HSE if missing);
- non current smokers in HSE; and
- women aged 85 years and over in wave 1.

Differences in the age-by-sex distribution of wave 1 and wave 2 achieved samples of core members are shown in Table 6-5. Women aged 85 and over in wave 1 were particularly likely to be lost from the sample. Hence, although the profiles were relatively similar, the analysis above suggested that differential non-response between waves 1 and 2 could not be ignored.

Table 6-5 Weighted comparison of wave 1 and wave 2 achieved samples, by age and sex

Core member respondents in waves 1 and 2

	Wave 1			Wave 2		
Age in wave 1	**Men**	**Women**	**Total**	**Men**	**Women**	**Total**
	%	%	%	%	%	%
50-54	23	20	21	24	21	22
55-59	18	16	17	19	17	18
60-64	16	14	15	16	15	15
65-69	14	13	13	14	13	14
70-74	12	12	12	11	12	12
75-79	9	11	10	8	11	10
80-84	5	7	6	4	7	6
85+	3	6	5	2	4	3
Bases:						
Unweighted	*5186*	*6205*	*11391*	*3950*	*4831*	*8781*
Weighted	*5279*	*6111*	*11390*	*4030*	*4708*	*8738*

Note: Age in wave 1 defined as age in 1st April 2002, beginning of wave 1 fieldwork. Both distributions weighted by the wave 1 weight.

The main aim of the weighting strategy in wave 1 was to try to reduce any bias arising specifically from: (1) failure to respond in HSE, (2) refusals to be recontacted after HSE and (3) non-response in ELSA wave 1. Its aim was then, more generally, to ensure that the respondent core member sample was broadly representative of the target population (i.e. persons aged 50+ living in private households in England) at the time of wave 1 fieldwork (2002-03).

In brief, the wave 1 weight was created in two steps. First, response in wave 1 was modelled using information collected in HSE. The modelling was conducted in a similar way to the wave 2 modelling described above, but only using information collected in HSE 1998, 1999 and 2001. The non-response weighting aimed to correct for any differences in characteristics found between respondents and non-respondents by giving greater weight to those sub-groups with lower response rates. The second step was a (post-stratification) adjustment to ensure that the respondent age-by-sex distribution matched the Census 2001 non-institutionalised distribution.

The wave 2 weighting strategy was similarly aimed at reducing any bias arising from sample loss after wave 1. For 10,770 core members eligible in wave 2 (i.e. hypothesised to belong to

the target population), a response/non-response indicator was statistically modelled on a full range of household and individual level information collected from HSE and wave 1 (details given above). Eligible core members *not* issued for interviewing owing to all persons in the household refusing recontact after wave 1 were included in the model.

A non-response weight in wave 2 was created by taking the inverse of the estimated probability of responding. For example, a response probability of 0.8 corresponded to a weight of 1.25 (1/0.8 = 1.25), whilst a lower response probability of 0.5 corresponded to a greater weight of 2 (1/0.5 = 2). The final wave 2 weight was a product of the wave 1 weight and the non-response adjustment in wave 2. That is, the wave 2 main interview weight aimed to correct for non-response bias between: (1) HSE and wave 1, and (2) waves 1 and 2.

Calibration/post-stratification weighting was *not* performed on the wave 2 weight. One reason was that the possible external sources of information for calibration (e.g. mid-year household population estimates or 2001 Census totals 'aged-on' to the mid-point of wave 2 fieldwork) would have required an adjustment to exclude immigrants to the 50+ population. By definition, immigrants could not have entered the ELSA study as core members as only those successfully interviewed in wave 1 were followed up for interview in wave 2 (they could, however, have been interviewed as new partners of core members). The advice given by the Demographics Methods Centre at the ONS was that such an adjustment would have inevitably introduced some errors into the weighting.

Cross-sectional and longitudinal weights

Longitudinal datasets such as ELSA can be analysed either as a cross-section or longitudinally. Cross-sectional analysis uses data collected in a particular wave; longitudinal analysis involves data collected from more than one wave for the purposes of analysing change. Cross-sectional and longitudinal weights support these two different estimation objectives. Longitudinal weights are often only defined for the subset of cases who have taken part in *all* waves up to and including the present wave. Cross-sectional weights are defined for all cases belonging to the target population who responded in a particular wave, including any new entrants to the study and/or those who have missed any of the preceding waves through non-response.

In the second wave, however, only responding core members in wave 1 were followed up for interview in wave 2.[25] It is for this reason that the wave 2 weight supplied with the data supports both cross-sectional and longitudinal analysis. At future waves, however, this will no longer hold as new entrants join the study (e.g. the 'refresher' cohort of persons entering their 50s in wave 3) and a number of core members returned to the study in wave 3 after being non-respondents in wave 2. In subsequent waves, therefore, both cross-sectional and longitudinal weights will be provided.

[25] Partners of core members were also followed up but only core members were assigned positive weights.

Effectiveness of the weighting

As an illustration of the extent to which the wave 2 weighting strategy had been successful in reducing any bias arising from differential non-response, Table 6-6 shows the relative comparison of the wave 1 and wave 2 distributions for educational status (as measured in wave 1).

Table 6-6 Weighted comparison of wave 1 and wave 2 achieved samples, by educational status in wave 1

Core member respondents in waves 1 and 2

Educational status in wave 1	Wave 1 (weighted)	Wave 2 (unweighted)	Wave 2 (weighted)	Ratio: Wave 2 relative to wave 1	
	%	%	%	Unweighted	Weighted
Degree or equivalent	10.8	12.0	11.1	1.12	1.03
A-level/Higher education below degree	16.8	18.3	17.3	1.09	1.03
O-level or other	15.5	16.6	16.0	1.08	1.03
CSE or other	13.4	13.4	13.3	1.00	0.99
No qualifications	43.6	39.6	42.4	0.91	0.97
Bases:					
Unweighted	*11391*	*8781*	*8781*		
Weighted	*11391*	-	*8781*		

In order to enable comparison, Table 6-6 shows the educational status distribution for all 11,391 core members responding in wave 1 and those 8,781 responding in both waves 1 and 2. The latter is shown both unweighted and weighted (wave 2 interview weight). If non-response had been uniform, then the wave 2 distribution would have been expected to mirror that for wave 1. Table 6-6 clearly shows, however, that core members with a degree or equivalent were over-represented in wave 2 (12.0% compared to 10.8% in wave 1) while those with no qualifications were under-represented (39.6% compared to 43.6%).

Using the example of Vandecasteele and Debels (2007), the under or over-representation of each educational status category in wave 2 relative to wave 1 can be shown by dividing the former by the latter. This is shown in the last two columns of Table 6-6. A number less than 1 indicated under-representation of the group in the longitudinal sample, while a number greater than 1 pointed to over-representation. So, the closer to 1, the closer the wave 2 distribution mirrored the distribution in wave 1. Conducting this analysis on both unweighted and weighted data illustrated the potential effectiveness of the weighting in reducing bias.

Looking at the unweighted distribution first, Table 6-6 showed the over-representation of core members with qualifications (e.g. a ratio of 1.12 for those with a degree or equivalent) compared to the under-representation of those without (a ratio of 0.91).

As to be expected, the wave 2 weighting strategy reduced, but did not eliminate, the under-representation of those without qualifications. After applying the wave 2 interview weight, 42.4% of core members did not have a qualification (at the time of wave 1) compared to the wave 1 estimate of 43.6% (the unweighted estimate in wave 2 was 39.6%). The upweighting of core members without qualifications via the modelling of response, therefore, moved the

wave 2 distribution closer to that in wave 1 (increasing the ratio from 0.91 unweighted to 0.97 weighted).

6.2.2 Nurse visit

Profile of nurse visit respondents

Core members were eligible for the nurse visit if they had completed a wave 2 main interview in person (i.e. not by proxy). Of the 8,688 core members who did so, nearly nine-in-ten (7,666) went on to complete a nurse visit. As a percentage of all core members eligible for a wave 2 main interview (10,770), this constituted a yield of 71%. The age-sex profile of nurse visit respondents is shown in Table 6-7.

Table 6-7 Respondents to nurse visit, by age and sex

Core member nurse visit respondents

Age in wave 2	Men	Women	Total	Men	Women	Total
				%	%	%
52-54	415	491	906	12	12	12
55-59	746	902	1648	22	21	21
60-64	564	668	1232	16	16	16
65-69	592	677	1269	17	16	17
70-74	480	557	1037	14	13	14
75-79	347	406	753	10	10	10
80-84	210	344	554	6	8	7
85+	97	170	267	3	4	3
Base (unweighted)	*3451*	*4215*	*7666*	*100*	*100*	*100*

Note: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork.

Analysis of response to nurse visit

Although overall 88% of those core members who completed a main interview in person successfully responded to the nurse visit, the response rate varied according to respondent age. This is shown in Table 6-8 and ranged from 90% (among the youngest core members who were in their 50s in wave 2) to approximately 84% (among the oldest core members who were aged 75 and over).

Table 6-8 Achieved nurse visits as a proportion of wave 2 full/partial interviews, by age

Core member full interview respondents

Age in wave 2	Productive interview	Productive nurse visit	Full/partial interviews resulting in a nurse visit
			%
52-54	1018	906	88.9
55-59	1829	1648	89.6
60-64	1397	1232	87.5
65-69	1389	1269	90.8
70-74	1193	1037	86.4
75-79	886	753	84.1
80-84	654	554	84.0
85+	322	267	82.8
Bases:			
Unweighted	*8688*	*7666*	
Weighted	*8674*	*7600*	

Notes: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork. Response rates weighted by the wave 2 interview weight.

There were a number of reasons why core members did not take part in the nurse visit, but the most common was refusal (Table 6-9). A minority who did agree to take part could not be contacted by the nurse. This may have reflected some people's circumstances, but in other cases this could be interpreted as hidden refusal, despite the fact that consent had been given to be visited by the nurse at the end of the main interview. Other reasons for non-response included being too ill or away at the time of fieldwork.

Table 6-9 Reasons for non-response to nurse visit

Core member non-respondents to nurse visit

Reason for non-response	Frequency	%
Refusal	801	78.4
Non-contact	89	8.7
Other	132	12.9
Base (unweighted)	*1022*	*100*

Table 6-10 shows response to the nurse visit by non-housing wealth quintile in wave 2. Response to the nurse visit increased from the lowest wealth quintile to the highest. 91.5% of men in the richest wealth quintile successfully completed a nurse visit, compared with 82.1% in the poorest quintile. The equivalent figures for women were 91.6% and 81.8%.

Table 6-10 Nurse visit response, by (non-housing) wealth quintile in wave 2 and sex

Core member full interview respondents

Wealth quintile in wave 2	Poorest	2nd	3rd	4th	Richest
	%	%	%	%	%
Men					
Respondents	82.1	86.1	88.8	90.6	91.5
Non-respondents	17.9	13.9	11.2	9.4	8.5
Women					
Respondents	81.8	85.4	89.0	91.1	91.6
Non-respondents	18.2	14.6	11.0	8.9	8.4
All					
Respondents	81.9	85.7	88.9	90.8	91.5
Non-respondents	18.1	14.3	11.1	9.2	8.5
Bases (unweighted)					
Men	*712*	*692*	*776*	*829*	*842*
Women	*996*	*1017*	*935*	*889*	*871*
All	*1708*	*1709*	*1711*	*1718*	*1713*
Bases (weighted)					
Men	*794*	*734*	*786*	*815*	*812*
Women	*1031*	*1030*	*901*	*831*	*806*
All	*1825*	*1765*	*1687*	*1647*	*1618*

Notes: All core members eligible for nurse visit (excluding those with a non-responding spouse). Response rates weighted by the wave 2 interview weight.

Multivariate model of response to nurse visit

For 8,688 core members eligible for the nurse visit in wave 2 (i.e. giving a full or partial main interview), response to the nurse visit was modelled on a full range of household and individual level information collected from HSE and ELSA waves 1 and 2. The analysis was conducted on data weighted by the wave 2 interview weight so that the adjustment for non-response to the nurse visit was made contingent on the already derived weight (the final nurse weight was a product of these weights).

The results showed significant differences between core member respondents to the nurse visit and non-respondents on a number of characteristics.[26] The non-responders to the nurse visit in wave 2 were more likely than responders to have the following characteristics:

- men aged 85 years and over in wave 2;
- women aged 75 years and over in wave 2;
- living in North West, West Midlands or London in wave 2;
- head of household at HSE in the semi-routine social class;
- having fair or poor self-assessed health in wave 2;
- current smoker in HSE; and
- low frequency of physical activity in wave 2.

The weighting strategy for the nurse visit was aimed at reducing any bias arising from differential non-response between completion of the main interview and nurse visit. A non-response weight for the nurse visit was created by taking the inverse of the estimated

[26] The logistic regression model of response to the nurse visit is shown in Appendix C.

probability of responding. The final nurse visit weight was a product of the wave 2 interview weight and the adjustment for non-response to the nurse visit.

6.2.3 Blood sample

Profile of blood sample respondents

Core members were eligible for this stage of data collection if they had successfully completed the nurse visit and gave consent for blood sample measurements. Of the 7,666 core members completing the nurse visit 6,231 (81%) went on to have a blood sample taken. As a percentage of the 10,770 core members eligible for a wave 2 main interview (10,770), this constituted a yield of 58%. The age-sex profile of core members who had a blood sample taken is shown in Table 6.11.

Table 6-11 Respondents to blood sample, by age and sex

Core member blood sample respondents

Age in wave 2	Men	Women	Total	Men	Women	Total
				%	%	%
52-54	366	417	783	13	12	13
55-59	627	774	1401	22	23	22
60-64	488	560	1048	17	17	17
65-69	480	541	1021	17	16	16
70-74	372	432	804	13	13	13
75-79	277	310	587	10	9	9
80-84	158	240	398	6	7	6
85+	70	119	189	2	4	3
Base (unweighted)	*2838*	*3393*	*6231*	*100*	*100*	*100*

Note: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork.

Analysis of response to blood sample

Although overall 81% of those eligible successfully gave a blood sample, the response rate varied according to respondent age. This is shown in Table 6-12 and ranged from 85% (among the youngest core members who were in their 50s in wave 2) to approximately 71% (among the oldest core members who were aged 85 and over).

Table 6-12 Achieved blood sample measurements as a proportion of nurse visits, by age

Core member nurse visit respondents

Age in wave 2	Productive nurse visit	Had blood sample taken	Nurse visits resulting in a blood sample
			%
52-54	906	783	86.4
55-59	1648	1401	84.7
60-64	1232	1048	84.7
65-69	1269	1021	79.9
70-74	1037	804	76.7
75-79	753	587	76.7
80-84	554	398	71.6
85+	267	189	71.1
Bases:			
Unweighted	*7666*	*6231*	*80.7*
Weighted	*7666*	*6188*	

Notes: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork. All core members eligible for blood sample in wave 2 (completed a nurse visit). Response rates weighted by the nurse weight.

In an analogous fashion to analysis of response to both the main interview and nurse visit, Table 6-13 shows response to the blood sample by non-housing wealth quintile (as measured in the wave 2 Income and Assets section). 83.8% of men in the richest wealth quintile gave a blood sample, compared with 76.1% in the poorest quintile. The equivalent figures for women were 83.8% and 75.0%.

Table 6-13 Blood sample respondents, by (non-housing) wealth quintile in wave 2 and sex

Core member nurse visit respondents

Wealth quintile in wave 2	Poorest	2nd	3rd	4th	Richest
	%	%	%	%	%
Men					
Respondents	76.1	81.6	82.2	85.7	83.8
Non-respondents	23.9	18.4	17.8	14.3	16.2
Women					
Respondents	75.0	76.7	81.7	83.1	83.8
Non-respondents	25.0	23.3	18.3	16.9	16.2
All					
Respondents	75.5	78.8	81.9	84.4	83.8
Non-respondents	24.5	21.2	18.1	15.6	16.2
Bases (unweighted)					
Men	*588*	*600*	*695*	*751*	*771*
Women	*827*	*876*	*837*	*811*	*797*
All	*1415*	*1476*	*1532*	*1562*	*1568*
Bases (weighted)					
Men	*670*	*647*	*698*	*735*	*735*
Women	*873*	*907*	*808*	*751*	*727*
All	*1543*	*1554*	*1506*	*1485*	*1463*

Notes: All core members eligible for blood sample (excluding those with a non-responding spouse). Response rates weighted by the nurse weight.

Multivariate model of response to blood sample

For 7,666 core members who took part in the nurse visit, response to the blood sample was modelled on a full range of household and individual level information collected from both HSE and ELSA waves 1 and 2. The analysis was conducted on data weighted by the nurse weight so that the wave 2 adjustment for non-response to the blood sample was made contingent on the already derived weight (the final blood sample weight was a product of these weights).

The results showed significant differences between core member respondents to the blood sample and non-respondents on a number of characteristics.[27] Non-responders to the blood sample were more likely than responders to have the following characteristics:

- men aged 70 years and over in wave 2;
- women aged 65 years and over in wave 2;
- living in Yorkshire & The Humber, East Midlands, East of England, London or South West in wave 2;
- head of household in the semi-routine social class (in HSE interview);
- having good, fair or poor self-assessed health in wave 2;
- low frequency of physical activity in wave 2; and
- limiting long-standing illness in wave 2.

The weighting strategy for the blood sample was aimed at reducing any bias arising from differential non-response between completion of the nurse visit and giving a blood sample. A non-response weight for the blood sample was created by taking the inverse of the estimated probability of responding. The final blood sample weight was a product of the nurse visit weight and the adjustment for non-response to the blood sample.

6.2.4 Self-completion questionnaire

Profile of respondents to the self-completion

Core members were eligible for the self-completion stage if they had completed a wave 2 main interview in person (i.e. not by proxy). Of the 8,688 core members who did so, nine-in-ten (7,803) went on to complete the self-completion questionnaire. As a percentage of all core members eligible for main interview (10,770), this constituted a yield of 72%. The age-sex profile of self-completion respondents is shown in Table 6-14.

[27] The logistic regression model of response to the blood sample is shown in Appendix D.

Table 6-14 Respondents to self-completion questionnaire, by age and sex

Core member full/partial interview respondents in wave 2

Age in wave 2	Men	Women	Total	Men	Women	Total
				%	%	%
52-54	418	502	920	12	12	12
55-59	756	929	1685	22	22	22
60-64	596	701	1297	17	16	17
65-69	597	690	1287	17	16	16
70-74	503	580	1083	14	14	14
75-79	356	411	767	10	10	10
80-84	198	331	529	6	8	7
85+	88	147	235	3	3	3
Base (unweighted)	*3512*	*4291*	*7803*	*100*	*100*	*100*

Note: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork.

Although overall 80% of core members giving a full/partial (i.e. non-proxy) interview went on to successfully return the self-completion questionnaire, the response rate varied according to respondent age (shown in Table 6-15). Response ranged from 93% (among core members aged in their 60s in wave 2) to approximately 73% (among the oldest core members who were aged 85 and over).

Table 6-15 Returned self-completion questionnaires as a proportion of wave 2 full/partial interviews, by age

Core members giving a full/partial interview in wave 2

Age in wave 2	Productive main interview	Returned self-completions	Full/partial interviews resulting in a returned self-completion questionnaire
			%
52-54	1018	920	89.6
55-59	1829	1685	91.7
60-64	1397	1297	92.3
65-69	1389	1287	92.2
70-74	1193	1083	90.1
75-79	886	767	85.8
80-84	654	529	80.4
85+	322	235	72.7
Bases:			
Unweighted	*8688*	*7803*	*89.0*
Weighted	*8674*	*7724*	

Notes: Age in wave 2 defined as age in 1st March 2004, beginning of wave 2 fieldwork. All core members eligible for self-completion in wave 2. Response rates weighted by wave 2 interview weight.

Analysis of response to self-completion questionnaire

Table 6-16 shows response to the self-completion questionnaire by non-housing wealth quintile (as measured in wave 2). Response in wave 2 increased from the lowest wealth quintile to the highest. 93.7% of men in the richest wealth quintile completed the questionnaire, compared with 82.2% in the poorest quintile. The equivalent figures for women were 94.4% and 80.3%.

Table 6-16 Self-completion respondents, by (non-housing) wealth quintile in wave 2 and sex

Core members giving a full/partial interview in wave 2

Wealth quintile in wave 2	Poorest	2nd	3rd	4th	Richest
	%	%	%	%	%
Men					
Respondents	82.2	86.2	91.5	93.4	93.7
Non-respondents	17.8	13.8	8.5	6.6	6.3
Women					
Respondents	80.3	86.3	92.0	94.6	94.4
Non-respondents	19.7	13.7	8.0	5.4	5.6
All					
Respondents	81.2	86.3	91.8	94.0	94.0
Non-respondents	18.8	13.7	8.2	6.0	6.0
Bases (unweighted)					
Men	*712*	*692*	*776*	*829*	*842*
Women	*996*	*1017*	*935*	*889*	*871*
All	*1708*	*1709*	*1711*	*1718*	*1713*
Bases (weighted)					
Men	*794*	*734*	*785*	*815*	*812*
Women	*1032*	*1031*	*901*	*832*	*806*
All	*1826*	*1765*	*1686*	*1647*	*1619*

Note: Response rates weighted by wave 2 interview weight.

Multivariate model of response to self-completion questionnaire

For 8,688 core members who gave a full or partial interview in wave 2, response to the self-completion questionnaire was modelled on a full range of household and individual level information collected from HSE and ELSA waves 1 and 2. The analysis was conducted on data weighted by the wave 2 main interview weight so that the non-response adjustment for the self-completion stage was made contingent on the already derived weight (the final self-completion weight was a product of these weights). The results showed significant differences between core member respondents to the self-completion and non-respondents on a number of characteristics.[28] Non-responders to the self-completion questionnaire were more likely than responders to have the following characteristics:

- male;
- aged 70 years and over in wave 2;
- living in most deprived areas (as measured by the 2004 Index of Multiple Deprivation quintiles) in wave 2[29];

[28] The logistic regression model of response to the self-completion questionnaire is shown in Appendix E.

[29] The Index of Multiple Deprivation (IMD) 2004 combines seven dimensions of deprivation measured at the level of the lower level super output area (LSOA), a statistical unit introduced in the 2001 Census which contains approximately 1,500 individuals. The dimensions are: income deprivation; employment

- non-white ethnicity;
- single in wave 2;
- renting or other 'non-owning' category compared with owner-occupiers (recorded in wave 1, or HSE if missing);
- no educational qualifications compared with those with a degree or equivalent in wave 1 (recorded in wave 1, or HSE if missing);
- being employed, self-employed, permanently sick/disabled compared with retired/semi-retired in wave 2; and
- having poor eyesight in wave 2.

The weighting strategy was aimed at reducing any bias arising from differential non-response between the main interview and return of the self-completion questionnaire. A non-response weight for the 7,803 self-completion respondents was created by taking the inverse of the estimated probability of responding. The final self-completion weight was a product of the wave 2 interview weight and the non-response adjustment.

deprivation; health deprivation and disability; education, skills and training deprivation; barriers to housing and services; living environment deprivation; and crime. Details of the theoretical and practical implementation of the IMD measure, including its reliability and validity, have been published (Office of the Deputy Prime Minister, 2004). For analysis of response IMD scores were divided into quintiles.

7 AN ALTERNATIVE RESPONSE RATES FRAMEWORK

The final chapter of this technical report takes advantage of recent developments in longitudinal survey methodology and sets out a number of alternative response rates that summarise response to ELSA up to and including wave 2. Such response rates will enable users to more easily compare ELSA with other longitudinal studies. The response rates presented in this chapter have been calculated using a recently developed standard approach for presenting response to longitudinal studies, which can (and will) be carried forward to subsequent waves. This framework draws heavily on the work of Lynn (2005). At relevant sections the rates presented here will be compared with those set out in Chapters 5 and 6.

Table 7-1 summarises the response rates presented in this chapter. No single rate can represent the overall level of response to a longitudinal survey such as ELSA. It is recommended that *three* response rates be routinely published at each wave:

- cross-sectional unconditional rate;
- cross-sectional conditional rate; and
- longitudinal unconditional rate.

These are shown in Table 7-1. At the time of wave 2 (2004-05):

- 39% of eligible sample members in wave 2 were successfully interviewed in wave 2 (RR_2): *a cross-sectional unconditional rate*.

- 82% of the eligible sample members who responded in wave 1 were successfully reinterviewed in wave 2 ($RR_{2|1}$): *a cross-sectional conditional rate* (conditioning on participation in wave 1).

- 39% of sample members eligible in every wave from the origin of the sample in HSE (wave 0) up to and including wave 2 had successfully responded in every wave up to and including wave 2 ($RR_{0,1,2}$): *a longitudinal unconditional rate*.

The rest of this chapter gives the background to these response rate calculations.

Table 7-1 Response rates from wave 0 to ELSA wave 2

Calculated at wave	Notation	Meaning	Numerator	Denominator	Rate
Cross-sectional unconditional rates:					
0	RR_0	The unconditional W0 response rate	Responding in W0	Eligible in W0	70%
1	RR_1	The unconditional W1 response rate	Responding in W1	Eligible in W1	47%
2	RR_2	The unconditional W2 response rate	Responding in W2	Eligible in W2	39%
Cross-sectional conditional rates:					
1	$RR_{1\|0}$	The (cross-sectional) W1 response rate conditional upon W0 response	Responding in W1	Eligible in W1 & respondent in W0	65%
2	$RR_{2\|1}$	The (cross-sectional) W2 response rate conditional upon W1 response	Responding in W2	Eligible in W2 & respondent in W1	82%
Longitudinal unconditional rates:					
1	$RR_{0,1}$	The (longitudinal) unconditional W1 response rate	Responding in W0 & W1	Eligible in W0 & W1	46%
2	$RR_{0,1,2}$	The (longitudinal) unconditional W2 response rate	Responding in W0, W1 & W2	Eligible in W0, W1 & W2	39%

7.1 Background

The response rates presented in this chapter are defined for individuals since they are the primary unit of interest. Response rates are presented for the main interview only. As in Chapters 5 and 6 a respondent is defined as giving a full or partial interview either in person or by proxy.

Field and study response rates
In Chapter 6 a distinction was made between field and study response rates:

- Fieldwork response rates are based on the subset of individuals actually issued for interview.

- Study response rates are broader in that they relate back to the originally selected sample (excluding those with 'terminating events' such as death which takes persons out of the target population): irrespective of whether eligible cases are issued for a follow-up interview at any particular wave.

Eligible individuals not issued to field, perhaps because all eligible individuals in the household refused to be recontacted subsequently or they responded negatively to an advance letter sent before interviewing, are included in the denominator for calculating study response rates. They are excluded, however, from the denominator for calculating field response rates. As the denominator only includes issued cases fieldwork response rates are higher than study response rates.

The focus of this chapter is on measuring study response in standard ways that can be easily compared with other longitudinal studies. An overall impression of the representativeness of the respondents remaining in the ELSA study in wave 2 is better served by examining study rather than field response rates.

Cross-sectional and longitudinal response rates
Response rates to longitudinal studies such as ELSA can be calculated both cross-sectionally and longitudinally (Nathan, 1999):

- Cross-sectional rates indicate what happened in a particular wave of data collection (e.g. showing the proportion of eligible sample members in wave *t* who were successfully interviewed in wave *t*).

- Longitudinal rates summarise response over a number of waves by relating response to the original sample (e.g. showing the proportion of sample members eligible in every wave up to wave *t* who had successfully responded in every wave). Such measures of cumulative response are essential as for the purposes of longitudinal analysis only cases which responded at all waves are generally of interest.

Unconditional and conditional response rates
Whether measuring response cross-sectionally (wave *t*) or longitudinally (all waves up to and including wave *t*), a distinction can be made between unconditional and conditional response rates:

- Unconditional response rates are based on all sample units eligible in a particular wave.

- Conditional response rates are based on the subset of eligible sample units who have responded in one or more previous waves. (Note that there are several options available for the conditioning rules. For example response in wave *t* could be calculated conditional on having given a full interview in the previous wave. Alternatively, response in wave *t* could be calculated conditional on responding in the first wave of the longitudinal survey).

Using these concepts the following response rates are presented in this chapter:

- cross-sectional (unconditional) response rates;
- cross-sectional (conditional) response rates; and
- longitudinal response rates (unconditional and conditional).

Eligible sample members

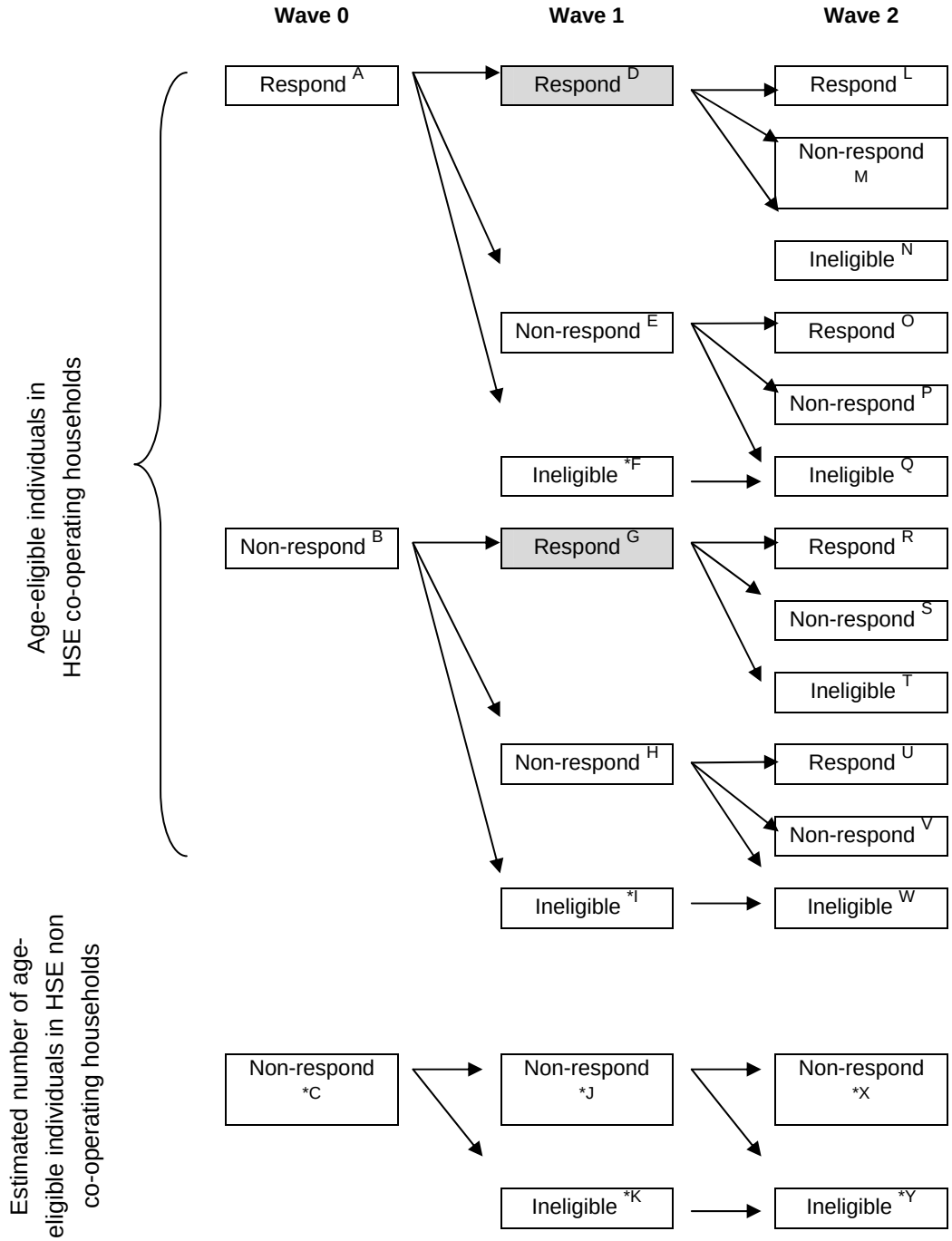
Response rates are presented for *eligible sample members* (i.e. individuals who were living within the household at the time of the HSE interview in 1998, 1999 and 2001, were born before 1 March 1952 and were still living at a private residential address in England at the time of the ELSA wave 1 interview in 2002-03).

Note, therefore, that the numerator for the response rates defined in wave 2 are not necessarily restricted to the subset of eligible sample members who took part in wave 1 (and were later renamed core members). For example, 57 age-eligible sample members identified from HSE who did not respond in wave 1 but were successfully interviewed in wave 2 ('core partners') are included in the numerator for the unconditional wave 2 cross-sectional rate.

Response rates are presented for age-eligible sample members only: interviewed cases are either core members or core partners. Young and new partners are not considered. Figure 7-1 shows the pattern of response across the three waves so far (HSE and ELSA waves 1 and 2). For the purposes of ELSA the HSE is often described as the wave 0 sample. The 11,391 core members successfully interviewed in wave 1 are shown in Figure 7-1 by grey shading.

Figure 7-1 makes the distinction at HSE between co-operating and non co-operating households, and between responding, non-responding and ineligible cases. HSE co-operating households are those where at least one eligible person was interviewed (meaning that the age of all members in the household was collected). Age information was *not* available for individuals within HSE non co-operating households. Applying information from co-operating to non co-operating households, however, gave us an estimate of the number of individuals eligible for wave 1. Table 7-2 provides the most up-to-date numbers. Both Figure 7-1 and Table 7-2 are used in this chapter to demonstrate the calculation of each response rate. Section 7.2 outlines the cross-sectional rates; Section 7.3 the longitudinal rates.

Figure 7-1 Pattern of response from HSE to ELSA wave 2 (age-eligible sample members)



* denotes an estimate

Table 7-2 Response to ELSA

CM Core member
CP Core partner

Identifier in Figure 7-1	Outcome status	Number of individuals
Wave 0		
HSE co-operating HH		
A	Respond in W0	18651
B	Non-respond in W0	1270
HSE non co-operating HH		
C	Non-respond in W0	6630*
Wave 1		
HSE co-operating HH, respondents in W0		
D	Respond in W1 (CM)	11205
E	Non-respond in W1	6125*
F	Ineligible in W1	1321*
HSE co-operating HH, individual non-respondents in W0		
G	Respond in W1 (CM)	186
H	Non-respond in W1	1027*
I	Ineligible in W1	57*
HSE non co-operating HH		
J	Non-respond in W1	5947*
K	Ineligible in W1	683*
Wave 2		
Respondents in W0 & W1		
L	Respond in W2 (CM)	8676
M	Non-respond in W2	1920
N	Ineligible in W2	609
Respondents in W0, non-respondents & ineligible in W1		
O	Respond in W2 (CP)	35
P	Non-respond in W2	5286*
Q	Ineligible in W2	2125*
Non-respondents in W0, respondents in W1		
R	Respond in W2 (CM)	105
S	Non-respond in W2	69
T	Ineligible in W2	12
HSE co-operating HH: non-respondents in W0, non-respondents & ineligible in W1		
U	Respond in W2 (CP)	22
V	Non-respond in W2	952*
W	Ineligible in W2	110*
HSE non co-operating HH: non-respondents in W0, non-respondents & ineligible in W1		
X	Non-respond in W2	5436*
Y	Ineligible	1194*

***** *denotes an estimate*

7.2 Cross-sectional response rates

7.2.1 Unconditional response rates (HSE sampling frame: including persons of unknown age within non co-operating households)

(Cross-sectional) unconditional rates indicate what proportion of eligible sample members in wave *t* successfully responded in wave *t*.

Wave 0

In wave 0, the denominator for the unconditional response rate focuses on those individuals eligible for interview in wave 0. Individuals eligible for ELSA were those born before 1 March 1952 living in a private household in England. The response rate is calculated as follows:

$$RR_0 = \frac{\text{Respond in wave 0}}{\text{Eligible sample members in wave 0}}$$

The relevant groups can be identified from the wave 0 column in **Figure** 7-1 as follows:

$$RR_0 = \frac{A}{A + B + C^*}$$

* denotes an estimate

From Table 7-2 the number of productive outcomes in wave 0 was 18,651. The number estimated to be eligible for interview was 18,651 + 1,270 + 6,630 = 26,551 (across the three HSE years used as the sampling frame for wave 1). Hence, the estimated unconditional response rate in wave 0 was 18,651/(18,651 + 1,270 + 6,630) = 0.71 × 100 = 70%.[30]

(Group C represents an estimate of the number eligible in wave 0 amongst those cases whose eligibility for ELSA was unknown. That is, the denominator for the wave 0 response rate contains an additional 6,630 cases who were hypothesised to belong to the target population but whose household did not take part in wave 0 (Stage 2 in Figure 2-1). As mentioned in Chapter 2, the ELSA sample was only selected from households that responded to HSE: non co-operating households in HSE were not included in the wave 1 sampling frame as there was no available information about residents that would have it made possible to identify those who were aged 50+).

Wave 1

In wave 1, the denominator focuses on those individuals eligible in wave 1. Individuals could have become ineligible in wave 1 if it became known that they had died, moved into an institution, or moved outside of England. In addition, a number of cases (with unknown eligibility) were estimated to be ineligible in wave 1 using age-sex mortality rates; annual rates of moves out of the UK and annual rates of moves into an institution. These cases, having

[30] This figure corresponds to the wave 0 response rate in Table 6-1 (measure D): where the denominator uses *all* those aged 50 years or more in wave 0, which was estimated using the published rates and knowledge of differences between all adults and the sub-group of interest. The number of age-eligible cases within HSE non co-operating households was estimated by applying age-adjusted

moved outside the target population, were set aside *before* the response rate was calculated. The response rate was calculated as follows:

$$RR_1 = \frac{\text{Respond in wave 1}}{\text{Eligible sample members in wave 1}}$$

The relevant groups can be identified from the wave 1 column in **Figure** 7**-**1 as follows:

$$RR_1 = \frac{D + G}{D + E^* + G + H^* + J^*}$$

* denotes an estimate

From Table 7-2, the number of productive outcomes in wave 1 was 11,391. The number estimated to be eligible was 11,391 + 6,125 + 1,027 + 5,947 = 24,490. Hence, the estimated unconditional response rate in wave 1 was 11,391/(11,391 + 6,125 + 1,027 + 5,947) = 0.47 × 100 = 47%. (Group J in **Figure** 7**-**1 represents the estimated number of eligible individuals in HSE non co-operating households hypothesised to remain eligible in wave 1: i.e. born before 1 March 1952, remaining alive and living in a private household in England).[31]

Wave 2

In wave 2, the denominator for the unconditional response rate focuses on those individuals eligible in wave 2. As in wave 1, individuals could have become ineligible in wave 2 if they were known to have died between waves 1 and 2. In addition, a number of cases with unknown eligibility were estimated to be ineligible in wave 2 using age-sex mortality rates; annual rates of moves out of the UK and annual rates of moves into an institution. Ineligible cases were set aside before the response rate was calculated. The response rate in wave 2 was calculated as follows:

$$RR_2 = \frac{\text{Respond in wave 2}}{\text{Eligible sample members in wave 2}}$$

The relevant groups can be identified from the wave 2 column in **Figure** 7**-**1 as follows:

$$RR_2 = \frac{L + O + R + U}{L + M + O + P^* + R + S + U + V^* + X^*}$$

* denotes an estimate

From Table 7-2, the number of age-eligible sample members taking part in wave 2 was 8,838 (8,781 core members and 57 core partners).[32] The number of individuals estimated to be

response rates from co-operating households to non co-operating households (separately for HSE 1998, 1999 and 2001).

[31] Note that this is a *study* response rate: it relates to the original sample in wave 0 who remain eligible in wave 1 rather than to the subset of cases actually issued in wave 1. For example, individuals who lived in a household where *all* eligible cases refused recontact post HSE (Stage 5 in Figure 2-1) or who refused in advance of wave 1 fieldwork are included in the denominator even though they were not issued and so did not have an opportunity to respond in wave 1. It is for this reason that the study response rate in wave 1 (RR_1: 47%) is lower than the fieldwork response rate (67%) quoted for measure B in Table 6-1.

[32] Core partners are individuals who were sampled as potential age-eligible members in wave 1 but who did not respond in wave 1 (but were established to be present in the household) and so were only interviewed in wave 2 by virtue of their being the partner of a core member.

eligible in wave 2 was 22,501. Hence, the estimated unconditional response rate in wave 2 was 8,838/22,501 = 0.39 × 100 = 39%. (Group X in **Figure** 7**-**1 represents the estimated number of individuals in HSE non co-operating households who remain eligible sample members in wave 2).

7.2.2 Unconditional response rates (ELSA sampling frame: persons with known age within HSE co-operating households)

Section 7.2.1 focused on all persons in HSE 1998, 1999 and 2001 estimated to be aged 50+ at the time of ELSA wave 1. Unconditional response rates can also be calculated at each wave for the subsample of individuals within HSE co-operating households - for whom age information was available.

Wave 1

The unconditional response rate in wave 1 was calculated as follows (the superscript 'a' is used to indicate a subsample; in this case *known* age-eligible sample members in HSE co-operating households):

$$RR_1^a = \frac{\text{Respond in wave 1}}{\text{Eligible sample members in wave 1 (HSE co-operating households)}}$$

The relevant groups can be identified from the wave 1 column in **Figure** 7**-**1 as follows:

$$RR_1^a = \frac{D + G}{D + E^* + G + H^*}$$

From Table 7-2, the number of productive outcomes in wave 1 was 11,391. The number eligible in wave 1 (among HSE co-operating households but disregarding any agreement to recontact for further study) was 11,391 + 6,125 + 1,027 = 18,543. Hence, the estimated unconditional response rate in wave 1 (for this subsample of cases) was 11,391/(11,391 + 6,125 + 1,027) = 0.61 × 100 = 61%.[33]

Wave 2

The unconditional response rate in wave 2 for eligible sample members in HSE co-operating households was calculated as follows:

$$RR_2^a = \frac{\text{Respond in wave 2}}{\text{Eligible sample members in wave 2 (HSE co-operating households)}}$$

The relevant groups can be identified from the wave 2 column in **Figure** 7**-**1 as follows:

$$RR_2^a = \frac{L + O + R + U}{L + M + O + P^* + R + S + U + V^*}$$

[33] This corresponds to the wave 1 response rate in Table 6-1 (measures C and D), where the denominator includes all individuals eligible for wave 1 (within HSE co-operating households) irrespective of whether they were issued to field.

From Table 7-2, the number of productive outcomes in wave 2 was 8,838 (core members and core partners). The number of individuals eligible in wave 2 (among HSE co-operating households) was 17,065. Hence, the estimated unconditional response rate in wave 2 (for this subsample of cases) was 8,838/17,065 = 0.52 × 100 = 52%.

Note again that this is a *study* response rate: it relates to the original sample members in HSE co-operating households (minus deaths, moves out of Britain and moves into institutions) rather than on the subset of cases actually followed up for interview in wave 2.

7.2.3 Conditional response rates

Unconditional response rates focus on those individuals eligible at a particular wave. Conditional response rates are narrower as they focus on the subset of eligible sample units who have successfully responded at one or more previous waves (i.e. conditioning on prior response). Different conditioning rules could be chosen. For example, a response rate in wave *t* could be measured by conditioning on having responded in the previous wave or on having responded in the first wave. (At the second wave of a longitudinal survey these two conditional rates are equivalent: response in the previous wave is equivalent to response in the first wave).

For a (cross-sectional) conditional response rate prior response is usually taken to mean having a successful response in the previous wave. This is the definition used in this section.

Wave 1

The denominator for the wave 1 response rate conditional on having responded in wave 0 focuses on those individuals eligible in wave 1 and who responded in wave 0. The response rate was calculated as follows:

$$RR_{1|0} = \frac{\text{Respond in wave 1 (if also respond in wave 0)}}{\text{Eligible sample members in wave 1 (if also respond in wave 0)}}$$

The relevant groups can be identified from the wave 1 column in **Figure** 7**-**1 as follows:

$$RR_{1|0} = \frac{D}{D + E}$$

From Table 7-2, the number of productive outcomes in wave 0 (persons *known* to be age-eligible for ELSA) was 18,651. Of these, 1,321 were estimated to be ineligible by the time of wave 1 (some one to four years after the HSE interview) through deaths, moves out of England or institutional moves, leaving a denominator of 17,330. Of these, 11,205 were successfully interviewed in wave 1. (That is, 11,205 of the 11,391 core members in wave 1 had also responded in HSE). Hence, the estimated response rate in wave 1 conditional on successfully responding in HSE was 11,205/17,330 = 0.65 × 100 = 65%.[34]

[34] This is a *study* response rate: it relates to individuals successfully interviewed in wave 0 (minus deaths, moves out of England and institutional moves) irrespective of whether they were issued to field in wave 1.

Wave 2

In wave 2, the denominator for the conditional response rate focuses on those individuals who successfully responded in wave 1 and who remained eligible in wave 2 (focusing, therefore, on core members). The response rate was calculated as follows:

$$RR_{2|1} = \frac{\text{Respond in wave 2 (if also respond in wave 1)}}{\text{Eligible sample members in wave 2 (if also respond in wave 1)}}$$

The relevant groups can be identified from the wave 2 column in Figure 7-1 as follows:

$$RR_{2|1} = \frac{L + R}{L + M + R + S}$$

From Table 7-2, the number of productive outcomes in wave 1 was 11,391. Of these, 621 cases were established to be ineligible in wave 2 (groups N and T), resulting in a denominator of 10,770. Of these, 8,781 were successfully interviewed in wave 2. Hence, the estimated (cross-sectional) response rate in wave 2 conditional upon having taken part in wave 1 was 8,781/10,770 = 0.82 × 100 = 82%.[35] This rate corresponds with the wave 2 response rate of 82% (Table 5-7) set out in Section 5.6.

7.3 Longitudinal response rates (HSE as starting point)

Longitudinal response rates are cumulative. That is, they show response up to and including wave *t* in relation to the original sample (minus the terminating events that take individuals out of the target population: e.g. deaths and moves into an institution). As with the cross-sectional rates presented in Section 7.2, longitudinal response rates can be calculated either unconditionally or conditional upon prior response:

- (Longitudinal) unconditional response rates in wave *t* focus on individuals eligible at every wave up to and including wave *t*, irrespective of their outcome status. The rate indicates the proportion of sample members eligible in every wave up to and including wave *t* that successfully gave an interview in every wave up to and including wave *t*. Unconditional rates are discussed in Section 7.3.1.

- The precise definition of (longitudinal) conditional rates in wave *t* depends on the definition of prior response. One option could be to calculate a longitudinal response rate

[35] The (cross-sectional) conditional response rate presented here (conditioning on having successfully responded in the previous wave) is analogous to a wave-to-wave attrition rate (see Nathan, 1999). A wave-to-wave attrition rate summarises response between consecutive waves. For the purposes of measuring response to ELSA, an obvious group of interest is the 11,391 sample members who successfully responded in wave 1 ('core members'). At subsequent waves these individuals remain eligible provided they remain living in a private household in Britain. The wave-to-wave attrition rate in wave 2 represents the proportion of eligible wave 1 respondents who gave an interview in wave 2. The wave-to-wave (sometimes called wave-on-wave) response rate in wave 2 takes as the denominator the number of sample units that had responded in wave 1 and were eligible in wave 2.

From Table 7-2, the number of individuals who responded in waves 1 and 2 (Groups L and R) was 8,781. In total, 10,770 of the 11,391 core members successfully interviewed in wave 1 were considered eligible in wave 2: resulting in a wave 1 to wave 2 attrition rate of 8,781/10,770 = 0.82 × 100 = 82% - exactly the same as the rate ($RR_{2|1}$) described above.

in wave *t* conditional on having responded in the previous wave. An alternative is to define prior response as having successfully taken part in the first wave of the survey. Conditional rates are discussed in Section 7.3.2.

In this section both sets of longitudinal rates take wave 0 as the starting point. Alternatively, ELSA users may prefer to adopt wave 1 as the first wave of the longitudinal study (thereby specifically measuring longitudinal response among core members). Analogous longitudinal rates calculated using wave 1 respondents as the starting point are presented in Section 7.4.

7.3.1 Unconditional response rates

Wave 1

The denominator for the wave 1 (longitudinal) unconditional response rate focuses on those original sample members eligible in waves 0 and 1 (irrespective of their outcome status at either wave or whether issued to field in wave 1). The numerator focuses on those eligible sample units that responded in both waves 0 and 1. The response rate, therefore, indicates the proportion of eligible sample units that responded in *every* wave up to and including wave 1. The response rate was calculated as follows:

$$RR_{0,1} = \frac{\text{Respond in waves 0 and 1}}{\text{Eligible sample members in waves 0 and 1}}$$

The relevant groups can be identified from the wave 1 column in Figure 7-1 as follows:

$$RR_{0,1} = \frac{D}{D + E^* + G + H^* + J^*}$$

From Table 7-2, the number of age-eligible individuals who responded in both waves 0 and 1 was 11,205. In total, 24,490 individuals were estimated to be eligible for interview in both waves. Hence, the estimated (longitudinal) unconditional response rate in wave 1 was 11,205/24,490 = 0.46 $\times$ 100 = 46%.

Wave 2

The denominator for the wave 2 (longitudinal) unconditional rate focuses on those original sample members eligible for interview in waves 0, 1 and 2 (irrespective of their participation history or whether issued to field). The numerator focuses on those eligible sample units that responded in every wave up to and including wave 2. The response rate, therefore, indicates the proportion of eligible sample units that responded in every wave, and was calculated in wave 2 as follows:

$$RR_{0,1,2} = \frac{\text{Respond in waves 0, 1 and 2}}{\text{Eligible sample members in waves 0, 1 and 2}}$$

The relevant groups can be identified from the wave 1 column in Figure 7-1 as follows:

$$RR_{0,1,2} = \frac{L}{L + M + O + P + R + S + U + V + X^*}$$

From Table 7-2, the number of age-eligible individuals who responded in waves 0, 1 and 2 was 8,676. In total, 22,501 individuals were estimated to be eligible for interview in all waves up to and including wave 2. Hence, the estimated (longitudinal) unconditional response rate defined in wave 2 was 8,676/22,501 = 0.39 × 100 = 39%.

7.3.2 Conditional response rates

Longitudinal response rates can be defined in each wave conditional on prior response to the survey. The exact measure depends clearly on the definition of prior response (e.g. preceding wave, first wave etc). At the time of wave 2 a longitudinal response rate can be calculated conditional upon having taken part in wave 1. This response rate was calculated as follows:

$$RR_{0,1,2|1} = \frac{\text{Respond in waves 0, 1 and 2}}{\text{Eligible sample members in waves 0, 1 and 2 (if also respond in wave 1)}}$$

The relevant groups can be identified from the wave 2 column in Figure 7-1 as follows:

$$RR_{0,1,2|1} = \frac{L}{L + M + R + S}$$

From Table 7-2, the number of age-eligible sample members who successfully responded in waves 0, 1 and 2 was 8,676. In total, 10,770 individuals were estimated to be eligible for interview in all waves up to and including wave 2 *and* who were successfully interviewed in wave 1. Hence, the estimated longitudinal response rate in wave 2 conditional upon response in wave 1 was 8,676/10,770 = 0.81 × 100 = 81%.[36]

[36] Note that the denominator is the same as that for $RR_{2|1}$: the (cross-sectional) wave 2 response rate conditional upon response in wave 1. The numerator for the longitudinal rate $RR_{0,1,2|1}$ is different, however, as it is a cumulative rate and relates back to the original sample to focus on cases that have successfully responded in waves 0, 1 and 2.

7.4 Longitudinal response rates (wave 1 as starting point)

Users of ELSA may prefer to adopt wave 1 as the first wave of the study rather than wave 0 (HSE). At each wave *subsequent* to the first a longitudinal response rate can be defined by conditioning on having successfully taken part in wave 1 (disregarding, therefore, response in wave 0). This rate can be used to track over time how the panel of initial wave 1 respondents (11,391 core members) is being maintained.

Wave 2

The wave 2 response rate conditional upon having successfully responded in wave 1 can be calculated as follows:

$$RR_{2|1} = \frac{\text{Respond in wave 2 (if also respond in wave 1)}}{\text{Eligible sample members in wave 2 (if also respond in wave 1)}}$$

This rate was set out in Section 7.2.3 ($RR_{2|1}$ = 82%). For illustration purposes the analogous rate in wave 3 is presented below.

Wave 3

A wave 3 longitudinal response rate (defined for respondents in waves 1, 2 and 3) conditional upon having successfully responded in wave 1 would be calculated as follows:

$$RR_{3,2|1} = \frac{\text{Respond in waves 1, 2 and 3}}{\text{Eligible sample members in waves 1, 2 and 3 (if also respond in wave 1)}}$$

Such longitudinal response rates, for those who successfully took part at the first wave, are useful in that they can indicate the success of panel maintenance strategies over time. They show the proportion of remaining *eligible* wave 1 respondents who gave an interview in every wave up to and including the current wave.[37]

[37] Take care to note that inclusion in the denominator in wave 3 only depends on being eligible in all waves and having taken part in wave 1. Prior response is defined here to be response in wave 1 only: inclusion does *not* depend on the outcome status in wave 2. This rate is analogous to the cumulative attrition rate presented by Nathan (1999).

8 REFERENCES

Banks, J., Breeze, E., Lessof, C. and Nazroo, J. (eds) (2006), *Retirement, Health and Relationships of the Older Population in England: The 2004 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies.

Banks, J., Breeze, E., Lessof, C. and Nazroo, J. (eds) (2008), *Living in the 21st century: older people in England: The 2006 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies.

Biemer, P. P. and Christ, S. (2008), 'Weighting survey data' in E.D. De Leeuw, J.J. Hox and D.A. Dillman (eds) *International Handbook of Survey Methodology*, United States: John Wiley & Sons.

Biemer, P. P. and Lyberg, L. (2003), *Introduction to Survey Quality*, London: The Institute for Fiscal Studies.

Brook, R. H., Chassin, M. R., Fink, A., Solomon, D. H., Kosecoff, J. and Park, R. E. (1986), 'A method for the detailed assessment of the appropriateness of medical technologies', *International Journal of Technology Assessment in Health Care*, 2: 53-63.

Cheshire, H., Cox, K., Lessof, C. and Taylor, R. (2006), 'Methodology' in J. Banks, E. Breeze, C. Lessof and J. Nazroo (eds) *Retirement, Health and Relationships of the Older Population in England: The 2004 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies.

Erens, B. and Primatesta, P. (eds) (1999), *Health Survey for England 1998, Vol. 2: Methodology and Documentation*, London: The Stationery Office.

Erens, B., Primatesta, P. and Prior, G. (eds) (2001), *Health Survey for England. The Health of Minority Ethnic Groups 1999, Vol. 2: Methodology and Documentation*, London: The Stationery Office.

Huppert, F. A., Gardener, E. and McWilliams, B. (2006), 'Cognitive function' in J. Banks, E. Breeze, C. Lessof and J. Nazroo (eds) *Retirement, Health and Relationships of the Older Population in England: The 2004 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies.

Laurie, H., Smith, R. and Scott, L. (1999), 'Strategies for reducing nonresponse in a longitudinal panel survey', *Journal of Official Statistics*, 15(2): 269-282.

Lepkowski, J., Kalton, G. and Kazprsyk, D. (1989), 'Weighting adjustments for partial non-response in the 1984 SIPP panel', *Proceedings of the Section on Survey Methods Research, American Statistical Association*.

Lynn, P. (2008), 'Nonresponse' in E.D. De Leeuw, J.J. Hox and D.A. Dillman (eds) *International Handbook of Survey Methodology*, United States: John Wiley & Sons.

Lynn P (2005), *Outcome Categories and Definitions of Response Rates for Panel Surveys and Other Surveys involving Multiple Data Collection Events from the Same Units.* Unpublished manuscript. Colchester: University of Essex.

Lynn, P., Buck N., Burton, J., Jäckie, A., Laurie, H. (December 2005), 'A Review of Methodological Research Pertinent to Longitudinal Survey Design and Data Collection', *Working Papers of the Institute for Social and Economic Research*, paper 2005-29. Colchester: University of Essex.

Marmot, M., Banks, J., Blundell, R., Lessof, C. and Nazroo, J. (eds) (2003), *Health, Wealth and Lifestyles of the Older Population in England: The 2002 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies (www.ifs.org/uk/elsa/report_wave1.html).

Melzer, D., Gardener, E., Lang, I., McWilliams, B. and Guralnik, J. M. (2006), 'Measured physical performance' in J. Banks, E. Breeze, C. Lessof and J. Nazroo (eds) *Retirement, Health and Relationships of the Older Population in England: The 2004 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies.

Nathan, G. (1999), *A Review of Sample Attrition and Representativeness in Three Longitudinal Survey*s, London: Government Statistical Service.

Office of the Deputy Prime Minister (2004), *The English Indices of Deprivation 2004* (revised), London: ODPM Publications.

Prior, G., Deverill, C., Malbut, K. and Primatesta, P. (eds) (2003), *Health Survey for England 2001, Methodology and Documentation*, London: The Stationery Office.

Ryff, C. D. and Keyes, C. L. M. (1995), 'The structure of psychological well-being revisited', *Journal of Personality and Social Psychology*, 69: 719-727.

Skinner, C. and de Toledo Vieira, M. (2007), 'Variance estimation in the analysis of clustered longitudinal survey data', *Survey Methodology*, 33: 3-12.

Sproston, K. and Primatesta, P. (2004), *Health Survey for England 2003, Vol.3 : Methodology and Documentation*, London: The Stationery Office.

Steel, N., Maisey, S. and Cox, K. (2006), 'Quality of healthcare' in J. Banks, E. Breeze, C. Lessof and J. Nazroo (eds) *Retirement, Health and Relationships of the Older Population in England: The 2004 English Longitudinal Study of Ageing*, London: The Institute for Fiscal Studies.

Taylor, R., Conway, L., Calderwood, L., Lessof, C., Cheshire, H., Cox, K. and Scholes, S. (2007), *Health, Wealth and Lifestyles of the Older Population in England: The 2002 English Longitudinal Study of Ageing, Technical Report*, London: National Centre for Social Research.

Taylor, M. F. (ed) with J. Brice, N. Buck and E. Prentice-Lane (2008), *British Household Panel Survey User Manual Volume A: Introduction, Technical Report and Appendices*, Colchester: University of Essex.

Uhrig, S. C. Noah. (2008), 'The nature and causes of attrition in the British Household Panel Survey', *Working Papers of the Institute for Social and Economic Research*, paper 2008-05. Colchester: University of Essex.

Vandecasteele, L. and Debels, A. (2007), 'Attrition in panel data: the effectiveness of weighting', *European Sociological Review*, vol. 23, no. 1, pp.81-97.

Appendix A INCOME AND WEALTH ITEM NON-RESPONSE

Section 5.3.2 discussed item non-response within the Income and Assets section of the main interview. Item non-response refers to the failure to obtain information for one or more questions in a survey, given that the other questions are completed. Tables A-1 and A-2 report the percentage of cases that fell into each category of data quality. The missing cases are split into cases where there was no information at all on that variable (missing completely) and cases where the individual had some income or wealth of the relevant type but where there was no information on how much they had (missing, >0).

Apx. Table A-1 Income variable data type

Income variable	Zero	Continuous	Closed band	Open band	Missing, >0	Missing completely
	%	%	%	%	%	%
Wages and salaries (BU)	54.5	40.1	2.5	0.3	1.2	0.1
Private pension (BU)	44.5	49.5	1.7	0.4	2.3	0.2
State pension	42.6	53.7	0.6	0.2	1.4	0.1
Annuity income	95.9	2.1	0.1	0.0	0.1	0.4
Incapacity benefit	93.9	4.2	0.0	0.0	0.2	0.2
Severe disablement allowance	97.6	0.6	0.1	0.0	0.1	0.2
Statutory sick pay	98.2	0.2	0.0	0.0	0.0	0.2
Attendance allowance	94.3	3.5	0.2	0.0	0.4	0.2
Disability living allowance	92.7	5.2	0.1	0.0	0.4	0.2
Industrial injuries allowance	97.5	0.9	0.0	0.0	0.0	0.2
War pension	97.7	0.6	0.0	0.0	0.1	0.2
Carer's allowance	97.2	1.2	0.0	0.0	0.0	0.2
Other health benefits	98.1	0.2	0.0	0.0	0.0	0.2
Income support	96.2	1.6	0.1	0.0	0.2	0.4
Pension credit	92.1	5.4	0.2	0.0	0.5	0.4
Working tax credit	97.5	0.6	0.0	0.0	0.0	0.4
Job seeker's allowance	97.9	0.3	0.0	0.0	0.0	0.4
Guardian's allowance	98.2	0.0	0.0	0.0	0.0	0.4
Widow's pension	97.1	0.9	0.0	0.0	0.1	0.4
Child benefit	96.1	2.1	0.0	0.0	0.0	0.4
Child tax credit	97.2	0.8	0.0	0.0	0.1	0.4
Other benefits	97.7	0.5	0.0	0.0	0.0	0.4
Other income	97.5	0.8	0.0	0.0	0.0	0.3
Take home pay	71.8	26.7	0.6	0.1	0.8	0.0
Net profit (self employment)	95.5	3.1	0.9	0.1	0.5	0.0
Self employment drawings	97.9	1.5	0.0	0.0	0.5	0.0
Odd jobs	96.0	3.7	0.1	0.0	0.2	0.0
Savings income	25.4	43.0	18.7	1.4	8.8	1.3
TESSA income	88.1	4.2	2.4	0.1	2.4	1.4
ISA income	75.4	11.7	3.3	0.4	4.1	1.6
Premium bonds income	85.6	10.5	0.2	0.1	0.9	1.4
National savings income	92.9	2.2	0.9	0.0	1.2	1.4
PEP income	90.8	2.5	1.1	0.1	2.7	1.4
Shares income	70.5	18.0	3.6	0.5	4.6	1.4
Trusts income	92.1	2.4	0.7	0.1	1.9	1.4
Bonds income	90.6	3.9	0.9	0.1	1.7	1.4
Income from other savings	93.7	1.8	0.6	0.1	1.0	1.4
Rental income	95.6	2.2	0.1	0.0	0.3	0.3
Farm income	97.6	0.5	0.0	0.0	0.1	0.3

BU denotes Benefit unit (defined in Section 3.2).

Apx. Table A-2 Wealth variable data type

Wealth variable	Zero	Continuous	Closed band	Open band	Missing, >0	Missing completely
	%	%	%	%	%	%
Savings	8.3	76.3	5.5	1.6	5.6	1.3
TESSAs	84.9	10.1	0.7	0.1	1.5	1.4
Cash ISA	52.7	37.9	1.5	0.3	3.1	1.6
Life insurance ISA	94.7	0.5	0.1	0.0	0.3	1.7
Shares ISA	82.2	10.6	1.4	0.2	1.2	1.6
Premium bonds	60.2	34.8	0.4	0.3	1.6	1.4
National savings	90.8	5.2	0.4	0.1	0.8	1.4
PEPs	81.1	11.5	2.3	0.2	2.2	1.4
Shares	64.8	24.7	3.6	0.5	3.6	1.4
Trusts	86.8	7.1	1.7	0.2	1.6	1.4
Bonds	85.1	9.8	0.9	0.1	1.3	1.4
Other savings	91.6	4.7	0.2	0.1	0.6	1.4
Life insurance (savings component)	87.5	6.4	1.7	0.0	0.9	2.2
Property	88.9	8.3	0.4	0.3	0.4	0.3
Farms	96.6	1.1	0.1	0.2	0.2	0.3
Other physical assets	87.5	9.0	0.9	0.2	0.7	0.3
Primary business wealth	99.6	0.1	0.1	0.0	0.1	0.0
Other business assets	96.8	1.1	0.4	0.1	0.2	1.4
Credit card debt	80.0	16.9	0.5	0.1	0.9	0.4
Other private debt	97.1	1.1	0.0	0.0	0.0	0.4
Other debt	77.7	19.7	0.5	0.1	0.4	0.3
Joint assets	96.1	1.8	0.1	0.1	0.3	0.2
House value	18.9	76.8	2.6	0.7	0.9	0.0
Housing debt	79.2	16.7	1.8	2.3	0.1	0.0

Appendix B MODEL OF RESPONSE TO MAIN INTERVIEW

It is known that certain subgroups in the population are more likely to respond to surveys than others. These groups can end-up over-represented in the sample, which can bias the survey estimates. Where information is available about non-responding individuals, the response behaviour of eligible respondents can be modelled and the results used to generate a non-response weight. This non-response weight is intended to reduce bias in the sample resulting from differential non-response to the longitudinal survey.

Response to wave 2 was modelled using logistic regression, with the dependent variable indicating whether or not the eligible core member responded to the survey. A partial or proxy interview was considered a response. Ineligible core members (known deaths, moves out of Britain and moves into an institution) were not included in the modelling. A number of variables collected from HSE and wave 1 were used to model response. Not all the variables examined were retained for the final model: variables not strongly related to an individual's propensity to respond were dropped from the analysis.

The variables found to be related to response were: (1) whether interviewed in HSE, (2) limiting long-standing illness, (3) social class, (4) Government Office Region, (5) year sampled for HSE, (6) ethnicity, (7) tenure, (8) marital status, (9) educational status, (10) whether a current smoker, and (11) age-by-sex group. The full model is given in Table B-1 below.

The non-response weight was calculated as the inverse of the predicted response probabilities saved from the logistic regression model. The non-response weight was then combined with the wave 1 weight to create the final weight to use with the wave 2 main interview data. The top one per cent of the weight was trimmed before the weight was scaled to the achieved sample size (resulting in the weight for core members taking part in wave 2 being standardised around an average of one). Weight trimming was used to restrict the range of the weights. Trimming non-response weights reduces the variance in the estimates induced by large variation in the weights, but it may also increase the nonsampling biases the weights were intended to reduce (Biemer and Christ, 2008).

Apx. Table B-3 Model of response to main interview

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Whether interviewed in wave 0 (p<0.001)					
Not interviewed (ref)	178	1	-	-	-
Interviewed	10566	2.74	0.46	1.98	3.80
Limiting longstanding illness (p=0.003)					
Limiting LI (ref)	3590	1	-	-	-
Non limiting LI	2397	1.28	0.09	1.11	1.47
No LI	4757	1.11	0.07	0.98	1.25
Social class (p<0.001)					
Managerial & professional (ref)	3395	1	-	-	-
Intermediate	801	1.02	0.12	0.81	1.29
Small employees & own account workers	1310	0.89	0.08	0.74	1.07
Lower supervisory & technical	1490	0.70	0.06	0.59	0.83
Semi-routine	3188	0.72	0.06	0.62	0.84
Other	561	0.46	0.05	0.36	0.58
Government Office Region (p<0.001)					
North East (ref)	663	1	-	-	-
North West	1466	0.89	0.11	0.71	1.13
Yorkshire & The Humber	1124	1.15	0.15	0.90	1.48
East Midlands	1018	1.43	0.19	1.10	1.87
West Midlands	1180	1.05	0.13	0.82	1.35
East of England	1273	1.07	0.14	0.84	1.37
London	1097	0.89	0.12	0.69	1.15
South East	1698	0.89	0.11	0.71	1.13
South West	1226	1.04	0.13	0.81	1.33
Year of HSE selection (p=0.003)					
2001 (ref)	4300	1	-	-	-
1998	4337	0.93	0.05	0.83	1.04
1999	2108	0.78	0.06	0.68	0.90
Ethnicity (p<0.001)					
White (ref)	10424	1	-	-	-
Non-white	320	0.42	0.06	0.32	0.54
Tenure (p<0.001)					
Owners (ref)	8590	1	-	-	-
Renters	1968	0.80	0.06	0.70	0.92
Other	186	0.59	0.10	0.42	0.83
Marital status (p<0.001)					
Single, never married (ref)	593	1	-	-	-
Married, first and only marriage	6043	0.85	0.10	0.67	1.07
Remarried	1178	1.04	0.15	0.79	1.37
Separated/divorced	1124	1.19	0.17	0.90	1.56
Widowed	1806	1.34	0.18	1.02	1.75
Educational status (p<0.001)					
Degree or equivalent (ref)	1194	1	-	-	-
A level/higher education below degree	1854	1.06	0.12	0.85	1.32
O level or other	1708	0.87	0.10	0.69	1.08
CSE or other	1426	0.74	0.09	0.59	0.93
No qualifications	4562	0.63	0.07	0.51	0.77

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Whether current smoker (p=0.008)					
Current smoker (ref)	2046	1	-	-	-
Not a current smoker	8699	1.19	0.08	1.05	1.36
Age in wave 1 & sex (p=0.057)					
Male 50-54 (ref)	1162	1	-	-	-
Male 55-59	944	0.93	0.11	0.73	1.18
Male 60-64	813	0.92	0.12	0.72	1.19
Male 65-69	704	1.11	0.15	0.86	1.45
Male 70-74	575	0.92	0.13	0.70	1.22
Male 75-79	425	0.99	0.16	0.72	1.35
Male 80-84	224	0.84	0.16	0.57	1.23
Male 85+	111	1.00	0.28	0.58	1.73
Female 50-54	1178	1.00	0.12	0.79	1.26
Female 55-59	982	1.00	0.12	0.79	1.27
Female 60-64	850	1.20	0.16	0.93	1.56
Female 65-69	772	1.02	0.13	0.79	1.32
Female 70-74	716	1.07	0.15	0.82	1.40
Female 75-79	610	1.03	0.16	0.76	1.40
Female 80-84	404	0.84	0.14	0.61	1.17
Female 85+	274	0.51	0.10	0.35	0.76

Notes:

1. The response was 1 = individual responding to ELSA wave 2, 0 = non-response. 621 core members known to be ineligible (deaths, moves out of GB and institutional moves) were excluded from the model.
2. Only variables that were significant at the 0.05 level (plus age-by-sex) were included in the model.
3. The data was weighted by the wave 1 weight prior to running the model.
4. The model R^2 was 0.0414.
5. The **Wald** test (quoted in parentheses) measures the impact of the categorical variable on the model with the appropriate number of degrees of freedom. If the test is significant (<0.05) then the categorical variable is considered to be 'significantly associated' with the response variable and therefore included in the model.
6. The **Wald** test for each level of the categorical variable is also shown. This tests the difference between that level and the baseline (reference) category.
7. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicate higher odds, and odds ratios less than 1 indicate lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval does not include 1, this category is significantly different from the reference category.

Table B-2 gives summary information on the wave 2 weight.

Apx. Table B-4 Summary statistics for interview weight

Wave 2 weight (W2WGT)					
Mean:	1.000	**Standard deviation**	.223		
Minimum	.578	**Maximum:**	3.284		
N:	8780				
Percentile	Value	**Percentile**	Value	**Percentile**	Value
10	.781	**20**	.830	**30**	.873
40	.914	**50**	.954	**60**	1.000
70	1.057	**80**	1.139	**90**	1.265
Percentage variance inflation due to weights:				4.95	

Note: An index ('percentage variance inflation due to weights) that gives an approximate measure of the increase in variance of sample means and proportions caused by the variability of the weights (Lepkowski et al., 1989) can be defined as:

$$I = \frac{\sum w_i^2}{\left(\sum w_i\right)^2} \quad where\ w_i\ is\ the\ weight\ for\ case\ i$$

Appendix C MODEL OF RESPONSE TO NURSE VISIT

It is known that certain respondents to the main HSE interview are more likely to respond to the nurse visit stage than others.[38] These groups can end-up over-represented in the achieved nurse visit sample, which can bias the survey estimates.

Information from the wave 2 main interview was available for both respondents and non-respondents to the nurse visit stage. Main interview data was used to model the response behaviour of core members eligible for the nurse visit and the results were used to generate a non-response weight specifically for the nurse data. This non-response weight was intended to reduce bias in the achieved nurse visit sample resulting from differential response to the nurse visit.

Response to the nurse visit was modelled using logistic regression, with the dependent variable indicating whether or not the eligible core member responded to the nurse visit. Only those core members completing a full/partial interview (i.e. non-proxy) were included in the non-response model. A number of variables collected from HSE and ELSA waves 1 and 2 were used to model response. Not all the variables examined were retained for the final model: variables not strongly related to an individual's propensity to respond were dropped from the analysis.

The variables found to be related to response were: (1) age-by-sex group, (2) Government Office Region, (3) social class, (4) self-assessed health, (5) whether a current smoker, (6) frequency of physical activity, and (7) limiting long-standing illness. The full model is given in Table C-1 below.

The non-response weight was calculated as the inverse of the predicted response probabilities saved from the logistic regression model. The non-response weight was then combined with the interview weight to create the final non-response weight to use with the nurse visit data. The top one per cent of the weight was trimmed before the weight was scaled to the achieved sample size (resulting in the weight for core members successfully completing the nurse visit being standardised around an average of one).

[38] Sproston and Primatesta (2004).

Apx. Table C-5 Model of response to nurse visit

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Age in wave 1 & sex (p<0.001)					
Male 50-54 (ref)	420	1	-	-	-
Male 55-59	923	0.87	0.19	0.60	1.28
Male 60-64	669	0.76	0.20	0.51	1.12
Male 65-69	642	1.15	0.21	0.75	1.75
Male 70-74	519	0.94	0.22	0.61	1.44
Male 75-79	420	0.60	0.22	0.39	0.91
Male 80-84	270	0.70	0.24	0.43	1.13
Male 85+	143	0.55	0.28	0.32	0.94
Female 50-54	417	0.94	0.23	0.60	1.48
Female 55-59	951	1.04	0.20	0.70	1.53
Female 60-64	735	0.77	0.20	0.52	1.15
Female 65-69	673	1.08	0.21	0.71	1.65
Female 70-74	588	0.71	0.21	0.48	1.07
Female 75-79	551	0.56	0.20	0.38	0.83
Female 80-84	444	0.58	0.21	0.38	0.88
Female 85+	322	0.69	0.23	0.44	1.09
Government Office Region (p<0.001)					
North East (ref)	539	1	-	-	-
North West	1175	0.6	0.11	0.43	0.85
Yorkshire and The Humber	908	0.76	0.14	0.53	1.09
East Midlands	822	0.85	0.16	0.59	1.23
West Midlands	954	0.69	0.12	0.48	0.98
East of England	1036	0.84	0.16	0.58	1.21
London	871	0.43	0.08	0.31	0.62
South East	1380	0.99	0.18	0.69	1.4
South West	1004	0.85	0.16	0.59	1.21
Social class (p<0.001)					
Managerial & professional (ref)	2753	1	-	-	-
Intermediate	651	1.14	0.15	0.85	1.51
Small employees & own-account workers	1064	1.26	0.12	0.99	1.61
Lower supervisory and technical	1202	1.05	0.11	0.84	1.32
Semi-routine	2572	0.74	0.09	0.63	0.88
Other	446	0.92	0.16	0.68	1.26
Self-assessed health (p<0.001)					
Excellent (ref)	1041	1	-	-	-
Very good	2382	1.07	0.13	0.84	1.38
Good	2731	0.89	0.12	0.69	1.13
Fair	1829	0.62	0.14	0.47	0.81
Poor	706	0.42	0.17	0.30	0.58

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Current smoker (p<0.001)					
Yes (ref)	1382	1	-	-	-
No	7307	1.39	0.09	1.18	1.65
Frequency of physical activity (p=0.005)					
More than once a week (ref)	6630	1	-	-	-
Once a week	903	0.79	0.11	0.64	0.98
One to three times a month	319	0.77	0.17	0.55	1.07
Hardly ever or never	838	0.70	0.11	0.57	0.86
Limiting long-standing illness (p<0.001)					
No limiting long-standing illness (ref)	3750	1	-	-	-
Long-standing illness	1815	1.25	0.09	1.04	1.51
Limiting long-standing illness	3124	1.56	0.09	1.29	1.87

Notes:

1. The response was 1 = individual responding to the nurse visit, 0 = non-response. Only those 8,689 core members completing a full (i.e. non proxy) main interview were included in the model.
2. Only variables that were significant at the 0.05 level were included in the model.
3. The data was weighted by the wave 2 main interview weight prior to running the model.
4. The model R^2 was 0.0407.
5. The **Wald** test (quoted in parentheses) measures the impact of the categorical variable on the model with the appropriate number of degrees of freedom. If the test is significant (<0.05) then the categorical variable is considered to be 'significantly associated' with the response variable and therefore included in the model.
6. The **Wald** test for each level of the categorical variable is also shown. This tests the difference between that level and the baseline (reference) category.
7. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicate higher odds, and odds ratios less than 1 indicate lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval does not include 1, this category is significantly different from the reference category.

Table C-2 gives summary information on the nurse visit weight.

Apx. Table C-6 Summary statistics for nurse visit weight

Nurse visit weight (WT_NURSE)					
Mean:	1.000	**Standard deviation**	.250		
Minimum:	.567	**Maximum:**	3.725		
N:	7666				
Percentile		**Percentile**		**Percentile**	
10	.758	**20**	.811	**30**	.858
40	.903	**50**	.949	**60**	1.001
70	1.064	**80**	1.148	**90**	1.292
Percentage variance inflation due to weights:				6.26	

Appendix D MODEL OF RESPONSE TO BLOOD SAMPLE

It is known that certain respondents to the HSE nurse visit stage are more likely to have a sample of blood taken.[38] These groups can end-up over-represented in the achieved blood sample data, which can bias the survey estimates.

Data available for both respondents and non-respondents to the blood sample stage was used to model the response behaviour of the core members eligible to have a sample of blood taken and the results were used to generate a non-response weight specifically for the blood sample data. This non-response weight was intended to reduce bias in the achieved blood sample data resulting from differential response to this module.

Response to the blood sample was modelled using logistic regression, with the dependent variable indicating whether or not the eligible core member had a sample of blood taken during the nurse visit. Only those core members completing a nurse visit were included in the non-response model. A number of variables collected from HSE and ELSA waves 1 and 2 were used to model response. Not all the variables examined were retained for the final model: variables not strongly related to an individual's propensity to give a blood sample were dropped from the analysis.

The variables found to be related to response were: (1) age-by-sex group, (2) Government Office Region, (3) social class, (4) self-assessed health, (5) whether often troubled with pain, (6) frequency of physical activity, and (7) limiting long-standing illness. The full model is given in Table D-1 below.

The non-response weight was calculated as the inverse of the predicted response probabilities saved from the logistic regression model. The non-response weight was then combined with the nurse visit weight (see Appendix C) to create the final non-response weight to use with the blood sample data. The top one per cent of the weight was trimmed before the weight was scaled to the achieved sample size (resulting in the weight for core members successfully having a sample of blood taken being standardised around an average of one).

Apx. Table D-7 Model of response to blood sample

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Age in wave 1 & sex (p<0.001)					
Male 50-54 (ref)	372	1	-	-	-
Male 55-59	814	0.74	0.19	0.51	1.07
Male 60-64	589	0.92	0.20	0.61	1.37
Male 65-69	566	0.68	0.20	0.46	1.01
Male 70-74	459	0.50	0.20	0.34	0.74
Male 75-79	371	0.59	0.21	0.39	0.88
Male 80-84	238	0.49	0.23	0.31	0.76
Male 85+	126	0.50	0.27	0.30	0.85
Female 50-54	368	0.75	0.22	0.48	1.15
Female 55-59	839	0.84	0.19	0.57	1.22
Female 60-64	648	0.74	0.20	0.50	1.08
Female 65-69	594	0.58	0.20	0.39	0.85
Female 70-74	520	0.55	0.20	0.38	0.82
Female 75-79	486	0.52	0.20	0.35	0.76
Female 80-84	391	0.38	0.20	0.25	0.56
Female 85+	285	0.49	0.22	0.32	0.75
Government Office Region (p<0.001)					
North East (ref)	477	1	-	-	-
North West	1035	0.93	0.15	0.69	1.25
Yorkshire and The Humber	802	0.71	0.16	0.53	0.97
East Midlands	726	0.56	0.15	0.41	0.76
West Midlands	842	0.95	0.16	0.70	1.30
East of England	915	0.68	0.15	0.51	0.92
London	763	0.68	0.16	0.50	0.93
South East	1219	0.83	0.15	0.62	1.12
South West	888	0.71	0.15	0.53	0.96
Social class (p=0.066)					
Managerial & professional (ref)	2433	1	-	-	-
Intermediate	574	0.92	0.12	0.72	1.17
Small employees & own-account workers	940	0.96	0.10	0.79	1.18
Lower supervisory and technical	1061	1.18	0.10	0.97	1.44
Semi-routine	2263	0.87	0.08	0.75	1.01
Other	394	0.82	0.14	0.62	1.08
Self-assessed health (p<0.001)					
Excellent (ref)	920	1	-	-	-
Very good	2105	0.80	0.13	0.62	1.02
Good	2412	0.54	0.13	0.42	0.69
Fair	1612	0.44	0.14	0.33	0.57
Poor	617	0.33	0.16	0.24	0.45

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Whether often troubled with pain (p=0.038)					
Yes (ref)	2942	1	-	-	-
No	4724	0.86	0.07	0.75	0.99
Frequency of physical activity (p<0.001)					
More than once a week (ref)	5855	1	-	-	-
Once a week	796	1.14	0.10	0.94	1.40
One to three times a month	280	0.94	0.16	0.69	1.28
Hardly ever or never	735	0.66	0.10	0.55	0.80
Limiting long-standing illness (p=0.004)					
No limiting long-standing illness (ref)	3311	1	-	-	-
Long-standing illness	1602	0.95	0.09	0.80	1.12
Limiting long-standing illness	2752	0.75	0.08	0.64	0.89

Notes:

1. The response was 1 = individual having a sample of blood taken, 0 = non-response. Only those 7,666 core members completing the nurse visit were included in the model.
2. Only variables that were significant at the 0.05 level were included in the model.
3. The data was weighted by the wave 2 nurse visit weight prior to running the model.
4. The model R^2 was 0.0476.
5. The **Wald** test (quoted in parentheses) measures the impact of the categorical variable on the model with the appropriate number of degrees of freedom. If the test is significant (<0.05) then the categorical variable is considered to be 'significantly associated' with the response variable and therefore included in the model.
6. The **Wald** test for each level of the categorical variable is also shown. This tests the difference between that level and the baseline (reference) category.
7. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicate higher odds, and odds ratios less than 1 indicate lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval does not include 1, this category is significantly different from the reference category.

Table D-2 gives summary information on the blood sample weight.

Apx. Table D-8 Summary statistics for blood sample weight

Blood sample weight (WT_BLOOD)					
Mean:	1.000	**Standard deviation**	.295		
Minimum	.540	**Maximum:**	4.244		
N:	6231				
Percentile		**Percentile**		**Percentile**	
10	.720	**20**	.782	**30**	.836
40	.885	**50**	.936	**60**	.997
70	1.064	**80**	1.162	**90**	1.331
Percentage variance inflation due to weights:				8.69	

Appendix E MODEL OF RESPONSE TO SELF-COMPLETION QUESTIONNAIRE

Data available for both respondents and non-respondents was used to model the response behaviour of core members eligible to fill in the self-completion paper questionnaire and the results were used to generate a non-response weight specifically for the variables collected in this module. This non-response weight was intended to reduce bias in the achieved self-completion data resulting from differential non-response.

Response to the self-completion questionnaire was modelled using logistic regression, with the dependent variable indicating whether or not the eligible core member returned the self-completion questionnaire. Only those core members completing a full (i.e. non-proxy) main interview were included in the non-response model. A number of variables collected from both HSE and ELSA waves 1 and 2 were used to model response. Not all the variables examined were retained for the final model: variables not strongly related to an individual's propensity to return the self-completion questionnaire were dropped from the analysis.

The variables found to be related to response were: (1) sex, (2) age-group, (3) marital status, (4) living child arrangements, (5) Index of Multiple Deprivation quintiles (IMD 2004), (6) ethnicity, (7) financial unit type, (8) tenure, (9) educational status, (10) income quintile, (11) current activity status and (12) self-reported eyesight. The full model is given in Table E-1 below.

The non-response weight was calculated as the inverse of the predicted response probabilities saved from the logistic regression model. The non-response weight was then combined with the main interview weight (see Appendix B) to create the final non-response weight to use with the self-completion data. The top one per cent of the weight was trimmed before the weight was scaled to the achieved sample size (resulting in the weight for core members successfully returning the questionnaire being standardised around an average of one).

Apx. Table E-9 Model of response in wave 2 (self-completion)

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Sex (p=0.005)					
Male (ref)	4006	1	-	-	-
Female	4682	1.27	0.08	1.08	1.49
Age in wave 1 (p<0.001)					
50-54 (ref)	1908	1	-	-	-
55-59	1564	1.13	0.13	0.88	1.47
60-64	1351	1.09	0.16	0.80	1.49
65-69	1200	0.92	0.17	0.66	1.30
70-74	1046	0.70	0.18	0.49	0.98
75-79	838	0.46	0.18	0.33	0.66
80-84	500	0.35	0.19	0.24	0.52
85+	282	0.31	0.21	0.20	0.47
Marital status (p=0.006)					
Single, never married (ref)	472	1	-	-	-
Married, first and only marriage	4791	1.59	0.25	0.97	2.60
Remarried	896	1.71	0.28	1.00	2.95
Separated/Divorced	897	0.91	0.19	0.63	1.32
Widowed	1632	1.38	0.18	0.96	1.96
Living child (p=0.021)					
Has children, lives with one or more (ref)	1622	1	-	-	-
Has children, does not live with them	6038	1.34	0.10	1.10	1.64
Does not have children	1028	1.16	0.15	0.86	1.57
Index of Multiple Deprivation 2004 (p<0.001)					
Least deprived (ref)	1994	1	-	-	-
2	2023	0.63	0.13	0.49	0.82
3	1768	0.51	0.13	0.39	0.66
4	1627	0.48	0.13	0.37	0.62
Most deprived	1276	0.55	0.14	0.42	0.72
Ethnic group (p<0.001)					
White (ref)	8443	1	-	-	-
Non-white	245	0.17	0.15	0.13	0.23
Financial unit type (p=0.017)					
Single (ref)	2787	1	-	-	-
Couple but separate finances	906	1.61	0.22	1.04	2.51
Couple joint finances	4996	1.83	0.21	1.22	2.74
Tenure (p=0.068)					
Own outright (ref)	5214	1	-	-	-
Mortgage	1771	0.97	0.11	0.78	1.21
Renting	1703	0.79	0.09	0.66	0.95
Education status (p<0.001)					
Degree or equivalent (ref)	975	1	-	-	-
A level/higher education below degree	1506	0.90	0.17	0.65	1.25
O level or other	1396	1.00	0.17	0.71	1.41
CSE or other	1160	0.92	0.18	0.65	1.30
No qualifications	3651	0.60	0.15	0.45	0.81

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Income quintile (p=0.001)					
1 (ref)	1772	1	-	-	-
2	1735	1.00	0.11	0.81	1.24
3	1712	1.02	0.11	0.82	1.26
4	1676	1.15	0.13	0.90	1.48
5	1662	0.90	0.14	0.69	1.18
Missing	132	0.34	0.27	0.20	0.57
Activity status (p=0.001)					
Retired/semi-retired (ref)	4633	1	-	-	-
Employed	2182	0.67	0.14	0.51	0.89
Self-employed	474	0.51	0.19	0.35	0.73
Permanently sick or disabled	507	0.64	0.15	0.47	0.86
Looking after home or family	893	0.92	0.14	0.70	1.21
Self-reported eyesight (p<0.001)					
Excellent (ref)	1185	1	-	-	-
Very good	2805	1.19	0.13	0.92	1.54
Good	3436	0.95	0.12	0.75	1.21
Fair	973	0.94	0.15	0.71	1.26
Poor	290	0.31	0.18	0.22	0.44

Notes:

1. The response was 1 = individual having returned the self-completion questionnaire, 0 = non-response. Only those 8,688 core members completing a full main interview were included in the model.
2. Only variables that were significant at the 0.05 level were included in the model.
3. The data was weighted by the wave 2 main interview weight prior to running the model.
4. The model R^2 was 0.1255.
5. The **Wald** test (quoted in parentheses) measures the impact of the categorical variable on the model with the appropriate number of degrees of freedom. If the test is significant (<0.05) then the categorical variable is considered to be 'significantly associated' with the response variable and therefore included in the model.
6. The **Wald** test for each level of the categorical variable is also shown. This tests the difference between that level and the baseline (reference) category.
7. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicate higher odds, and odds ratios less than 1 indicate lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval does not include 1, this category is significantly different from the reference category.

Table E-2 gives summary information on the self-completion weight.

Apx. Table E-10 Summary statistics for self-completion weight

Self-completion weight (SCW2WGT)					
Mean:	1.000	**Standard deviation**	.266		
Minimum	.569	**Maximum:**	4.147		
N:	7803				
Percentile		**Percentile**		**Percentile**	
10	.751	**20**	.803	**30**	.851
40	.896	**50**	.943	**60**	.993
70	1.060	**80**	1.153	**90**	1.299
Percentage variance inflation due to weights:				7.09	

Appendix F KEY ELSA ESTIMATES

Effect of the weights on key estimates

It is recommended that analysis be conducted on weighted data. The extent of the effect that the weights had on the data is likely to differ by each data item and each survey estimate. Key estimates from across the range of topics covered in the wave 2 study have been identified to illustrate the effects of the weighting.

The effect of weighting on key estimates is illustrated in Tables F-1 to F-5 by comparing unweighted and weighted estimates. Column 3 shows the size of the sample on which it is based. Column 4 shows the weighted sample size, Columns 5 and 6 show the unweighted and weighted estimates respectively.

Note that the focus here is on cross-sectional (rather than longitudinal) estimates. Estimates using variables collected in the main interview were calculated on data weighted by the interview weight; those using variables collected in the nurse visit were calculated on data weighted by the nurse visit weight. Estimates obtained from the blood sample data were calculated on data weighted by the blood sample weight and those using variables collected in the self-completion questionnaire were calculated on data weighted by the self-completion weight. All estimates were computed on core members only.

Estimating complex sample errors

All sample estimates are subject to sampling error. Sampling error is the error in a sample estimate (i.e. the difference between the estimate and the 'true' population value) that is due to the selection of only a subset of the total population rather than the entire population (Biemer and Lyberg, 2003). The usual measure of sampling error is the sampling variance. The variance of an estimator contains information regarding how close the estimator is to the true population value. The square root of the sampling variance of an estimator is the standard error of the estimator.

There are two aspects of sample design that impact on standard errors: clustering and stratification.[39] The HSE 1998, 1999 and 2001 samples that provided the sampling frame for ELSA (see Section 2.1) were clustered according to a stratified multi-stage design. First, postcode sectors were selected from the Postcode Address File (postcode sectors contain an average of 2,500 households). Postcode sectors were stratified by health authority and the proportion of households in the non-manual socio-economic groups. Sectors were then selected with probability proportional to their size, measured by delivery point count.

The stratification of postcode sectors was designed to ensure that specified subgroups were adequately represented, ensuring an increase in the precision of estimates relative to a

[39] The focus here is on estimating survey sampling variance in the case of cluster sampling. It is natural for many analysts to use an alternative approach and represent clustering via multilevel models. For a discussion of variance estimation in the analysis of clustered longitudinal survey data see Skinner and de Toledo Vieira (2007).

simple random sample selection. Geographically clustering the sample was done in order to reduce field costs by locating the sample in tightly defined areas. In the opposite direction to stratification, clustering can have the effect of inflating the standard error of estimates if there is a geographical clustering of population characteristics of interest. For example, estimates of tenure type have an inflated standard error (or a decrease in precision) when based on a clustered sample compared with estimates based on an equivalently sized simple random sample since housing tenure is highly geographically clustered. The effect of clustering on estimates of standard errors is dependent on how homogeneous the characteristic of interest is within postcode sectors and the degree to which it varies between postcode sectors (Taylor et al., 2008).

The complex sample design of surveys may be assessed relative to simple random sampling (srs) by calculating a range of design factors ('DEFT') associated with it, where:

$$DEFT = \sqrt{\frac{Variance\ of\ \ estimator\ with\ complex\ design, sample\ size\ n}{Variance\ of\ estimator\ with\ srs\ design, sample\ size\ n}}$$

and represents the multiplying factor to be applied to the simple random sampling error to produce its complex sample design equivalent. A design factor of one means that the complex sample design has achieved the same precision as a simple random sample of the same size. A design factor greater than one means the complex sample has attained less precision than its simple random sample equivalent.

Tables F-1 to F-5 show the complex standard errors (i.e. accounting for the clustering and stratification) and design factors associated with each estimate. Column 7 shows the estimated 'true' standard error, column 8 the 95% confidence interval for the estimate, and the final column shows the estimated design factor. Note that both the 'true' standard errors and design factors are themselves subject to random sampling error. All estimates were computed using STATA.

For longitudinal surveys, the loss in precision incurred as a result of initially selecting a clustered sample will lessen at each successive wave as the sample units move location causing de-clustering of the sample (Lynn et al., 2005). In this analysis the clustering variable was taken to be the postcode sector of the wave 2 interview address. In total, 2,028 postcode sectors were covered by the achieved wave 2 sample (average number of respondents 4.6, minimum 1, maximum 22). The stratification variable was created by grouping the postcode sectors into 95 stratification cells based on the 'old' Regional Health Authority classification for England.

Apx. Table F-11 True standard errors (SE) and 95% confidence intervals for socio-economic variables

	Characteristic	Col.3. N Unwtd	Col.4. N Wtd	Col.5. Estimate Unwtd (%)	Col.6. Estimate Wtd	Col.7. True SE	Col.8. 95% CI	Col.9. DEFT
Men	**Age-group**							
	52-54	3950	4047	8.8	10.4	0.5	9.4-11.5	1.11
	55-59	3950	4047	21.5	22.9	0.7	21.6-24.3	1.06
	60-64	3950	4047	16.9	16.6	0.6	15.4-17.8	1.03
	65-69	3950	4047	16.7	15.9	0.6	14.8-17.1	0.99
	70-74	3950	4047	14.3	13.0	0.5	12.0-14.0	0.97
	75-79	3950	4047	10.9	10.5	0.5	9.5-11.4	0.99
	80+	3950	4047	10.9	10.6	0.5	9.6-11.5	0.99
	Legal marital status							
	Single, never married	3950	4047	5.8	6.4	0.4	5.6-7.3	1.12
	Married (first and only)	3950	4047	62.8	62.7	0.8	61.1-64.3	1.05
	Remarried	3950	4047	12.6	12.4	0.5	11.3-13.4	1.00
	Separated/Divorced	3950	4047	8.8	9.1	0.5	8.2-10.1	1.04
	Widowed	3950	4047	9.9	9.4	0.5	8.5-10.4	1.00
	Ethnicity							
	White	3948	4045	97.4	96.6	0.3	95.9-97.3	1.21
	Non-white	3948	4045	2.6	3.4	0.3	2.7-4.1	1.21
	Highest educational qualification (HSE)							
	Degree or equivalent	3878	3952	16.0	14.9	0.6	13.7-16.1	1.04
	A level/Higher education below degree	3878	3952	21.5	20.3	0.6	19.1-21.6	0.99
	O level or other	3878	3952	14.9	14.7	0.6	13.5-15.8	1.02
	CSE or other	3878	3952	12.6	12.7	0.6	11.6-13.8	1.05
	No qualifications	3878	3952	35.0	37.4	0.9	35.7-39.1	1.10
Women	**Age-group**							
	52-54	4830	4733	8.2	8.8	0.4	8.0-9.7	1.05
	55-59	4830	4733	20.7	20.2	0.6	19.0-21.3	1.00
	60-64	4830	4733	16.8	15.6	0.5	14.6-16.6	1.00
	65-69	4830	4733	15.3	14.2	0.5	13.2-15.2	1.00
	70-74	4830	4733	13.4	12.5	0.5	11.6-13.5	0.99
	75-79	4830	4733	11.3	11.8	0.5	10.9-12.8	1.05
	80+	4830	4733	14.3	16.8	0.6	15.6-18.0	1.12
	Legal marital status							
	Single, never married	4829	4732	4.6	4.6	0.3	4.0-5.2	1.06
	Married (first and only)	4829	4732	48.3	48.6	0.8	47.2-50.1	1.05
	Remarried	4829	4732	8.8	8.5	0.4	7.8-9.3	1.00
	Separated/Divorced	4829	4732	12.1	11.2	0.5	10.3-12.1	1.02
	Widowed	4829	4732	26.1	27.0	0.7	25.7-28.3	1.07
	Ethnicity							
	White	4828	4731	97.9	97.5	0.3	97.0-98.0	1.18
	Non-white	4828	4731	2.1	2.5	0.3	2.0-3.0	1.18
	Highest educational qualification (HSE)							
	Degree or equivalent	4796	4692	8.3	7.4	0.4	6.6-8.2	1.07
	A level/Higher education below degree	4796	4692	15.0	13.8	0.5	12.8-14.8	1.02
	O level or other	4796	4692	18.0	16.9	0.6	15.9-18.0	1.02
	CSE or other	4796	4692	13.0	12.8	0.5	11.8-13.8	1.01
	No qualifications	4796	4692	45.7	49.0	0.8	47.5-50.6	1.11

Table F-1 continued

	Characteristic	Col.3. N Unwtd	Col.4. N Wtd	Col.5. Estimate Unwtd (%)	Col.6. Estimate Wtd	Col.7. True SE	Col.8. 95% CI	Col.9. DEFT
Men	**Tenure**							
	Own outright	3945	4042	61.2	58.7	0.8	57.1-60.3	1.05
	Buy with mortgage	3945	4042	22.4	23.4	0.7	22.0-24.7	1.04
	Rent	3945	4042	15.0	16.5	0.7	15.2-17.8	1.15
	Other	3945	4042	1.4	1.4	0.2	1.1-1.8	1.05
	Employment status							
	Retired/Semi-retired	3937	4032	56.7	54.0	0.8	52.4-55.6	1.03
	Employed	3937	4032	34.1	36.1	0.8	34.5-37.6	1.03
	Looking after home	3937	4032	1.5	1.6	0.2	1.2-2.0	1.04
	Permanently sick/disabled	3937	4032	6.7	7.3	0.4	6.4-8.1	1.09
	Unemployed	3937	4032	1.0	1.1	0.2	0.8-1.5	1.08
	Region							
	North East	3946	4042	6.2	5.9	0.5	5.0-6.9	1.23
	North West	3946	4042	13.0	13.5	0.7	12.2-14.8	1.22
	Yorkshire & The Humber	3946	4042	11.1	10.6	0.6	9.5-11.8	1.18
	East Midlands	3946	4042	10.7	10.1	0.6	8.9-11.2	1.22
	West Midlands	3946	4042	10.8	11.0	0.6	9.8-12.2	1.24
	East of England	3946	4042	12.1	12.1	0.6	10.9-13.4	1.24
	London	3946	4042	8.7	9.6	0.5	8.6-10.7	1.15
	South East	3946	4042	15.6	15.3	0.7	14.0-16.6	1.16
	South West	3946	4042	11.9	11.7	0.6	10.5-12.9	1.20
Women	**Tenure**							
	Own outright	4818	4722	62.5	60.8	0.8	59.3-62.3	1.09
	Buy with mortgage	4818	4722	17.8	17.8	0.6	16.7-18.9	1.02
	Rent	4818	4722	18.2	19.8	0.7	18.5-21.1	1.15
	Other	4818	4722	1.5	1.6	0.2	1.2-2.0	1.07
	Employment status							
	Retired/Semi-retired	4817	4721	52.8	52.6	0.8	51.0-54.1	1.09
	Employed	4817	4721	24.4	24.1	0.6	22.8-25.3	1.04
	Looking after home	4817	4721	17.4	17.7	0.6	16.5-18.9	1.10
	Permanently sick/disabled	4817	4721	4.9	5.1	0.3	4.5-5.8	1.06
	Unemployed	4817	4721	0.5	0.6	0.1	0.4-0.8	1.06
	Region							
	North East	4824	4727	6.7	6.4	0.4	5.6-7.2	1.20
	North West	4824	4727	13.0	13.7	0.6	12.5-15.0	1.27
	Yorkshire & The Humber	4824	4727	10.9	10.3	0.5	9.3-11.3	1.14
	East Midlands	4824	4727	10.0	9.0	0.5	8.1-10.0	1.23
	West Midlands	4824	4727	10.7	10.9	0.6	9.8-12.1	1.29
	East of England	4824	4727	11.6	11.7	0.6	10.5-12.9	1.32
	London	4824	4727	9.5	10.3	0.6	9.2-11.5	1.33
	South East	4824	4727	16.1	16.0	0.6	14.8-17.2	1.13
	South West	4824	4727	11.6	11.5	0.6	10.4-12.6	1.27

Apx. Table F-12 True standard errors (SE) and 95% confidence intervals for self-completion variables

	Characteristic	Col.3. N Unwtd	Col.4. N Wtd	Col.5. Estimate Unwtd (%)	Col.6. Estimate Wtd	Col.7. True SE	Col.8. 95% CI	Col.9. DEFT
Men	Reads daily newspaper	3451	3537	72.1	71.6	0.8	70.0-73.2	1.05
	Has hobby or pastime	3451	3537	73.9	72.2	0.8	70.6-73.8	1.06
	Taken a holiday in UK in last 12 months	3451	3537	57.7	55.7	0.9	54.0-57.5	1.05
	Taken a holiday abroad in last 12 months	3451	3537	49.9	48.2	0.9	46.5-49.9	1.02
	Gone on a daytrip or outing in last 12 months	3451	3537	61.8	60.2	0.9	58.5-62.0	1.06
	Uses the internet/email	3451	3537	44.7	43.0	0.9	41.2-44.8	1.07
	Owns a mobile phone	3451	3537	67.3	66.1	0.8	64.5-67.7	1.03
Women	Reads daily newspaper	4198	4105	64.2	63.9	0.8	62.3-65.4	1.06
	Has hobby or pastime	4198	4105	70.2	67.8	0.8	66.3-69.3	1.09
	Taken a holiday in UK in last 12 months	4198	4105	58.3	56.0	0.8	54.5-57.6	1.06
	Taken a holiday abroad in last 12 months	4198	4105	48.4	45.5	0.8	43.9-47.2	1.08
	Gone on a daytrip or outing in last 12 months	4198	4105	66.8	64.5	0.8	62.9-66.1	1.09
	Uses the internet/email	4198	4105	32.6	30.1	0.7	28.7-31.6	1.03
	Owns a mobile phone	4198	4105	67.9	64.5	0.8	62.9-66.1	1.11

Apx. Table F-13 True standard errors (SE) and 95% confidence intervals for self-reported memory status

	Characteristic	Col.3. N Unwtd	Col.4. N Wtd	Col.5. Estimate Unwtd (%)	Col.6. Estimate Wtd	Col.7. True SE	Col.8. 95% CI	Col.9. DEFT
Men	Excellent	3879	3970	3.8	3.9	0.3	3.3-4.5	1.03
	Very good	3879	3970	18.1	18.1	0.6	16.8-19.4	1.05
	Good	3879	3970	40.4	40.0	0.8	38.4-41.6	1.03
	Fair	3879	3970	29.4	29.7	0.7	28.3-31.2	1.01
	Poor	3879	3970	8.4	8.3	0.5	7.4-9.2	1.04
Women	Excellent	4765	4657	2.7	2.7	0.2	2.2-3.2	1.01
	Very good	4765	4657	18.6	18.7	0.6	17.6-19.9	1.03
	Good	4765	4657	45.3	44.9	0.7	43.4-46.3	1.03
	Fair	4765	4657	27.6	27.6	0.7	26.3-28.9	1.05
	Poor	4765	4657	5.8	6.1	0.4	5.4-6.8	1.09

Apx. Table F-14 True standard errors (SE) and 95% confidence intervals for self-assessed health, number of falls in last 12 months, mean Body Mass Index (BMI) and BMI status

	Characteristic	Col.3. N Unwtd	Col.4. N Wtd	Col.5. Estimate Unwtd (%)	Col.6. Estimate Wtd	Col.7. True SE	Col.8. 95% CI	Col.9. DEFT
Men	**Self-assessed health**							
	Excellent	3902	3995	12.4	12.3	0.5	11.3-13.4	1.02
	Very good	3902	3995	26.9	26.8	0.7	25.3-28.2	1.05
	Good	3902	3995	32.2	31.9	0.8	30.4-33.4	1.01
	Fair	3902	3995	20.4	20.6	0.7	19.3-22.0	1.05
	Poor	3902	3995	8.1	8.4	0.5	7.4-9.3	1.08
	Number of falls in last two years (aged 60+)							
	0	2702	2644	74.1	74.0	0.9	72.3-75.7	1.01
	1	2702	2644	13.2	13.3	0.7	12.0-14.6	1.01
	2	2702	2644	5.6	5.6	0.4	4.7-6.4	0.99
	3+	2702	2644	7.0	7.2	0.5	6.1-8.2	1.07
	Mean BMI	3235	3312	27.8	27.8	0.08	27.7-28.0	1.08
	BMI status							
	Underweight	3235	3312	0.6	0.6	0.1	0.3-0.9	1.00
	Desirable	3235	3312	23.6	23.8	0.8	22.2-25.3	1.04
	Overweight	3235	3312	49.4	48.8	0.9	47.0-50.6	1.04
	Obese	3235	3312	26.4	26.8	0.8	25.2-28.5	1.06
Women	**Self-assessed health**							
	Excellent	4780	4673	12.1	11.7	0.5	10.8-12.6	0.99
	Very good	4780	4673	28.1	28.0	0.7	26.7-29.4	1.06
	Good	4780	4673	31.3	30.9	0.7	29.5-32.3	1.04
	Fair	4780	4673	20.9	21.5	0.6	20.2-22.7	1.07
	Poor	4780	4673	7.6	7.9	0.4	7.1-8.8	1.08
	Number of falls in last two years (aged 60+)							
	0	3371	3292	61.9	61.3	0.9	59.6-63.0	1.03
	1	3371	3292	20.6	20.8	0.7	19.3-22.2	1.06
	2	3371	3292	8.6	8.7	0.5	7.8-9.7	1.02
	3+	3371	3292	8.8	9.2	0.5	8.2-10.2	1.03
	Mean BMI	3958	3844	28.0	28.0	0.09	27.8-28.1	1.03
	BMI status							
	Underweight	3958	3844	1.1	1.1	0.2	0.8-1.5	1.11
	Desirable	3958	3844	29.8	29.9	0.8	28.4-31.3	1.04
	Overweight	3958	3844	38.4	38.4	0.8	36.8-39.9	1.02
	Obese	3958	3844	30.7	30.6	0.8	29.1-32.1	1.03

Apx. Table F-15 True standard errors (SE) and 95% confidence intervals for mean systolic and diastolic blood pressure, mean total cholesterol and mean fibrinogen levels

	Characteristic	Col.3. N Unwtd	Col.4. N Wtd	Col.5. Estimate Unwtd (%)	Col.6. Estimate Wtd	Col.7. True SE	Col.8. 95% CI	Col.9. DEFT
Men	**Mean systolic BP**	2956	3014	136.0	135.9	0.33	135.2-136.5	1.01
	Mean diastolic BP	2956	3014	75.7	75.8	0.22	75.4-76.2	1.02
	Mean total cholesterol	2688	2713	5.6	5.6	0.02	5.5-5.6	1.07
	% 5.0 mmol/l chol	2688	2713	70.5	69.7	0.9	67.9-71.6	1.06
	Mean fibrinogen	2686	2715	3.2	3.2	0.02	3.16-3.22	1.08
Women	**Mean systolic BP**	3668	3561	134.8	135.1	0.36	134.4-135.8	1.06
	Mean diastolic BP	3668	3561	74.4	74.1	0.19	73.8-74.5	1.03
	Mean total cholesterol	3199	3167	6.2	6.1	0.02	6.1-6.2	1.07
	% 5.0 mmol/l chol	3199	3167	85.0	84.0	0.7	82.6-85.5	1.13
	Mean fibrinogen	3180	3147	3.3	3.3	0.01	3.29-3.34	1.09