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Living in the 21st century: older people in England The 2006 English Longitudinal Study of Ageing

Technical Report

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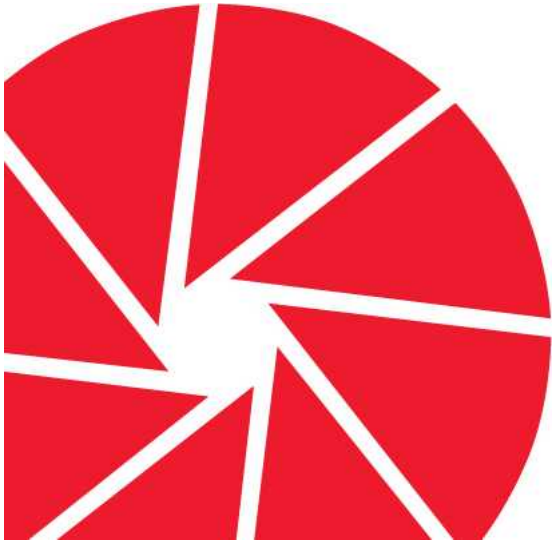
Draft report



Contents

List of Tables

List of Figures

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1 INTRODUCTION

The third wave of the English Longitudinal Study of Ageing (ELSA) was collected in 2006-07; by now we have up to eight years of data tracking the health, wealth and social characteristics of people aged 50 and over in England. 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), Department for Communities and Local Government and Office for National Statistics. Ethical approval was granted by the Multi-centre Research and Ethics Committee (MREC).

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 policy development. 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 sample for the first wave of ELSA (2002-03) was drawn from households who had previously responded to the Health Survey for England (HSE) in 1998, 1999, and 2001. All those who were recruited for the first wave or have since become partners of such people are known as Cohort 1. Detailed eligibility criteria are provided in Chapter 2. In brief, the majority of those aged 50 and over (age-eligible ‘sample members’ born before 1 March 1952) 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 (born after 29 February 1952). Partners of sample members who had joined the household since the HSE 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 residential addresses in England during the fieldwork period (March 2002 to March 2003). 11,391 age-eligible sample members successfully interviewed in wave 1 were later renamed 'Cohort 1 core members'. 636 interviews were conducted with young partners, 72 with new partners.

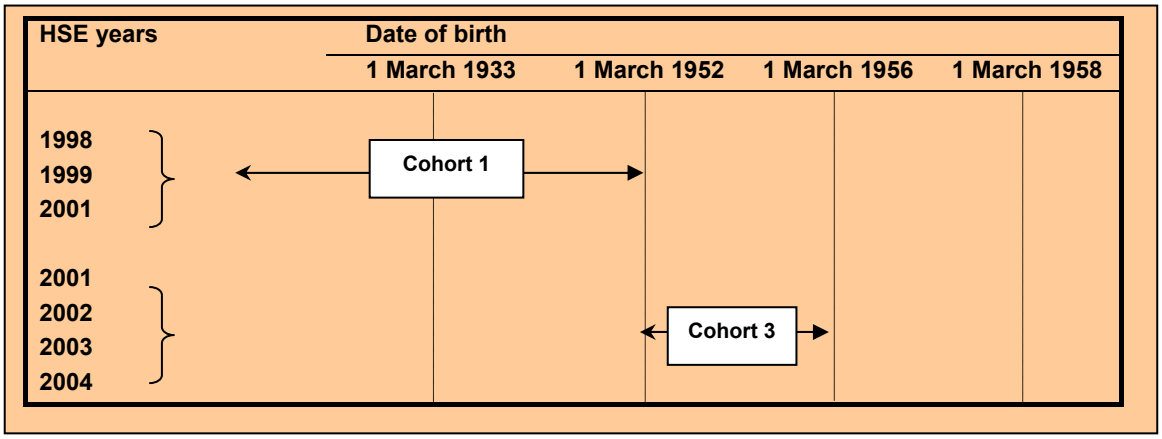
Respondents in wave 1 represented the baseline and were approached two years later for wave 2 (2004-05), with a nurse visit in addition to the face-to-face interview and self-completion questionnaire.[2] 9,433 main interviews were conducted in wave 2. 8,781 interviews (93% of the total) were conducted with Cohort 1 core members, 652 (7%) with partners.

Fieldwork for the third wave took place between May 2006 and August 2007. Cohort 1 core members, including non-respondents in wave 2, were issued for fieldwork if they met ELSA's following-up rules (set out in Chapter 4). A 'refresher' cohort of people just entering their 50s was added to the sample in wave 3 (henceforth referred to as Cohort 3). Cohort 3 was selected from the 2001-2004 HSE years. Adding Cohort 3 ensured a continuing sample of the household population aged 50 and older that was representative cross-sectionally and longitudinally. Note that due to ageing Cohort 1 core members responding to the main interview were representative of the household population aged 52 and older in wave 2; aged 54 and older in wave 3.

9,771 main interviews were completed in wave 3. Of these, 7,535 (77%) were Cohort 1 core members (including 47 with individuals who had moved into an institution) and 1,276 (13%) Cohort 3 core members. The remaining 960 (10%) were with partners.

A larger cohort of people aged 50-74 (persons born after 28 February 1933 and before 1 March 1958) has been added in wave 4 (2008-09).

Figure 1-1 ELSA sample design



[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.
[2] The next nurse visit is at wave 4 (2008-09).

A summary of the ELSA sample design is shown in Figure 1.1. Cohorts 1 and 3 overlap as a number of Cohort 1 young partners (sampled from HSE 2001) moved into their 50s in wave 3 and so became Cohort 3 core members *if* successfully interviewed in 2006-07.

In the third wave, the aim was to supplement Cohort 1 with people born between 1 March 1952 and 29 February 1956 so that the ELSA sample would again cover people aged 50 and over. Unfortunately, the algorithm used to select Cohort 3 at the time of sample selection excluded age-eligible sample members born after 29 February 1952 and before 1 March 1953. This resulted in a shortfall among this cohort (resulting in a gap of one year's births between Cohorts 1 and 3). The weighting adjustment made to address this shortfall is discussed in Section 6.3.2. Potential age-eligible sample members mistakenly not issued in wave 3 are currently being followed up for interview in wave 4.

In wave 3 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 3 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.

Increasingly, investigators of longitudinal surveys are keen to link micro-level administrative data to survey data. The administrative data need not be limited to data current at the time of the survey interview. It can include historical information stretching back many years. Alternatively, the administrative data can continue to be collected and linked indefinitely, even after an individual leaves the survey or stops collecting primary data (see Calderwood and Lessof, 2009).

In each ELSA wave 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 interviews 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 people in England: The 2006 English Longitudinal Study of Ageing" (Banks et al., 2008). Research for the latest wave included the following key areas:

- employment and the reasons older people move into or out of work;
- material well-being, the distribution of wealth and which groups are more likely to live in poverty;
- influences on the onset of ill health and disability, and what shortens healthy life expectancy;
- the effects of bereavement, separation, disability and income on quality of life, and why some people are more resilient than others; and
- independent living and social participation or exclusion.

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 third wave. Information about the wave 1 methodology can be found in Taylor et al. (2007); details on the wave 2 methodology can be found in Scholes et al. (2008a). 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 3 report (Scholes et al., 2008b).

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 (Cohort 1) was designed to represent people aged 50 and over (persons born before 1 March 1952) and their partners, living in private residential addresses in England and was selected from households that had previously responded to the Health Survey for England (HSE) in 1998, 1999 and 2001. By the time of wave 3 (2006-07) Cohort 1 core members were aged 54 and over. The mean age for those who were still living in a private residential address was 68 years (minimum 54 maximum 104).

In the third wave, the aim was to supplement ('refresh') Cohort 1 with people born between 1 March 1952 and 29 February 1956 (people just entering their 50s in 2006-07) so that the ELSA sample would again cover people aged 50 and over. The sources for the new recruits were the 2001-2004 HSE years. As before, people were eligible if they had been living in a responding HSE household and were, at the time of the ELSA 2006-07 interview, still living at a private residential address in England. Partners were also interviewed. These people form Cohort 3. Responding age-eligible sample members were designated Cohort 3 core members.

This chapter provides background information about the HSE and ELSA wave 1 sampling designs (Section 2.1), followed by information on the Cohort 1 core members followed-up for interview in wave 2 (Section 2.2). Section 2.3 discusses the follow-up of Cohort 1 in wave 3 and the selection of the refresher cohort; including an explanation of a shortfall among this cohort.

2.1 Health Survey for England to wave 1 (2002-03)

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 residential addresses.[3] Interviewing for HSE is continuous and the sample is issued to interviewers evenly throughout the year. The HSE response rates for households

[3] People living in institutions, who are likely to be older and, on average, in poorer health than those in private residential addresses are not covered by the HSE.

and individuals are presented by survey year in Table 2-1 (HSE years used as a sampling frame for ELSA are shown by grey shading).

Table 2-1 HSE response rates

Response rate	HSE year								
	1998 %	1999 %	2000 %	2001 %	2002 %	2003 %	2004 %	2005 %	2006 %
Co-operating households	74	76	75	74	76	73	72	74	68
Individual response	69	70	68	67	67	66	66	64	61

Note: Households described as 'co-operating' are those where at least one eligible person was interviewed.

Household response rates ranged from 76% in 1999 and 2002 to 68% in 2006; individual response rates from 70% in 1999 to 61% in 2006. Further details about the HSE are available from its Technical Reports (Erens and Primatesta, 1999; Erens, Primatesta and Prior, 2001; Prior et al., 2003; Sproston and Primatesta, 2003; Sproston and Primatesta, 2004; Sproston and Mindell, 2006; Craig and Mindell, 2008).

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 (which contain, on average, 2,500 households) are stratified by health 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 subset 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.[4]

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

[4] In 2004 nurse visits were only offered to respondents in the target minority ethnic groups, whether identified in the general population sample or the minority ethnic sample.

institutions in 2000, and people aged 65 and over living in private residential addresses 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.

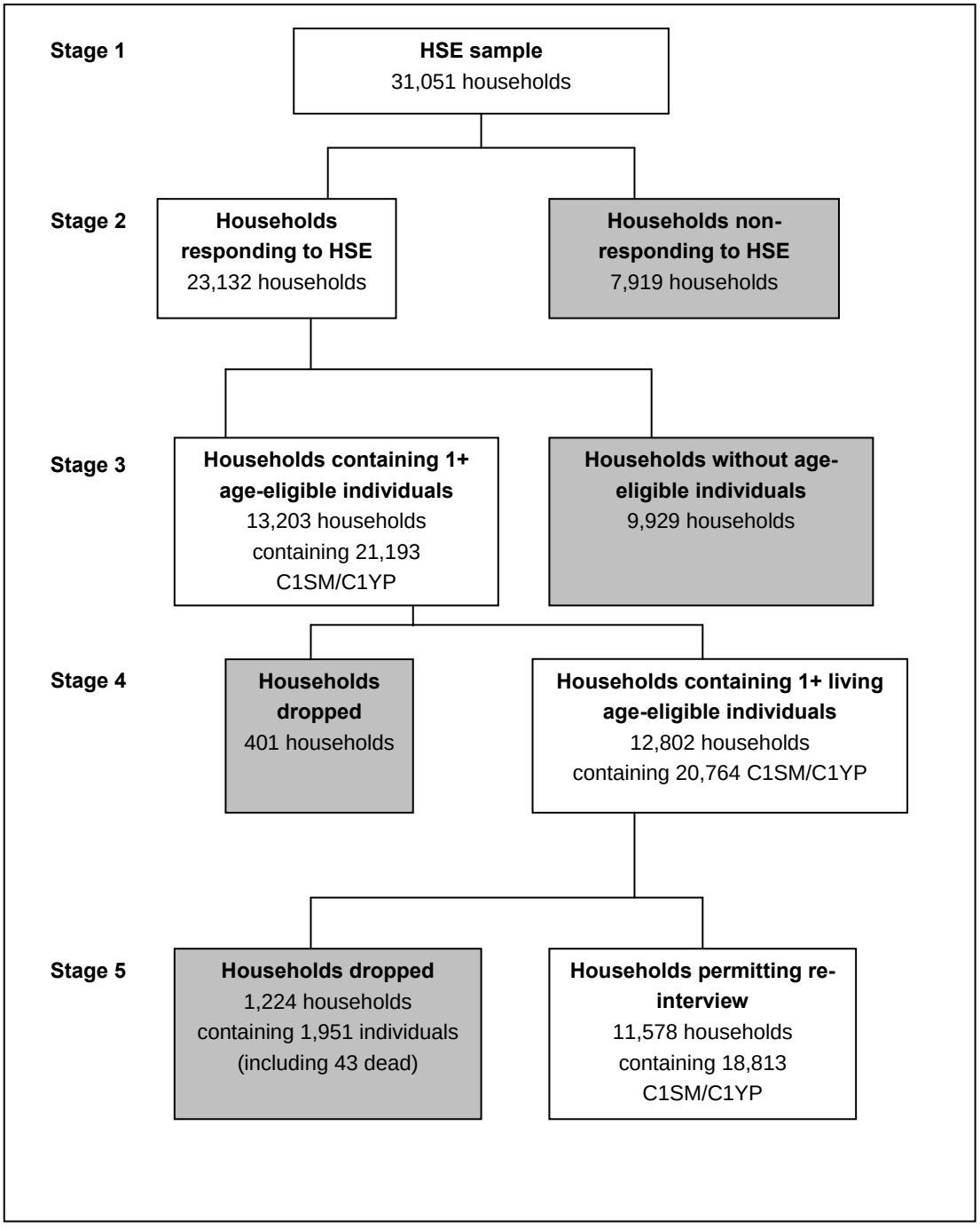
At the top of the tree were the sample of 31,051 households issued for HSE 1998, 1999 and 2001 – this is represented as Stage 1 and has been described in the section above. Following this, four stages took place. In brief, the wave 1 sample was only selected from households that responded to HSE (Stage 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 follow-up interview in ELSA wave 1.

The following paragraphs describe Stages 2 to 5 in more detail and present the characteristics of individuals *issued* (i.e. followed up for interview) in the wave 1 fieldwork period.

Figure 2-1 ELSA sample definition (Cohort 1)

C1SM Age-eligible sample member (born before 1 March 1952)
C1YP Young partner (partner of age-eligible sample member, born after 29 February 1952)



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 (core) 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, age-eligible **sample members (C1SM)** 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 and over at the beginning of the planned fieldwork (in March 2002). In total, 19,924 age-eligible individuals were identified: a mean age in wave 1 of 66 years (minimum 50, maximum 102). Sample members who successfully took part in ELSA wave 1 were later designated as '**Cohort 1 core members (C1CM)**'.

- Second, cohabiting spouses or partners of sample members who were younger than 50 years old were identified. These potential **young partners (C1YP)** were defined as the cohabiting younger 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: mean age in wave 1 was 45 years (minimum 21, maximum 49).[5]

104 Cohort 1 young partners who responded in 2006-07 (sampled from HSE 2001) moved into their 50s in wave 3 (persons born after 29 February 1952 and before 1 March 1956) and so changed status to become Cohort 3 core members (see Table 2-5).

Stage 3

Taking age-eligible 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 sample members and 1,269 young partners mentioned above). The shaded box

[5] The main analytical focus of ELSA is on core 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

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 sampling frame 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, age-eligible 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 age-eligible 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 sampling frame. 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, age-eligible sample members and young partners were not included in the final ELSA sample if *all* HSE respondents aged 50 years and 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 sampling frame. 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 because no living age-eligible 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 (17,767 age-eligible sample members and 1,046 young partners) constituted the final sample issued for follow-up interview in wave 1.

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inclusion makes it possible to carry out analyses of a representative sample of couples where at least one spouse was aged 50 or older in 2002-03.

2.1.3 Checking eligibility in wave 1 fieldwork and identifying new partners

The final wave 1 sampling frame described in the previous section reflected the household composition at the time of HSE interviewing. 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. into a 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. Young partners identified from HSE who had split from the age-eligible sample member before the wave 1 interview were not followed up for interview.

- A further subgroup of individuals was identified during wave 1 fieldwork. **New partners (C1NP1)** were defined as the cohabiting spouses or partners of age-eligible 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 wave 1, as illustrated in Figure 2-2.

Figure 2-2 Eligibility criteria for wave 1 interview

- **Sample members (C1SM)** 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 (age-eligible) and were still living at a private residential address in England at the time of the wave 1 interview (2002-03). Those 11,391 individuals successfully interviewed in wave 1 were later renamed '**Cohort 1 core members (C1CM)**'.

- **Young partners (C1YP)** 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. Cohort 1 young partners were born after 29 February 1952. (Cohort 1 young partners born before 1 March 1956 sampled from HSE 2001 who took part in wave 3 became Cohort 3 core members in 2006-07; see Section 2.3.2).

- **New partners (C1NP1)** 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 wave 1

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

Table 2-2 Cohort 1 respondents in wave 1 by sample type

All wave 1 respondents (2002-03)

Sample member type	Number of respondents
Core member	11391
Young partner	636
New partner	72
Total	*12099*

2.2 Wave 2 (2004-05)

2.2.1 Eligibility for wave 2

Cohort 1 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. 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 wave 1 interview not to be

recontacted.[6] Eligibility, therefore, did not necessarily lead to being followed up for interview in 2004-05. Several other categories of individuals were also eligible for an interview in wave 2. These were the partners of Cohort 1 core members (core partners, new partners or young partners, as described in Figure 2-3).

Figure 2-3 Eligibility criteria for wave 2 interview

- **Cohort 1 core members (C1CM)** 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, at the time of the ELSA 2002-03 interview, still living in a private residential address in England. They were no longer eligible if they had since died or moved out of Britain (core members who had moved to Scotland or Wales by the time of wave 2 were followed up for interview). 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 (C1CP)** 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. Core partners were non-respondents in wave 1 (although established to be present in the household), so missing the baseline survey for Cohort 1. Consequently, they were *only* approached in wave 2 by virtue of their being the partner of a core member.

- **Young partners (C1YP)** 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 in wave 1. Young partners were born after 29 February 1952. (Young partners born before 1 March 1956 sampled from the HSE 2001 who took part in 2006-07 changed status in wave 3 to become Cohort 3 core members; see Section 2.3.2).

- **New partners (C1NP1, C1NP2)** were the cohabiting spouses or partners of eligible sample members at the time of *either wave 1 or 2,* of any age, who had joined the household since HSE.

[6] As explained in Section 2.1.2, 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.

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 Cohort 1 core member at the time of the second ELSA interview in 2004-05. That is to say, all partners who had been living with a Cohort 1 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 (entering the ELSA study, therefore, as a 'new partner').

Over the wave 2 fieldwork period (June 2004 to July 2005) 9,433 main interviews were conducted (Table 2-3). As in wave 1 the majority of interviews (8,781: 93%) were with Cohort 1 core members: average age in wave 2 was 67 years (minimum 52 maximum 100). 652 (7%) interviews were conducted with partners.

Table 2-3 Cohort 1 respondents in wave 2 by sample type

All wave 2 respondents (2004-05)

Sample member type	Number of respondents
Core member	8781
Core partner	57
Young partner	501
New partner	94
Total	*9433*

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. 7,666 nurse visits were completed (nearly nine-in-ten of those core members who completed a wave 2 main interview). Full details on response to the main interview, nurse visit, blood sample and self-completion questionnaire can be found in the Technical Report (Scholes et al., 2008a).

2.2.2 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.

2.3 Wave 3 (2006-07)

2.3.1 Cohort 1

As in wave 2, core members were eligible for the main interview in wave 3 unless they had since died, had explicitly asked at the end of an ELSA interview not to be re-contacted or had moved out of Great Britain. Partners of Cohort 1 core members (core partners, new partners or young partners) were also eligible for an interview. Figure 2-4 summarises the eligibility criteria in wave 3.

Efforts continued in wave 3 to attempt to interview all partners who had been living with a core member at the time of an ELSA interview and had been separated or divorced from them, or had been widowed, in order to understand their circumstances after this event had occurred. The only circumstances in which a partner who had separated from the core member was not approached were if they had died, had explicitly asked at the end of an ELSA interview not to be re-contacted, had left Britain or moved into an institution. As in wave 2, ex-partners are only followed up once after leaving the core member's household. The number of main interviews achieved in 2006-07 is discussed in Section 2.3.3.

End-of-life interviews

392 end-of-life interviews were carried out with a relative or carer of ELSA respondents who had died since the last wave of interviewing. 386 were core members: average age in wave 1 was 76 years (minimum 51 maximum 99). These interviews were first introduced in wave 2 (when 133 end-of-life interviews with core members were conducted) and collect information about the respondent's health, social and economic circumstances in the last two years of their life. Over time, these end-of-life interviews will begin to accumulate so that some analysis is possible. There will be more detailed information about the interview and response in the future.

Institutional interviews

A disadvantage of using the HSE as the sampling frame for ELSA is that the study concentrates on individuals living in private residential addresses, 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 wave 1 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 living in a private residential address at the first ELSA interview into a residential care home or similar institution. Institutional interviews began in wave 3.

Figure 2-4 Eligibility criteria for wave 3 interview (Cohort 1)

- **Cohort 1 core members (C1CM)** 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, at the time of the ELSA 2002-03 interview, still living in a private residential address in England. They were not eligible if they had since died or moved out of Britain. Core members living in a household where all wave 1 or wave 2 respondents explicitly refused further contact were not issued for follow-up interviews in wave 3.

- **Core partners (C1CP)** were individuals who, like Cohort 1 core members, had been living within the household at the time of the HSE interview in 1998, 1999 and 2001 and were born before 1 March 1952. Cohort 1 core partners were *not* interviewed as part of wave 1 (although established to be present in the household), so missing the baseline survey. As a consequence they were only approached in subsequent waves by virtue of their being the partner of a core member.

- **Young partners (C1YP)** were the cohabiting spouses or partners of Cohort 1 core members, who were living within the household at the time of HSE, and were still cohabiting with the core member at the wave 1 interview (2002-03). They were born after 29 February 1952. Young partners interviewed once after they had split from their partner are no longer followed up for interview. (Young partners born before 1 March 1956 sampled from the HSE 2001 who took part in 2006-07 changed status in wave 3 to become Cohort 3 core members; see Section 2.3.2).

- **New partners (C1NP1, C1NP2, C1NP3)** were the cohabiting spouses or partners of Cohort 1 core members at the time of the first, second or third ELSA interview who had joined the household since the original HSE interview. As with young partners, new partners are only interviewed once in the event of a split with their core member partner.

2.3.2 Cohort 3

In the third wave, the aim was to supplement Cohort 1 with people born between 1 March 1952 and 29 February 1956 so that the ELSA sample would, in 2006-07, cover people aged 50 and over. The sources for the new recruits were the 2001-2004 HSE years. [7] As before, individuals were eligible if they had been living in a responding HSE household and were, at the time of the ELSA 2006-07 interview, still living at a private residential address in England. Partners were also interviewed. These people form Cohort 3. The addition of new cohorts as they enter their 50s is planned at every *other* wave; hence there was no such augmentation in wave 2.

Unfortunately, the algorithm used to select Cohort 3 from the HSE 2001-2004 years at the time of sample selection excluded age-eligible sample members born between 1 March 1952 and 28 February 1953. Persons sampled born between these two dates were mistakenly classified as Cohort 3 old partners. This resulted in a gap of one year's births between Cohorts 1 and 3. The weighting adjustment made to address this shortfall is discussed in Section 6.3.2.

The eligibility criteria for Cohort 3 is described in Figure 2-5. Overall, 103 sample members born between 1 March 1952 and 28 February 1953 (the omitted one-year cohort) were in fact successfully interviewed in wave 3 (see Table 2-5). Originally such individuals were classified at the time of sample selection as: (1) Cohort 1 young partners (sampled from HSE 2001) or (2) Cohort 3 old partners. These have now been reclassified as Cohort 3 core members (but have been assigned a zero cross-sectional weight; see Section 6.3.2). Age-eligible sample members from the 2001-2004 HSE years mistakenly not issued in wave 3 have been followed up for interview in wave 4 (2008-09).

[7] Only the general population ('core') sample was used from HSE 2004.

Figure 2-5 Eligibility criteria for wave 3 interview (Cohort 3)

- **Sample members (C3SM)** were individuals who were living within the household at the time of HSE (2001-04) and were born between 1 March 1952 and 29 February 1956 (age-eligible). In order for the sample member to be eligible, the interviewer had to ascertain that the individual was, at the time of the ELSA 2006-07 interview, still living in a private residential address in England. Those successfully interviewed in wave 3 were later designated '**Cohort 3 core members (C3CM)**'.

- **Young and old partners (C3YP/C3OP)** were the cohabiting spouses or partners of eligible sample members, who were living within the household at the time of HSE, and were still cohabiting with the Cohort 3 core member at the wave 3 interview. Young partners were born after 29 February 1956; old partners before 1 March 1952.

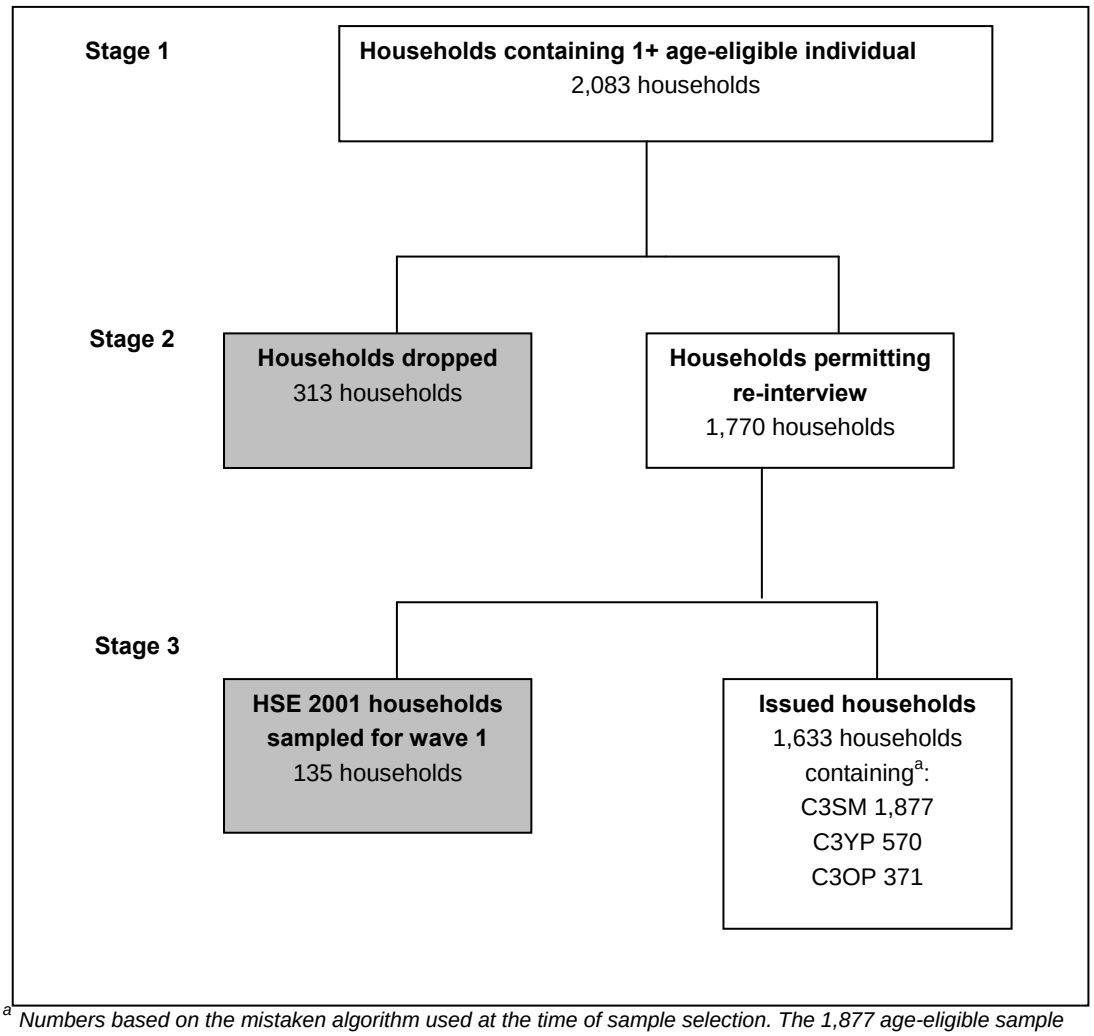
- **New partners (C3NP)** were the cohabiting spouses or partners of eligible sample members at the time of the wave 3 interview, of any age, who had joined the household since the HSE interview.

For all four sample types, interviews were only conducted at households in England, and only within residential addresses. That is to say, if an individual had moved out of England or into an institution since their HSE interview, they were treated as ineligible and were not followed-up for interview. In subsequent waves, Cohort 3 core members will be followed-up for interview if they move into Scotland or Wales or have an institutional move.

The process of selecting the Cohort 3 sample from the 2001-2004 HSE years (as implemented at the time of sample selection; i.e. mistakenly omitting the 1 March 1952 and 28 February 1953 birth cohort) is summarised in Figure 2-6. The shaded areas show the number of households that were not issued in wave 3.

Figure 2-6 Cohort 3 sample definition

C3SM Age-eligible sample member (born between 1 March 1953 and 29 February 1956)[a]
C3YP Young partner
C3OP Old partner



[a] *Numbers based on the mistaken algorithm used at the time of sample selection. The 1,877 age-eligible sample members were born between 1 March 1953 and 29 February 1956 (thereby excluding the missing year of births). The 371 old partners issued for field included 111 cases who should have been classified as age-eligible sample members (born between 1 March 1952 and 28 February 1953). Note that this error had no effect on data collection as partners received the same interview as age-eligible sample members.*

At the top of the tree Figure 2-6 were the subset of 2,083 HSE 2001-04 responding households that included at least one age-eligible individual (Stage 1). Age-eligibility meant being born between 1 March 1953 and 29 February 1956: it *should* have meant born between 1 March 1952 and 29 February 1956.

Not all age-eligible individuals were included in the Cohort 3 sampling frame. Inclusion was conditional on at least one age-eligible individual agreeing to further contact post HSE. Sample members and young/old partners were not included in the final Cohort 3 sample if *all* HSE respondents born between 1 March 1953 and 29 February 1956 had refused, when asked, to being recontacted in the future. This is shown in Stage 2 of Figure 2-6. Using this criterion meant that 313 of the 2,083 households were removed from the final ELSA sample

because no age-eligible individual had consented to recontact. Overall, 1,770 households contained at least one age-eligible individual agreeing to further contact. Of these, 135 households from the HSE 2001 had already been issued as part of ELSA wave 1 and so were dropped, leaving a sample of 1,633 Cohort 3 households (broken down by HSE year 2001-2004 as follows: 498, 294, 585 and 256). These households contained 1,877 age-eligible sample members and 941 partners (570 young; 371 old). These individuals constituted the final Cohort 3 sample followed up for interview in 2006-07.

2.3.3 Summary of response in wave 3

9,771 main interviews were completed in wave 3 (Table 2-4). 7,535 and 1,276 interviews were conducted with Cohort 1 and 3 core members respectively. More detailed summaries of response in wave 3 are provided in Chapters 5-7.

Table 2-4 Respondents in wave 3, by Cohort and sample type

All wave 3 respondents (2006-07)

Sample member type	Number of respondents
Cohort 1	
Core member[a]	7535
Core partner	88
Young partner	312
New partner	103
Cohort 3	
Core member[b]	1276
Young partner	294
Old partner	142
New partner	21
Total	
Cohort 1	*8038*
Cohort 3	*1733*

Notes: [a] Includes 47 institutional interviews. [b] Includes 104 Cohort 1 young partners (from HSE 2001) who changed status in 2006-07 to become Cohort 3 core members.

The mistake with the sampling algorithm at the time of selection and the overlap between Cohorts 1 and 3 (from HSE 2001) meant that the 1,276 Cohort 3 core members could be themselves broken down into five different sample types (summarised in Table 2-5):

- 1,109 main interviews were conducted with original age-eligible sample members (that is to say, sampled as age-eligible: born between 1 March 1953 and 29 February 1956). This total, therefore, excludes the missing year of birth.

- Five main interviews were conducted with original age-eligible sample members (born between 1 March 1953 and 29 February 1956) in HSE 2001 households that were included in the Cohort 1 sampling frame prior to wave 1 fieldwork but were not issued in wave 1. [8]

- 59 main interviews were conducted with original age-eligible sample members (born between 1 March 1953 and 29 February 1956) in HSE 2001 households who were

[8] A decision was made to re-approach only those overlapping HSE 2001 households that had not been given the opportunity to take part in ELSA.

already included in the ELSA study as Cohort 1 young partners. These changed status in 2006-07 to become Cohort 3 core members.

- 45 main interviews were conducted with cases originally classified at the time of sample selection as Cohort 1 young partners (born in the missing year of birth: 1 March 1952 and 28 February 1953). These also changed status in 2006-07 to become Cohort 3 core members.

- 58 main interviews were conducted with cases originally classified at the time of sample selection as Cohort 3 old partners (born in the missing year of birth: 1 March 1952 and 28 February 1953). These have been reclassified as Cohort 3 core members.

Table 2-5 Origin of Cohort 3 core members

Cohort 3 core members (2006-07)

Sample member type	Number of respondents
Age-eligible sample members (C3SM) correctly sampled	
In non-overlapping households	1109
In overlapping (HSE 2001) households	5
Cohort 1 young partners	59
Reclassified (born in missing year of birth)	
Cohort 1 young partners	45
Cohort 3 old partners	58
Total	1276

3 DEVELOPMENT OF THE WAVE 3 MAIN INTERVIEW AND RETROSPECTIVE INTERVIEW VISIT

The ELSA wave 3 interview covered a wide range of topics. It was similar to the questionnaire used in waves 1 and 2, 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).

Participants at each wave were asked to complete a face-to-face interview and self-completion questionnaire. At wave 2, the main change was the addition of a nurse visit. At Wave 3 two new self-completion questionnaires were tested. These were designed to elicit information on particular scenarios; also referred to as vignettes (Section 3.1.1).

The topic areas covered in the wave 3 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 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 intention in Wave 3 was to collect data about the same topics as in Wave 1 and 2. There were, however, some additions to the content of the interview to respond to new areas of enquiry. Some questions from Wave 2 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 at the previous wave.

In terms of methodology, the wave 3 interviews reflected back on information collected in the first two waves 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.

In addition, **Institutional interviews** were conducted for the first time at Wave 3. These were carried out as an alternative to the main interview (with an almost identical content) with core member respondents in wave 1 and 2 who had moved out of the private residential sector (e.g. into nursing care home or institution). The aim of these interviews was also to look at the circumstances surrounding the move into an institution.

End-of-life interviews were also conducted at Wave 3, with surviving spouses/partners or other relatives of core members that had passed away since wave 2 (Section 3.4).

Following the main interview, and the self-completion of two questionnaires, respondents were asked whether they would carry out **Life History Interviews**; also referred to as Retrospective interviews. The aim of the Life History Interview was to collect retrospective information about all eligible ELSA sample members on a wide variety of different topics; from the homes that respondents had lived in throughout their lives, to a record of all the children (natural and adopted) that respondents have had throughout their life to date (Section 3.5).

Respondents who took part in Wave 1 of ELSA, but refused to participate in either or both the Wave 2 and Wave 3 main interview (at this wave) were contacted by the Telephone Unit in order to carry out a short Computer Assisted **Telephone Interview** (or CATI) consisting of 10 to 11 questions (Section 3.6).

This chapter provides background information about the comprehensive piloting undertaken before the mainstage for the main interview , including the vignette self completion questionnaires (Section 3.1.1), and the life history interview (Section 3.1.2). This chapter continues by covering the new questionnaire topics (Section 3.2), and the structure and content of the wave 3 main interview (Section 3.3). This chapter concludes by covering the structure and content of the wave 3 end of life interview (Section 3.4), the structure and content of the wave 3 life history interview (Section 3.5), and the structure and content of the wave 3 telephone interview (Section 3.6).

3.1 Pilot surveys in wave 3

Extensive discussion took place with ELSA collaborators about necessary changes to the wave 3 interview. The intention was for the content to remain broadly the same (to allow for the analysis of change between all three waves), and allow respondents the opportunity to update information given at their previous interview. A full pilot was conducted from the 31st August 2005 to 20th September 2005 and a subsequent dress rehearsal ran from 10th January to 2nd February 2006.

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 at wave 2, and then 4 years later at wave 3 in 2006. The aim of the Wave 3 pilot and dress rehearsal was to fully test the CAPI instrument (including its institutional and proxy counterparts), the self-completion questionnaires, associated documents and the fieldwork approach for the main interview.

Pilots were also conducted for the life history interview, carried out for the first time at this wave.

3.1.1 Development of main interview instruments

The pilot and dress rehearsal of the main interview had the aims of: testing the sample preparation procedure (for the existing and refreshment sample); developing a refusal

strategy for Wave 3; testing changes to existing questions, cognitively testing new questions, significant routing changes to modules and the vignette self-completions; and reviewing new questionnaire topics.

In addition the dress rehearsal allowed for:

- Running of an incentive experiment: testing whether it is more efficient and productive to give respondents the £10 incentive prior to or following the interview.
- Testing the feasibility of digitally recording parts of the CAPI interview. The recordings would aid questionnaire development by providing understanding of how respondents interpret specific questions.

See Section 3.2 on New Questionnaire Topics for details of the new developments to the mainstage questionnaire as a result of the pilot and dress rehearsal.

The self-completion questionnaires to be used alongside the main interview were also piloted during the dress rehearsal. This was carried out with three experimental self-completions – a health self-completion, a work self-completion and a nutrition and physical activity self-completion.

Respondents were assigned to one of four experimental groups:

1. Physical activity and nutrition self-completion, plus main self-completion (allocated to ¼ of sample)
2. Vignettes general health "Health" self-completion, plus main self-completion (allocated to ¼ of sample)
3. Vignettes work disability "Work" self-completion, plus main self-completion (allocated to ¼ of sample)
4. Main self-completion only (allocated to ¼ of sample)

Interviewers were asked to ensure the respondent completed the core self-completion while they were in their home and, if applicable, leave the second questionnaire for the respondent to complete in their own time.

The generally high level of commitment of ELSA respondents meant that most people did not object to receiving up to two self-completions. However, some respondents did find the questionnaires overly long and demanding. Respondents were generally in favour of doing at least one self-completion in their own time as they felt it was too much to ask to complete it at the end of the CAPI interview. It was therefore decided that these experimental self-completions were to be treated as 'added extras' to ensure good response to the core self-completion. They were to be left behind for respondents to complete and return by post, whereas the core questionnaire was to be completed, if possible, while the interviewer was in the respondent's home

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 67% and 63% respectively. The majority of respondents remembered their wave 1 and 2 interviews, so there was little need for interviewers to 'sell' the study on the doorstep. Having the same interviewer as at wave 1 and/or wave 2, however, was felt to assist with co-operation due to the rapport that was already established.

3.1.2 Development of the life history interview

The Life History Interview had the aim of collecting retrospective information about all eligible ELSA sample members. To date, most of the information collected for ELSA has been about the circumstances of respondents' lives from the time they were first interviewed for the Health Survey for England (HSE) until the present day. At HSE, all the ELSA core members were over 45 years old and some of them were already in their nineties. As a result, we know little about what happened earlier on in their lives. Many aspects of early life have been shown to have a significant impact on people's health, economic circumstances and quality of life in later years. The Life History Interview enabled us to gather more detailed information about important events that have occurred in ELSA respondents' lives and what their childhood was like.

The Life History Interview aimed to collect data in a number of different areas including housing and geographical mobility, cohabiting relationships, children, and jobs and earnings. Collecting accurate information about all these different types of events is a challenge. People do not remember events from the past perfectly. Therefore, NatCen used a special method of gathering this information, called the 'Life History Calendar' (or 'lifegrid'), which has been designed to help people remember past events more accurately. As its name suggests, this method is in the form of a calendar, which shows time across the top and multiple rows down its side which make it possible to record different kinds of events in respondents' lives (e.g. where they lived, family events). As respondents answer questions about key life events, these events are displayed on the Life History Calendar. This enables respondents to cross-reference certain life-events with others (e.g. "when I had my first child I was living in house B"). The calendar also shows important external events, for instance, when JFK was assassinated, which may help respondents recall the timing of personal life events. Using the life history calendar technique has been shown to improve the accuracy of the information people can remember.

The life history interview was developed over a number of stages. The first stage was a pre-test, carried out in September 2005, and involved a paper lifegrid (calendar) followed by a CAPI interview. The paper lifegrid worked well, but having to enter the information on paper and then on to the CAPI was too repetitive and time-consuming. Therefore we decided to develop a CAPI version of the calendar. Due to the need for the calendar to be a very flexible and user friendly program, it took some time to develop an effective calendar.

The second stage of development of the life history interview was a 2nd pre-test, carried out in June 2006. This involved testing a preliminary CAPI version of the calendar, allowing data to be collected on children, accommodation, work and partners. This provided information on how to improve these sections of the CAPI – with regards to both content and structure – and informed the development of additional CAPI sections to be included in the upcoming pilot.

The third stage of development of the life history interview was a pilot, conducted between 16th and 28st September. This consisted of a personal interview using a CAPI program and a short self-completion questionnaire. The CAPI program incorporated a Life History Grid

(LHG) (calendar) to assist respondents' ability to recall past events. As a result of the pilot it was found that interviewers could improve the accuracy of the data provided by respondents by cross-referencing events.

The dress rehearsal was the final/fourth stage in the development of the ELSA life history interview, which involved refining the balance between having both flexible elements and structured elements in the CAPI – through the LHG and the interview questions respectively. The dress rehearsal fieldwork period ran from 21s November to 5th December 2006. Overall, there were no major problems with the topic order or content although some specific questions needed to be revised, and there was good response and positive feedback from respondents about the this interview.

The development life history interview can be summarised as follows: The first two pre-test stages of development were experimental stages that allowed the development of an appropriate CAPI methodology. At these stages the overall aim was to find the best way to incorporate the Life History calendar (or LHG) into the CAPI. The subsequent pilot stage and dress rehearsal stages of development went on to implement the appropriate CAPI methodology identified from the pre-tests, with the aim of finding the best way to balance the dual focus of using both a flexible Life History calendar and a structured CAPI questionnaire.

3.2 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

Some health questions from Wave 2 were omitted in Wave 3, although they would possibly be added back in the questionnaire in the future. The main additions or changes to the Health module at Wave 3 were as follows: (1) New questions recorded respondents' dental health to find out how dental state deteriorates and when problems arise. (2) Additional questions were also added to make sure that the information on medical illnesses and chronic conditions the respondent had been diagnosed with in the past were correct (e.g. cardiovascular conditions). (3) Respondents were also now asked about the help they have received for daily activities.

Table 3-1 provides detail on all the changes in the content of the health data collected over the waves of ELSA.

Table 3-1 Content of the health data collection at each wave of the ELSA study, from Wave 0 up until wave 3

	Wave 0	Wave 1	Wave 2	Wave 3
Physical health				
Self-rated general health; (Limiting) long-standing illness	√	√	√	√
Incontinence	√	√	√	√
Eyesight and hearing		√	√	√
Physician diagnosed conditions	√	√	√	√
Diagnostic symptom assessments: Rose Angina, MRC Respiratory Questionnaire, Edinburgh Claudication Questionnaire	√*	√	√	√
Age-related symptoms and events, including pain; falls		√	√	√
Quality of medical care			√	√
Disabilities: ADLs, including caring and aids		√	√	√
Walking speed performance test (part of EPESE battery)		√	√	√
Smoking, alcohol consumption)	√	√	√	√
Mental health				
General Health Questionnaire (GHQ-12)	√	√		
CES-D depression scale		√	√	√
Physical examination and performance data				
Height; Demi-span	√		√	
Blood pressure; Waist-hip ratio	√		√	
Lung function	√*		√	
Chair stands; Balance; Grip strength; Leg length			√	
Weight	√		√	
Blood assays				
Triglycerides	√*		√	
Total and HDL-cholesterol	√*		√	
C-reactive protein, fibrinogen	√*		√	
Haemoglobin and ferritin	√		√	
Fasting lipids, glucose, glycated haemoglobin			√	
Cortisol			√	
IgE/HDM IgE	√*			
DNA extraction and storage			√	

Social participation

New questions on public transport usage came from interests of the Department of Transport. We know that access to a car is very important in improving quality of life for older people. We therefore wanted to be able to measure the impact of reducing car use on other aspects of peoples' lives e.g. accessibility to services, social participation and health. It was also important for us to understand the role of others outside the household, e.g. family and friends providing lifts by car.

New questions at Wave 3 recorded how often respondents used taxis, got lifts from family/friends, or used transport provided by a hospital, day centre or lunch club.

Table 3-2 provides detail on all the changes in the social and civic participation data collected over the waves of ELSA.

Table 3-2 Social measures at each wave of the ELSA study

	Wave 0	Wave 1	Wave 2	Wave 3
Informal care giving and volunteering		√	√	√
Membership of and activities in organisations		√	√	√
Participation in cultural activities (cinema, art gallery, etc.)		√	√	√
Participation in political activities (voting, membership of party, etc.)		√	√	√
Quality of social networks		√	√	√
Social isolation			√	√
Access to public transport		√	√	√
Difficulty accessing facilities (health services, supermarket etc.)		√	√	√
Social capital		√		√

Work and Pensions

New questions for Wave 3, proposed by the Department for Work and Pensions (DWP), related to pension statements used to forecast state pension at retirement; specifically questions about state pension forecasts that had been sent out by the government. Plus female respondents under the age of 60 were now asked if they knew when they would reach the State Pension Age and if they were aware that the State Pension Age for women was changing.

Although there were no changes since Wave 2 to the income and assets section of the ELSA questionnaire, Table 3-3 provides detail on all the changes in the economic / financial data collected over the waves of ELSA.

Table 1-3 Content of the economics / financial data collected at each wave of the ELSA study

	Wave 0	Wave 1	Wave 2	Wave 3
Household income				
Earnings		√	√	√
State benefits (by source and recipient)		√	√	√
Private pensions		√	√	√
Asset income (by asset category)		√	√	√
Other income		√	√	√
Wealth				
Financial assets (11 categories)		√	√	√
Physical assets (five categories)		√	√	√
Business wealth		√	√	√
Debt (three categories)		√	√	√
Housing wealth and mortgage debt		√	√	√
Pensions				
Current plan details		√	**(√)**	**(√)**
Date joined plan		√	**(√)**	**(√)**
Current contributions		√	√	√
Self-reported accrued pension wealth		√	√	√
Past pension details (up to three past pensions)		√	**(√)**	**(√)**
Plan names		√	**(√)**	**(√)**

…continued

	Wave 0	Wave 1	Wave 2	Wave 3
Employment				
Main job details	√	√	**(√)**	**(√)**
Health and work disability			√	√
Normal pay and hours	√	√	√	√
Secondary and other economic activity details		√	√	√
Age and reason for retirement (if retired)		√	**(√)**	**(√)**
Employer name and permission to contact		√	**(√)**	**(√)**
Consumption				
Housing (rent and mortgage payments)	√	√	√	√
Vehicle ownership		√	√	√
Durable ownership		√	√	√
Durable purchases			√	√
Food in, food out		√	√	√
Fuel expenditures			√	√
Health insurance contributions		√	√	√
Expectations				
Mortality		√	√	√
Employment		√	√	√
Bequest and inheritances		√	√	√
Health limit ability to work		√	√	√
Income adequacy		√	√	√
Movement into nursing home			√	√
House value		√	√	√
Moving house			√	√
Public and private pension income			√	√

Housing and consumption

At wave 3, the following questions were removed: Questions on the amount spent on leisure activities (other than eating out), and the amount of money given to relatives or other people (outside their household), including money to charity.

Cognitive Function

Questions used to measure literacy were dropped for Wave 3. All other tests remained the same and the cognitive function booklet itself remained unchanged from Wave 2. However, interviewers now had a help screen to check the rules for scoring the animal naming task and had the option to specify why some tests could not be completed (i.e. due to poor eyesight, difficulty using a pen etc.).

Table 3-4 provides detail on all the cognitive function data collected over the waves of ELSA.

Table 3-4 Cognitive function measures at each wave of the ELSA study

	Wave 0	Wave 1	Wave 2	Wave 3
Memory				
Self-rated memory		√	√	√
Orientation in time		√	√	√
Word list learning		√	√	√
Prospective memory		√	√	√
Executive function/other items				
Word-finding		√	√	√
Letter cancellation		√	√	√
Basic abilities				
Numerical ability		√		√
Literacy			√	

Expectations

In Wave 2 respondents were asked what they thought their chances were of living to a particular age. The age asked about depended on the respondent's current age. In Wave 3, a new question was added after this for all respondents aged under 70 which asked what they thought their chances were that they would live to be 85 or more. By asking everyone about their chances of reaching the same age, this would enable comparisons between the different responses people gave. In addition, wave 3 excluded the questions about the most positive and negative aspects of ageing.

Psychosocial health

The questions about when the respondent thinks middle age ends and old age starts, which were in Wave 1, were added back in at Wave 3.

Table 3-5 provides detail on all the psychological data collected over the waves of ELSA.

Table 3-5 Psychological measures at each wave of the ELSA study

	Wave 0	Wave 1	Wave 2	Wave 3
Psychosocial factors				
Control and demand (work, home and in general)		√	√	√
Effort-reward imbalance (work, volunteering, caring and in general)			√	√
Perceived social status (position on a ladder)		√	√	√
Perceived financial difficulties		√	√	√
Relative deprivation			√	√
Psychological and social well-being				
Quality of life (CASP-19)		√	√	√
Life satisfaction (Diener)			√	√
General Health Questionnaire (GHQ-12)		√	√	√
CES-D depression scale	√	√		
Ryff well-being scale*			√	

Final questions and consents

The consent form at Wave 3 was slightly different from the one used at previous waves. In Waves 1 and 2 the economics consent section asked respondents for their consent to link to

their National Insurance contributions, benefits, and tax credits. However at Wave 3 the questionnaire also asked for their permission to link to their tax records (rather than just their tax credits) in addition to information about their savings and pensions. Plus, at this third wave we only asked new respondents to sign this consent form.
In addition to the changes at Wave 3 to the consent procedure, there were new questions prompting interviewers to ask respondents if they would be willing to do the Life History Interview

Self-completions
There were three self-completions included in Wave 3. The main self-completion asked about the respondents' quality of life, social participation, control at work, life satisfaction, social networks and alcohol consumption. Some questions which were asked in the Wave 1 self-completion were added back in and some Wave 2 questions were taken out of the main self-completion for this wave. In addition to the main self-completion respondents were randomised to receive either one of two – or neither one of the two – vignette self-completion questionnaires.

3.3 Structure and content of wave 3 main interview

As in the first waves, the wave 3 main survey comprised a personal face-to-face interview and self-completion questionnaire; respondents could be allocated to complete a vignette self completion questionnaire.

The structure of the main interview was the same as it had been for wave 1and 2. 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 3

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. This module also checks the eligibility for ELSA of all current household members (including New Partners).

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. New questions at Wave 3 record respondents' dental health and the help they have received for daily activities.

Social Participation (SP) – covers the use of public transport. New questions at Wave 3 record how often respondents use taxis, get lifts from family/friends, or use transport provided by a hospital, day centre or lunch club.

Work and Pensions (WP) – collection or updating of current work activities; current and past pensions; reasons for job change and health-related job limitations. New questions for Wave 3 relate to pension statements sent by the Department for Work and Pensions (used to forecast state pension at retirement).

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 2 did so again in wave 3.

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 2 answered this module again in wave 3.

Cognitive Function (CF) – measured different aspects of the respondent's cognitive function, including memory, speed and mental flexibility. Questions used to measure literacy were dropped for Wave 3. All other tests remained the same. However, interviewers now have the option to specify why some tests could not be completed (i.e. due to poor eyesight, difficulty using a pen etc.).

Expectations (EX) – measured expectations for the future in a number of dimensions; financial decision-making and relative deprivation. There were minor changes to this module, including the deletion of questions on subjective views of ageing.

Psychosocial Health (PS) – measured how the respondent viewed his or her life across a variety of dimensions. The questions about when the respondent thinks middle age ends and old age starts, which were in Wave 1, were added back in at Wave 3.

Effort and Reward (ER) – assessed 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 respondents' contact details, stable address, details of any proxy informants and requests permission to link to health and economic data from various administrative sources. At wave 3 there were changes to the consent procedure and there were new questions to set up the Life History Interview.

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.

Self-completion questionnaire (administered by paper) (SC) – covering quality of life, social participation, mobility, control at work, life satisfaction, social networks and alcohol consumption. There are three self-completions included in Wave 3. The main self-completion covers quality of life, social participation, mobility, control at work, life satisfaction, social networks and alcohol consumption. Some questions which were asked in the Wave 1 self-completion were added back in and some Wave 2 questions were taken out of the main self-completion for this wave

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. 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 details of any tax credits they were claiming. In addition, at Wave 3 the questionnaire also asked for their permission to link to their tax records (rather than just their tax credits) in addition to information about their savings and pensions. Plus, at this third wave we only asked new respondents to sign this consent form. 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). 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.

The main interview 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.
In concurrent interviewing sessions, the following sections were asked of both respondents concurrently:

- Individual demographics (ID)
- Health (HE)
- Social participation (SP)
- Work and pensions (WP)

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

In addition to the standard self-completion questionnaire, some respondents were asked to complete one of two supplementary self-completion questionnaires containing anchoring vignettes. Each questionnaire was made up of two sections. The first asked respondents to rate various aspects of their own situation on a 5-point scale (for example, the health questionnaire focused on mobility, pain, cognition, sleep and depression). In the second section of the two questionnaires, respondents were asked to rate the situation of various hypothetical people who experience different circumstances on the same 5- point scale. Respondents were asked to assume that the hypothetical people used in the second section have the same age and background that they have. Anchoring vignettes are designed to take into account the fact that people of different countries, sex, age bands and socio-economic groups may rate similar circumstances differently. The questions enable analysts to see how different respondents rate themselves compared with how they rate the hypothetical examples. This information can be used to make comparisons between different groups or

across time. They will facilitate cross-group and cross-country analyses as very similar questionnaires were used in the Survey of Health and Retirement in Europe and in the Health and Retirement Study in the United States. A third of respondents were randomly selected to complete the questionnaire about health and another third were asked to complete the questionnaire on work disability. The remaining respondents were given neither.

At the end of the main interview, wave 3 respondent were also invited to complete a life history interview. In addition, respondents might carry out a telephone interview if reissued, or an institutional interview (if applicable), or an end-of-life interview might be carried out with a partner/spouse or relative if the respondent had passed away.

3.4 Structure and content of wave 3 end-of-life interviews

The End of Life interview (then named the 'Exit interview') was introduced at ELSA Wave 2. For wave 3 interviewers approached a close friend/relative of an eligible ELSA respondent who has died since Wave 2 to do an interview about the deceased. If a household included more than one eligible person, and one of them had died, the other respondent was asked if they were willing to do an End of Life interview about that person. If this respondent was not willing to do the End of Life interview, then they were asked to nominate someone else to do it.

The aim of the End of Life interview was to complete the information collected at previous waves of ELSA. This would allow linking of the answers given by the late respondent at Waves 1 and 2 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. We were interested in their health, social circumstances, and financial situation over this time, and what happened to their assets after they died.

The End of Life questionnaire at Wave 3 included questions on some of the following topics:

- Health of deceased in year preceding death (physical and mental)
- Care and support needed in 3 months preceding death
- Memory/mood in last year preceding death
- Problem behaviour
- Financial questions – private health care, funeral expenses, inheritance – houses, businesses, other assets.

3.5 Structure and content of wave 3 life history interview

The life history interview comprised a personal face-to-face CAPI and self-completion questionnaire. See Figure 3-3 for the content of these questionnaires. The CAPI was carried out with one respondent at a time independently. Respondents were sent a card before their interview and asked to write down the jobs and residences they had had throughout their lives. It was expected that in some cases couples would confer when filling out these cards and perhaps reach an agreement about information that applied to both people – e.g. houses they lived in together. Proxy interviews were not allowed.

The self-completion questionnaire could be completed after the face-to-face interview was over and the interviewer had left the household (if the eligible individual was interviewed alone), or while other people in the household were being interviewed.

Figure 1-3 Life History Questionnaire Content

Introduction questions – checking name, date of birth and gender.

Children (RC) – checking of details of respondent's children reported at HSE or previous waves of ELSA (Waves 1 or 2, not Wave 3) and collection of details of any other natural or adopted children not previously reported. For women, questions were included about any terminations, miscarriages or stillbirths.

Partners (RP) – questions on all cohabiting relationships, marriages and important non-cohabiting relationships including key dates and reason for end of relationship.

Accommodation (RA) – asks about details of each residence lived in for 6 months or more throughout life including when started and stopped living there, address (or country if outside UK), and how household occupied residence. This module included questions about their residence when they were 10 years old such as number of bedrooms, who lived there, number of books, and whether it had features such as an inside toilet and central heating. Also asked whether parents permanently separated or divorced and whether respondent was separated from mother as a child.

Work (RW) – asks about details of each job had for 6 months or more throughout life including when job started and ended, job title, whether worked full or part time, whether employee or self-employed, and starting salary. Also covered gaps between jobs, final salary of last career job, and whether ever left job due to ill health, disability, or company closing down.

Health (RH) – covers injuries, health during childhood, periods of ill health as an adult, smoking, and for women: menstruation, menopause, and HRT.

Other life events (RO) – asks whether respondent wants to mention any other life events not discussed previously in the interview.

Self completion (RS) – includes questions on relationship with mother and father as a child and experience of difficult life events (e.g. natural disaster, life threatening illness or accident, and victim of assault), There was also an open question asking them to write about 3 aspects of their life which were important to them and how it affected them.

3.6 Structure and content of wave 3 telephone interviews

Respondents who did not complete an ELSA Wave 3 main interview at this wave were contacted by the Telephone Unit in order to carry out a CATI (Computer Assisted Telephone

Interview).. The telephone interview was new to Wave 3. We approached people who took part in Wave 1 of ELSA, but refused to participate in either or both of Waves 2 or 3. The telephone interview allowed us both to gather more information on why people refuse to continue taking part in ELSA, and also to gather some key factual information about these respondents, using a short interview consisting of 10 (and in a very few cases 11) questions.

The telephone interview was short and collected only a small amount of information (a productive CATI interviews took about 10 minutes to complete), but it was an important addition to the ELSA strategy for retaining respondents. It had three main purposes:

- To ascertain why people refuse to continue participating in ELSA, and to give an indication of how to most effectively encourage people to come back to ELSA in the future
- To gather some very basic data that provided us with at least some information for respondents for whom we would otherwise have nothing
- To know more about people who do not take part, so as to work out if their omission is biasing ELSA results in any way.

There was an incentive for completing the telephone interview, and no proxy interviews were accepted.

Because the interview was so short, it was not separated into different modules. The programme was structured in such a way that, in the case of a household containing two eligible respondents, interviewers could select the respondent that they wished to speak to first. Each call consisted of two sections:

- First, respondents were asked about their experience of being interviewed for ELSA, and to suggest some ways in which to encourage them to take part in the study once more in the future (the “quality control” section).
- Following this, there were 10 very straightforward questions which related to health, work and benefits, marital status, and accommodation. Most of these questions were taken directly from the main face-to-face interview, and were chosen because they were quick and simple both to ask and to answer, and because together cover, in a very basic way, the key areas that ELSA is interested in.

4 FIELDWORK PROCEDURES

Fieldwork for the third wave of ELSA began in late April 2006 and spanned 16 months, finishing in July 2007. 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.

246 interviewers worked over the course of wave 3. Before starting work, all new interviewers underwent a two day personal briefing by a researcher. Wave 2 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 4.6-4.8 outline other aspects of the fieldwork procedures. The chapter concludes with a brief outline of the end-of-life, life history and telephone interviews (Sections 4.9-4.11).

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 3 were:

- deaths;
- moves out of Britain; and

- living in a household where *all* eligible respondents refused to be re-contacted after HSE, wave 1 or wave 2.[9]
- young or old partners if they no longer live with the core member

Deaths were reported through two methods. All participants who gave their permission (95%) in HSE/wave 1/wave 2 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 3 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 and 2 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 or 2 interview and/or were partners of core members who had not themselves taken part in wave 1 or 2.

Four groups of eligible respondents were represented in the sample of issued households followed up in wave 3:

- Those personally interviewed in wave 1 and agreed implicitly to be recontacted at wave 1 or wave 2 (core members and younger/new partners). All were sent an 'advance letter' advising them of the third wave of the study, and informing them that an interviewer would be visiting shortly. Their wave 1 and 2 data was fed-forward to their wave 3 interview. If they had moved or their household had split since wave 2, the interviewer attempted to trace (see Section 4.2) and interview them, even if they had moved to Wales or Scotland.[10]

- Individuals who had not completed a wave 2 interview. A minority of individuals were not successfully interviewed in wave 2, 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 2 non-respondents were only followed up in wave 3 by virtue of their being the partner of a core member.

- Individuals who completed a full wave 2 interview but did not agree to be recontacted for wave 3, although a different person in their household had given implicit consent. Like the individuals who had not completed a wave 2 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 3 their individual wave 1 or wave 2 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. Continuing to

[9] No direct recontact question was asked of respondents, but some spontaneously requested not to be approached again.
[10] 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 3 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 2 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 4.9). Core member respondents in wave 2 who had moved out of the private residential sector (e.g. into nursing care home or institution) were also interviewed. Contact details were collected so that they could receive an institutional interview. Institutional interviews began at this wave 3.

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. We understood that it was possible that all the sample members within the household might have moved since they were last interviewed for ELSA or, even more likely, since their HSE interview for the refreshment sample.

If the whole household had moved since the wave 2 interview, or a core member who had consented to be recontacted in future waves had moved away, interviewers were directed to try the following possible routes to trace movers:

- attempt telephone contact with the respondent
- attempt to find a follow-up address
- approach the present occupants, neighbours, or friends to obtain the new address
- approach the person(s) living at the 'stable address' provided previously by the respondent - Wave 2 respondents had been asked to give the name and contact details of someone who could be contacted if they moved
- Consider phone books, electoral register, local shops, letting agency, estate agent, post office

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 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 3

- 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 cheque which was provided at the end of the ELSA interview.
- We tailored each advanced letter to the individual respondents, based on whether or not they had been interviewed at wave 2, they had refused to be interviewed at Wave 2, or were part of the refreshment sample.
- Where possible, respondents were assigned to the same interviewer in wave 3 as they had been in wave 2 and/or wave 1.
- Interviewers initially made contact by telephone with some pre-selected cases who were interviewed at both waves 1 and 2 of ELSA and were under 80. It was felt that respondents who agreed to both ELSA interviews were less likely to refuse at Wave 3 and were therefore the best candidates for this method. In all other cases 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 2 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 cheque.

- Self-completion questionnaires that had not been returned by respondents were also followed up. Non-respondents were first sent a reminder letter with new questionnaires (if applicable) 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.

- An important addition to our strategy for retaining respondents were the Telephone Interviews carried out for the first time at this wave. These were conducted in order to better understand reluctance to continue participating in ELSA, and to understand how we might most effectively encourage people to come back to ELSA in the future. In addition, these interviews went some way towards dealing with non-response and collected key data on the respondents at this third wave.

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[11], 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

[11] Individuals with a low level of proficiency in spoken English were classified as non-respondents.

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.[12] 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 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 younger partners) because many of the questions asked of individual respondents are not asked of proxy informants. 92 proxy interviews were conducted in wave 2 with core members this increased to 121 at wave 3. As in wave 2, a number of analyses in the wave 3 report (Banks et al., 2008) excluded proxies.

Although proxy informants were a small group in waves 1, 2 and 3 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.

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 2 interview date and selecting the period closest to two years from that interview. 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 waves 1 and 3 for Cohort 1 core members was 49 months (interquartile range 48–51 months, minimum time lapse 38 months, maximum 63 months). For those 7,168 core members who had taken part in all three waves, the median time lapse between wave 2 and 3 interviews was 22 months (interquartile range 20-23 months, minimum time lapse 12 months, maximum 37 months). The median time lapse between waves 1 and 3 for Cohort 1 core members was 49 months (interquartile range 48-51 months, minimum time lapse 38 months, maximum 63 months).

[12] Benefit and financial units were defined in Section 3.3.

4.6 Quality checking of interviews

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

4.7 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 3 findings in the post, near the time of the launch of the study findings, with a letter of thanks from the Principal Investigator.

4.8 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 editing instructions can be viewed at the UK Data Archive, as part of the User Guides and Documentation for each wave (http://www.data-archive.ac.uk/findingData/snDescription.asp?sn=5050#doc).

4.9 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 2 and implicitly agreed to be recontacted, and who had died since the wave 2 interview. These interviews were conducted during the fieldwork period for the main interview (April 2006-July 2007). 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.

End-of-life interview content

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

- Health of the deceased in year preceding death (physical and mental)
- Care and support needed in 3 months preceding death
- Memory/mood in last year preceding death
- Problem behaviour, and

- Financial questions on private health care, funeral expenses, inheritance – houses, businesses, other assets.

4.10 Life history interview

ELSA respondents who had a main wave 3 interview were asked – in the final questions section of the interview – to carry out a separate Life History Interview at a later date (also referred to as Retrospective interviews) (detailed below). Respondents were given an appointment card which had spaces to fill in some details which would be covered in the interview, namely residences and jobs they had had for six months or more. Whenever possible the same interviewer who carried out the wave 3 interview also conducted the life history interview (the interview content is detailed in Section 3.5). The life history interviews took place from February to October 2007. The time between the wave 3 interview and the life history interview ranged from less than a month to over 6 months. Telephone interviews

Life history follow up rules
The Life History Interview consisted of the following ELSA Wave 3 sample members:

- Respondents who answered that they were willing to take part in the life history interview when asked at the end of their main ELSA Wave 3 interview.
- Respondents who had a productive Wave 3 interview but said they were not willing to take part in the life history interview AND live in the same household as a respondent who was willing to take part in the life history interview.
- Respondents who refused to take part in the ELSA Wave 3 interview AND live in the same household as a respondent who was willing to take part in the life history interview.

As the Life History sample was prepared during the Wave 3 fieldwork, households who had not been interviewed by the 19th April 2007 were excluded.

4.11 Telephone interviews

Setting up the Telephone Interview
The only respondents eligible for telephone interviews were those who had refused to participate in ELSA at both Waves 2 and Wave 3. The information given by the face to face interviewer at the last attempt to interview each respondent was checked to ensure that telephone interviewers would not be calling any respondents who gave a very strong indication that they did not wish to be contacted again, or who had requested that we remove them from the ELSA database.

The households contacted contained up to two eligible people in a household. Every household being issued for the telephone interview contained at least one core member. The telephone interviews were carried within the main interview fieldwork period; they began in late March 2007 and spanned 1 month, finishing in April 2007.

Telephone interview content

The telephone interview was very short, lasting approximately 10 minutes, and included the following items:

- A quality control section – this included questions on respondents' experience of being interviewed for ELSA, and ways in which we might be able to encourage them to take part in the study once more in the future
- Followed by 10 questions which relate to health, work and benefits, marital status, and accommodation; most taken directly from the main face-to-face interview and (in a very basic way) covering key areas of the ELSA main interview

5 FIELDWORK RESPONSE IN WAVE 3

This chapter presents information about the fieldwork response rates achieved in wave 3 and corresponds with those published in the methodology chapter in the full report of the survey (Scholes et al., 2008b). It shows the progress of the sample (Cohorts 1 and 3) whose selection was described in Chapter 2.

The chapter begins with an explanation of how ineligibility and unknown eligibility were 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). Section 5.4 provides the fieldwork contact, co-operation and household response rates for core members (who are the main group of interest) and Section 5.5 presents the individual response rate.

This chapter focuses on response during the fieldwork period for wave 3 (May 2006 to August 2007) and is largely based on the *issued* sample. It does *not* take account of other groups, such as individuals who were not followed up for interview, perhaps because the household did not respond at HSE or *all* responding members in the household at the end of the wave 1 interview (Cohort 1) refused to be recontacted subsequently. A discussion of differential non-response to the ELSA study as a whole, which takes a broader account by including these other important groups, is presented in Chapter 6. Chapter 7 uses the most recent data to update an 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 was calculated, this section describes why 1,113 Cohort 1 core members became ineligible (i.e. left the target population) by the time of wave 3 (2006-07) and explains how the subgroup of individuals whose eligibility was unknown was treated. Definitions of the contact, co-operation and response rates are presented in Sections 5.4 and 5.5. Within relevant sections Cohorts 1 and 3 are discussed in turn.

[13] This was information about deaths of wave 1 and wave 2 respondents who had agreed to have their records linked to the National Health Service Central Register (NHSCR) and was provided by the Office for National Statistics. The mortality update provided information about deaths before the start of wave 3 fieldwork which was used to determine the composition of the issued sample.

Ineligibility

The response rates presented throughout this report excluded known ineligible core members from the denominator. Cohort 1 core members thought to be eligible for an interview prior to/during wave 3 fieldwork were 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).

ELSA analyses primarily focus on the target population; persons aged 50 and over living in a private residential address. Core members interviewed in institutions (whether in person or by proxy) would, in this sense, be considered to be ineligible. Core members interviewed in institutions in ELSA wave 3 are considered throughout this report as ineligible.

1,113 Cohort 1 core members became ineligible by the time of wave 3. This represents 10% of all 11,391 Cohort 1 core members successfully interviewed in wave 1 (2002-03). The reasons for ineligibility by age are shown in Table 5-1.

Table 5-1 Reasons for ineligibility, by age and sex

Ineligible Cohort 1 core members in wave 3 (2006-07)

Reason for ineligibility	Men			Women			
	54-59 %	60-74 %	75+ %	54-59 %	60-74 %	75+ %	Total %
Deaths	60	79	94	48	76	86	85
Moves out of Britain	40	19	2	52	21	1	8
Institutional moves	-	3	4	-	3	13	7
Base (unweighted)	*25*	*183*	*368*	*23*	*124*	*390*	*1113*

Notes: 47 Cohort 1 core members were successfully interviewed in institutions in wave 3 (2006-07), 32 by proxy and 15 in person, but are treated in this report as ineligible. Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Columns may not sum to 100% because of rounding. '-' represents zero.

The overwhelming reason for becoming ineligible was through death (85%). This is not surprising given the age of the ELSA sample. 8% of Cohort 1 core members had moved out of Britain. 76 core members had moved from a private household into an institution, most likely a residential or nursing home (7%).

Unknown eligibility

Core members in wave 3 not known to be ineligible can be divided into two categories: cases whose eligibility was known and those whose eligibility was unknown. Known eligibility means essentially that the core member remained a member of the target population in wave 3 and should therefore be included in the response rate calculation. In some cases, eligibility may have been unknown because the household was unwilling to provide information needed to make that determination or could not be traced.

Since the denominator of any response rate measure 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 Cohort 1 core members not traced in wave 3 would have become ineligible by 2006-07 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). By the time of wave 3 this figure had decreased to 2.2% (consisting of non-contacts and those not successfully traced). The response rate calculations set out in this chapter made the assumption that most of the sub-groups with unknown eligibility were in fact eligible.

Eligible but not issued to field

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

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 residential addresses).

Core members not known to have died and living in a household whose respondents in waves 1 or 2 all refused to be recontacted were considered eligible for the ELSA study (they were considered to still belong to the target population) but were *not* issued to field in 2006-07. 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 Section 5-4. They were included in the denominator for the individual response rate (Section 5-5).

5.2 Full, proxy and partial interviews achieved (Cohort 1)

Table 5-2 shows the 7,535 Cohort 1 core members interviewed in wave 3 (2006-07) by: (1) their pattern of response over the first three waves (core members, by definition, took part in wave 1) and (2) the type of interview (i.e. full or partial interview, interviewed in person or by proxy, and whether they were interviewed in an institution). 47 Cohort 1 core members (less than one percent) were interviewed in an institution.[14] Table 5-3 shows the subset of 7,488 Cohort 1 core member respondents who were, at the ELSA 2006-07 interview, still living in a private residential address.

[14] The mean age of Cohort 1 respondents interviewed in an institution (either in person or by proxy) was 84 years (minimum 62, maximum 97). The mean age for those giving a full interview in person was 68 years (minimum 54, maximum 102). Age defined as age in 1 March 2006.

Table 5-2 Core member respondents in wave 3, by pattern of response and type of interview

Cohort 1 core member respondents in wave 3 (2006-07), including those in institutions

	Number of respondents	%
Pattern of response		
All three waves	7197	96
Missed wave 2	338	4
Type of interview in wave 3		
Full interview in person	7304	97
Full interview by proxy	121	2
Partial interview in person	63	1
Institutional interview in person	15	0
Institutional interview by proxy	32	0
Base (unweighted)	*7535*	*100*

Table 5-3 Core member respondents living in private households, by situation in wave 3

Cohort 1 core member respondents who lived in a private residential address in wave 3 (2006-07)

	Number of respondents	%
Pattern of response		
All three waves	7168	96
Missed wave 2	314	4
In institution/out of GB in wave 2	6	0
Type of interview in wave 3		
Full interview in person	7304	98
Full interview by proxy	121	2
Partial interview in person	63	1
Base (unweighted)	*7488*	*100*

Note: Columns may not sum to 100% because of rounding.

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 and self-completion questionnaire. 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) or a particular item/question (e.g. amount of income from current savings).

Proxy and partial interviews are discussed below; item and module non-response are covered in Section 5.3. Differential non-response to the self-completion questionnaire is discussed in Section 6.4.

Proxy interviews

Where a sample 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.

200 proxy interviews were conducted in a private residential address in wave 3 (2% of total interviews); 121 of these were with Cohort 1 core members (2% of core member non-institutional interviews). This compares with 125 proxy interviews in wave 2 (1.3% of total interviews); 92 with core members (1% of core member interviews).

These cases are likely to be excluded from some analyses of ELSA data, mainly because a much reduced set of information is available for these people. As the number of proxy interviews is growing (and is likely to grow in future waves as Cohort 1 ages) it is important to be aware of their characteristics and to check whether any issues might arise from excluding them from analyses.

Table 5-4 compares the full interview and proxy respondents in wave 3, by age and sex (presented for Cohort 1 core members only). 50% of female proxy respondents were aged 80 and over, compared with 34% of men. The equivalent figures for those completing a full interview in person were 14% and 12% respectively.

Table 5-4 Full interview and proxy respondents, by age and sex

Cohort 1 core member full interview and proxy respondents in wave 3 (2006-07), excluding those who lived in institutions

Age in wave 3	Full interview respondents			Proxy respondents		
	Men %	Women %	Total %	Men %	Women %	Total %
54-59	27	27	27	14	8	11
60-64	18	18	18	8	8	8
65-69	16	15	16	19	5	12
70-74	16	14	15	12	16	14
75-79	11	12	12	14	13	13
80-84	8	8	8	8	13	11
85 and over	4	6	5	25	37	31
Base (unweighted)	*3257*	*4047*	*7304*	*59*	*62*	*121*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Columns may not sum to 100% because of rounding.

Tables 5-5 and 5-6 compare the full interview and proxy respondent sample (Cohort 1 core members) by limiting long-standing illness and current work activity respectively (both measured in wave 3). Relative to those core members completing a full interview in person, proxy respondents were more likely to have had a limiting long-standing illness and a current work status of being permanently sick or disabled. 76% of proxy respondents had a limiting long-standing illness; 21% were permanently sick or disabled. The equivalent figures for those completing a full interview in person were 36% and 5% respectively. Such differences were expected due to the stringent rules employed to qualify for a proxy interview (see Section 4.4).

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

Cohort 1 core member full interview and proxy respondents in wave 3 (2006-07), excluding those who lived in institutions

Limiting long-standing illness	Full interview respondents			Proxy respondents		
	Men %	Women %	Total %	Men %	Women %	Total %
No long-standing illness	44	42	43	14	21	17
Long-standing illness	23	20	21	3	10	7
Limiting long-standing illness	33	38	36	83	69	76
Base (unweighted)	*3255*	*4043*	*7298*	*59*	*62*	*121*

Table 5-6 Full interview and proxy respondent sample, by work activity and sex

Cohort 1 core member full interview and proxy respondents in wave 3 (2006-07), excluding those who lived in institutions

Current work activity	Full interview respondents			Proxy respondents		
	Men %	Women %	Total %	Men %	Women %	Total %
Retired/semi-retired	61	58	60	62	65	63
Employed	24	20	22	7	3	5
Self-employed	7	3	5	3	2	3
Unemployed	1	0	1	-	-	-
Permanently sick or disabled	5	4	5	28	15	21
Looking after home or family	1	14	8	-	16	8
Base (unweighted)	*3255*	*4042*	*7297*	*58*	*62*	*120*

Notes: '-' represents zero. Columns may not sum to 100% because of rounding.

Partial interviews

A further subgroup of individuals only responded to part of the wave 3 interview. A total of 93 individuals gave a partially completed interview (1% of total interviews); of these 76 were core members (1% of core member interviews). The implication of this for analysis is that there were 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

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. However it should be recognised that in the wave 3 interview not all sections required responses from every individual:

- 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 3.3).

- 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 5-7 gives the response rates for the three key sections of the main questionnaire (Housing, Income and Assets, and self-completion questionnaire). Note that these are response rates calculated amongst respondents in 2006-07. Only respondents to the main interview in person were asked to fill in the self-completion questionnaire. A household, 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 complete.

Table 5-7 Response rates to key sections

Respondents in wave 3 (2006-07), self-completion excludes proxies

Section	Total eligible	Level	Response rate %
Housing[16]	6483	Household	99.9
Income & Assets (IA)[17]	7097	Financial unit	99.0
Self-completion questionnaire[18]	9539	Individual	86.4

The analysis showed that the levels of response for the Housing and Income and Assets sections were very high (above 99%). As in waves 1 and 2, the level of response for the self-completion questionnaire (86% in 2006-07) was sufficiently low to warrant further investigation. Response to the self-completion questionnaire for Cohorts 1 and 3 was 88% and 80% respectively ($p<0.001$, results not shown). In addition, 2,423 respondents returned the additional self-completion questionnaires which included health vignettes while 2,497

[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).

respondents returned the additional self-completion questionnaire with work-related vignettes (described in Section 3.1.1). This represents a response rate of 78% and 79%, respectively, but it should be noted that these were presented as 'optional' rather than a key part of the core survey. Further information about weighting to address differential non-response to the self-completion questionnaire is given in Chapter 6.

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 waves 1 and 2, the discussion and analysis is restricted to financial information because it is 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 waves 1 and 2, 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 related 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]

[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

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

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 Fieldwork contact and co-operation rates

This section sets out the fieldwork contact and co-operation rates achieved in 2006-07. When considering contact and co-operation rates the focus was on 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 7 because interviewers are not given the opportunity to interview all non-respondents. For example, a sub-group of Cohort 1 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). Core members within these households were removed from the denominator when considering fieldwork contact and co-operation rates – but were included in the denominator for the individual response rate presented in Section 5.5 as they were considered to 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 3 fieldwork activity and were based on the sub-group of Cohort 1 core members who were issued to field in 2006-07 are outlined in this section. In both instances, respondents were defined as those who gave a full or partial interview at a private residential address either in person or by proxy. Contact and co-operation rates are covered in turn.

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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.

[20] Financial and benefit units were defined in Section 3.3.

Fieldwork household contact rate

Over the full fieldwork period (May 2006 to August 2007) 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 an individual co-operation rate of 83% 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.

5.5 Individual response rate

The individual response rate was calculated by dividing the number of achieved individual interviews by the number of *eligible* individuals (that is to say, individuals not known to have died, moved out of Britain or moved out of the private residential sector). Again respondents were defined as those who gave a full or partial interview at a private residential address either in person or by proxy. Cohorts 1 (core members) and 3 (age-eligible sample members) are discussed in turn.

Cohort 1

An individual response rate of 73% was achieved for Cohort 1 core members (Table 5-8). The individual response rate presented here was defined for Cohort 1 core members as the 'total respondents to wave 3 divided by total individuals eligible for wave 3'. By eligible we mean that core members were *not* known to have died, moved into an institution or moved outside Great Britain.

As this rate was defined for Cohort 1 core members the response rate was conditional upon response in wave 1 (as core members, by definition, took part in ELSA wave 1). However, inclusion in either the numerator or denominator was *not* conditional upon response in wave 2. Hence the total respondents in wave 3 included those Cohort 1 core members who returned to the ELSA study after missing wave 2. (For more details on conditional response rates see Chapter 7).

The reasons for non-response for Cohort 1 core members *issued* to field in wave 3 are presented in Table 5-8 and by age-group in Table 5-9. As in wave 2, the largest component (over three-quarters) of non-response was a result of refusals (Table 5-8). Of non-responders 7% were individuals who could not be found (no change from wave 2). The second largest category of non-response was 'other', grouping together such reasons as being ill or away during the survey period.

Table 5-8 Individual response rate (Cohort 1)

Eligible Cohort 1 core members in wave 3 (2006-07)

Outcome in wave 3	Frequency	% of eligible respondents	% of non-respondents
Total eligible			
Respond[a]	7488	73	
Non-respond	2790	27	
Non-respondents *issued* to field[b]			
Refusal	1454	14	76
Other	226	2	12
Moved – unable to trace	142	1	7
Non-contact	88	1	5

[a] *Excludes 47 institutional interviews.* [b] *Analysis conducted on Cohort 1 core members identified as eligible in wave 2, issued to field in wave 3 and not known to have become ineligible in 2006-07 through deaths, institutional moves or moves out of Britain.*

27% of Cohort 1 core members non-responding through 'other' reasons such as being ill or away during the survey period were aged 80 years and over (Table 5-9). 46% of eligible Cohort 1 core members issued but refusing to take part in wave 3 were below the age of 60.

Table 5-9 Reasons for non-response, by age

Eligible Cohort 1 core members issued but non-respondents in wave 3 (2006-07)

Age in wave 3	Refusal	Other	Moved – unable to trace	Non-contact	Total
	%	%	%	%	%
54-59	26	17	39	31	27
60-64	20	11	23	24	18
65-69	17	15	11	17	16
70-74	14	16	8	6	14
75-79	11	13	8	7	11
80-84	8	12	6	8	8
85 and over	4	16	6	8	6
Base (unweighted)	*1454*	*226*	*142*	*88*	*1910*

Note: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork.

A judgement of the impact of any differential non-response is reserved for Chapter 6 where bias is examined.

Cohort 3

The equivalent contact and co-operation rates for age-eligible sample members in Cohort 3 sampled from the 2001-2004 HSE years were 83% and 74% respectively.

Overall, 1,276 Cohort 3 core members were successfully interviewed in 2006-07. Table 5-10 summarises the individual response rate for the three different groups who were correctly sampled as age-eligible sample members, i.e. excluding cases born in the missing year of birth (described in Section 2.3). A response rate of 60% was achieved among the 1,877 age-eligible sample members born between 1 March 1953 and 29 February 1956 followed up for interview in 2006-07. Not surprisingly a higher response rate of 74% was achieved amongst those Cohort 1 young partners already included in the ELSA study.

Table 5-10 Individual response rate (Cohort 3)

Age-eligible sample members (Cohort 3) from HSE 2001-2004 issued for follow-up in 2006-07

Sample member type	Issued	Respond	Non-respond	Ineligible	Response rate %[a]
Age-eligible sample members (C3SM) correctly sampled					
In non-overlapping households	1877	1109	733	35	60
In overlapping (HSE 2001) households	15	5	10	-	33
Cohort 1 young partners	80	59	21	-	74
Total	*1972*	*1173*	*764*	*35*	*61*

[a] *Response rate calculated as respondents/(respondents + non-respondents) x 100*

Reasons for non-response are given in Table 5-11 (all age-eligible sample members from the HSE 2001-2004 years combined). The largest component (over half) of non-response was a result of refusals. Just under a third of non-respondents, however, were individuals who had moved and could not be traced.

Table 5-11 Reasons for non-response (Cohort 3)

Age-eligible sample members (Cohort 3) from HSE 2001-04 issued for follow-up in 2006-07

Outcome in wave 3	Frequency	% of eligible respondents	% of non-respondents
Total eligible[a]			
Respond	1173	61	
Non-respond	764	39	
Non-respondents			
Refusal	407	21	53
Moved – unable to trace	231	12	30
Other	72	4	9
Non-contact	54	3	7

Notes: [a] This analysis focused on the 1,972 age-eligible sample members who were issued to field in wave 3 (20 and 15 cases became ineligible through moves out of Britain and deaths respectively) – who were born between 1 March 1953 and 29 February 1956 (and so excluded cases born in the missing year of birth). Columns may not sum to 100% due to rounding.

6 DIFFERENTIAL NON-RESPONSE AND WEIGHTING

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 target population exactly. If certain types of households or individuals were more or less likely to participate in HSE and/or ELSA waves 1-3 then the non-response cannot be considered to be random and failure to take this into account may mean that the analysis of core members successfully taking part at each particular wave 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 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 3 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 aged 50+ living in private residential addresses).

The equal probability sampling design of the HSE (described in Section 2.1.1), 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 and refusals to be recontacted (both HSE and ELSA) over some eight years of data collection all had the potential to make the respondent sample in wave 3 (2006-07) somewhat unrepresentative of the population.

This section examines the differential nature of non-response to ELSA and outlines the weighting strategy used to reduce the potential for bias. Section 6.1 outlines the response pattern for the 11,391 Cohort 1 core members successfully interviewed in wave 1 (the ‘baseline’ year). A distinction is made between: 1) total response, 2) attrition non-response, and 3) non-attrition non-response. Figure 6-1 graphically displays response across the waves: and will be referred to at various points in the rest of the report. Section 6.2 examines the differential nature of non-response to the wave 3 main interview. The weighting strategy

undertaken is described in Section 6.3; taking the longitudinal and cross-sectional weights in turn. Advice on using the weights is provided in the "Wave 3 User Guide" available from the UK Data Archive. Section 6.4 examines the differential nature of non-response to the wave 3 self-completion questionnaire. In the final section (Section 6.5) response across all waves is examined by using HSE/ELSA wave 1 characteristics to identify the factors associated with total response, attrition non-response and non-attrition non-response.

6.1 Response across the waves

The response patterns across the three waves are shown in Figure 6-1: **X** denotes a response at a given wave, **O** denotes a non-response and **I** denotes *known* ineligibility through the events of deaths, institutional moves or moves out of Britain. As an illustration, of the 8,781 Cohort 1 core members who successfully responded in wave 2 (group XX), 7,168 also responded in wave 3, 1,192 failed to respond and 421 were known to be ineligible (groups XXX, XXO and XXI respectively).

Table 6-1 below focuses on the subset of 10,180 Cohort 1 core members who were considered eligible at every wave and classifies the response pattern over ELSA waves 1-3 into three groups (Kalton and Brick, 2000):

- total respondents: who provided data on every wave (XXX);
- *attrition* non-respondents: who dropped out of the study at some wave after the first and remained out of the study for all subsequent waves (XOO and XXO)[21]; and
- *non-attrition* non-respondents: who returned to the study after missing one or more waves (XOX).

Table 6-1 Response patterns for Cohort 1 core members

Cohort 1 core members eligible over all three waves

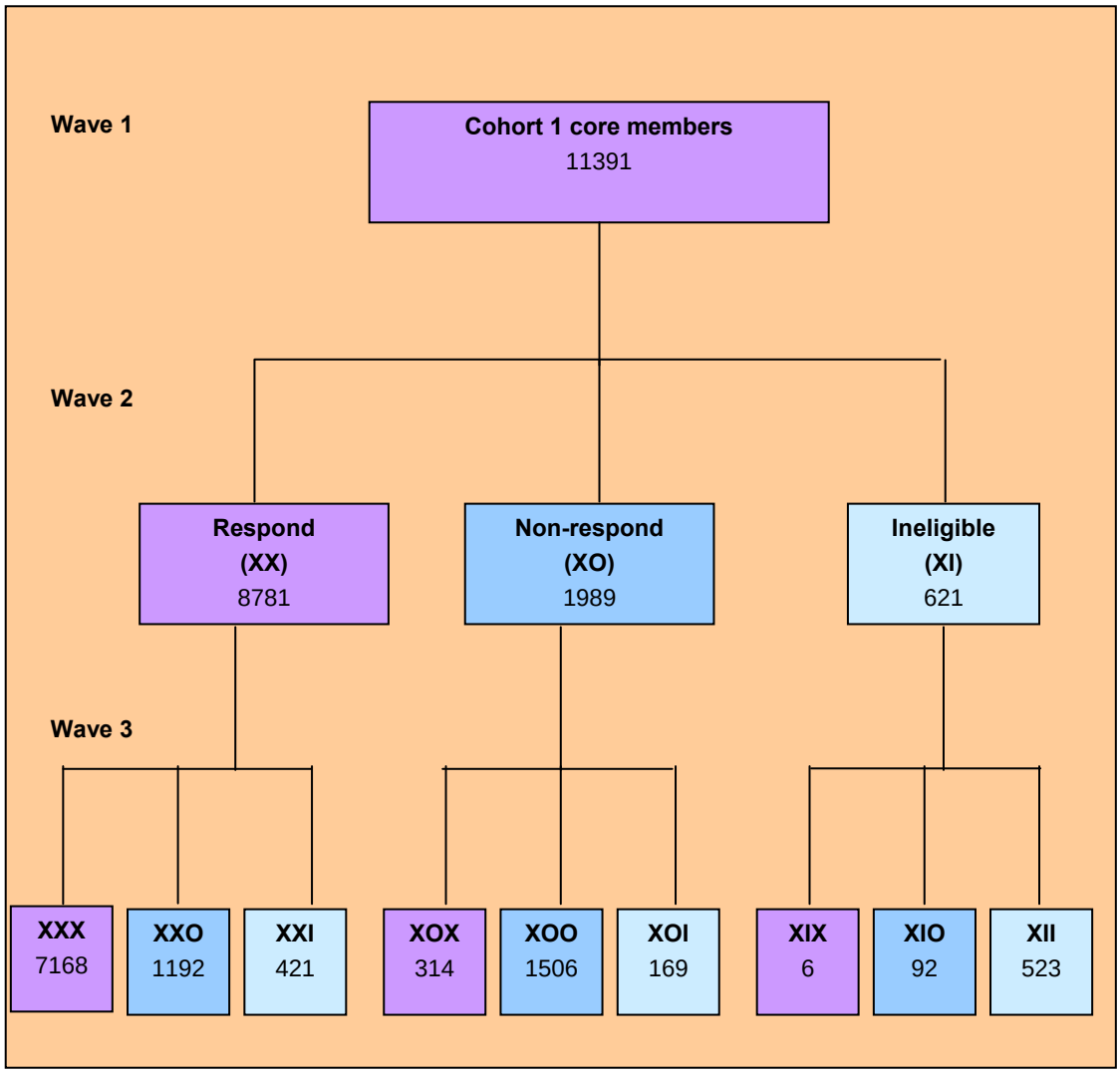
Pattern of response	Number of respondents	%
All three waves: total response (XXX)	7168	70
Attrition non-response:		
XXO	1192	12
XOO	1506	15
Non-attrition non-response (XOX)	314	3
Base (unweighted)	*10180*	*100*

70% of Cohort 1 core members eligible over ELSA waves 1-3 had taken part in all waves. Just below three-in-ten (27%) had dropped out of ELSA after either the first or second wave and remained out of the study in wave 3. 3% of core members returned to the study in 2006-07 after missing wave 2. The final section of this chapter (Section 6.5) outlines an analysis of the HSE/ELSA wave 1 characteristics significantly associated with total response, attrition non-response and non-attrition non-response.

[21] Some of these cases may, of course, come back to the ELSA study in wave 4 or later.

Figure 6-1 Response across ELSA waves 1-3 (Cohort 1 core members)

X Respond
O Non-respond
I Ineligible



6.2 Differential non-response in wave 3

This section examines the differential nature of non-response to the wave 3 main interview. The age-sex profile of core member respondents is shown: Cohorts 1 and 3 are discussed in turn.

6.2.1 Cohort 1

Profile of main interview respondents (excluding those in institutions)

7,488 Cohort 1 core members were successfully interviewed in wave 3; 66% of the 11,391 cases interviewed in wave 1 (2002-03) and 73% of the 10,278 cases remaining eligible in 2006-07 (see Table 5.8). The age-by-sex profile of core member respondents is shown in Table 6-2. The achieved sample contained more women than men, as expected, and that there were relatively more older women than men.

Table 6-2 Wave 3 respondents (Cohort 1), by age and sex

Core member respondents in wave 3 (2006-07), including proxies but excluding those who lived in institutions

Age in wave 3	Men	Women	Total	Men	Women	Total
				%	%	%
54-59	898	1101	1999	27	27	27
60-64	612	721	1333	18	17	18
65-69	550	621	1171	16	15	16
70-74	517	587	1104	15	14	15
75-79	359	516	875	11	12	12
80-84	255	328	583	8	8	8
85 and over	150	273	423	4	7	6
Base (unweighted)	*3341*	*4147*	*7488*	*100*	*100*	*100*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Columns may not sum to 100% due to rounding.

Analysis of response to main interview

An analysis of non-respondents helped to identify the potential for bias in the respondent sample. Table 6-3 shows the main interview response rates for Cohort 1 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. The analysis focused on the 10,180 Cohort 1 core members eligible in ELSA waves 2 and 3.[22] The data was weighted by the wave 1 main interview weight.

Table 6-3 shows that among women, 74.4% aged 50-59 in wave 1 (2002-03) and 70.7% aged 75 and over responded in wave 3 (2006-07). The equivalent figures for men were narrower (74.3% and 71.3%, respectively). Table 6-4 shows response in wave 3 increasing from the lowest wealth quintile to the highest. 79.1% of men in the richest wealth quintile successfully responded in wave 3, compared with 67.5% in the poorest quintile. The equivalent figures for women were 77.7% and 68.1%.

[22] Groups XXX, XXO, XOX and XOO in Figure 6-1.

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

Eligible Cohort 1 core members in all waves

Age in wave 1					
		50-59 %	60-74 %	75 and over %	Total %
Men	Respondents	74.3	72.3	71.3	73.1
	Non-respondents	25.7	27.7	28.7	26.9
Women	Respondents	74.4	73.8	70.7	73.4
	Non-respondents	25.6	26.2	29.3	26.6
All	Respondents	74.3	73.1	70.9	73.2
	Non-respondents	25.7	26.9	29.1	26.8
Bases (unweighted)					
Men		*1886*	*2027*	*649*	*4652*
Women		*2241*	*2394*	*983*	*5618*
All		*4127*	*4421*	*1632*	*10180*
Bases (weighted)					
Men		*2066*	*1958*	*641*	*4665*
Women		*2133*	*2257*	*1085*	*5475*
All		*4199*	*4215*	*1726*	*10140*

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

Table 6-4 Wave 3 main interview response (Cohort 1), by (non-housing) wealth quintile and sex

Eligible Cohort 1 core members in all waves

Wealth quintile in wave 1					
	Poorest %	2nd %	3rd %	4th %	Richest %
Men					
Respondents	67.5	69.2	71.9	75.5	79.1
Non-respondents	32.5	30.8	28.1	24.5	20.9
Women					
Respondents	68.1	71.9	72.7	77.0	77.7
Non-respondents	31.9	28.1	27.3	23.0	22.3
All					
Respondents	67.8	70.7	72.3	76.3	78.4
Non-respondents	32.2	29.3	27.7	23.7	21.6
Bases (unweighted)					
Men	*796*	*783*	*896*	*1003*	*1050*
Women	*1114*	*1100*	*1144*	*1087*	*1113*
All	*1910*	*1883*	*2040*	*2090*	*2163*
Bases (weighted)					
Men	*848*	*801*	*913*	*1022*	*1043*
Women	*1101*	*1090*	*1120*	*1048*	*1062*
All	*1949*	*1891*	*2033*	*2070*	*2105*

Notes: Excludes those with a non-responding spouse in 2002-03. Response rates weighted by the wave 1 interview weight.

6.2.2 Cohort 3

Profile of main interview respondents

1,276 Cohort 3 core members were successfully interviewed in wave 3 (2006-07). As shown in Table 2-5, 1,173 responding core members were issued as age-eligible sample members (born between 1 March 1953 and 29 February 1956) and 103 were reclassified from Cohort 1 young partners/Cohort 3 old partners to core members as they were born in the missing year of birth (1 March 1952 to 28 February 1953). The age-by-sex profile of the 1,173 Cohort 3 core members born between 1 March 1953 and 29 February 1956 is shown in Table 6-5. For both men and women, the age distribution was evenly split across the 50, 51 and 52 age bands.

Table 6-5 Wave 3 respondents (Cohort 3), by age and sex

Cohort 3 core member respondents in wave 3 (2006-07) excluding those in the missing year of birth (1 March 1952 and 28 February 1953)

Age in wave 3	Men	Women	Total	Men	Women	Total
				%	%	%
50	177	220	397	33	35	34
51	172	209	381	32	33	32
52	188	207	395	35	33	34
Base (unweighted)	*537*	*636*	*1173*	*100*	*100*	*100*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Columns may not sum to 100% due to rounding.

Analysis of response to main interview

An analysis of non-respondents helped to identify the potential for bias in the respondent sample. Table 6-6 shows the main interview response rates by age and sex; Table 6-7 shows response by highest educational qualification in the relevant HSE interview. The analysis focused on the 1,937 individuals from the 2001-2004 HSE years who were correctly sampled as age-eligible sample members (described in Section 2.3); excluding, therefore, cases in the missing year of birth (1 March 1952 and 28 February 1953) and 35 individuals known to have become ineligible by 2006-07 through deaths and moves out of Britain.

Table 6-6 shows that 62% of women successfully responded at the time of the ELSA 2006-07 interview, compared with 59% of men. Response was higher for those age-eligible sample members with a degree or equivalent (Table 6-7). 64.2% of men with a degree or equivalent successfully responded in 2006-07, compared with 47.3% with no educational qualifications. The equivalent figures for women were 69% and 60%.

Table 6-6 Wave 3 main interview response (Cohort 3), by age in wave 3 and sex

Age-eligible sample members followed up from 2001-2004 HSE years

Age in wave 3		50	51	52	Total
		%	%	%	%
Men	Respondents	61.0	57.9	56.8	58.5
	Non-respondents	39.0	42.1	43.2	41.5
Women	Respondents	61.1	63.3	62.9	62.4
	Non-respondents	38.9	36.7	37.1	37.6
All	Respondents	61.1	60.8	59.8	60.6
	Non-respondents	38.9	39.2	40.2	39.4
Bases (unweighted)					
Men		*290*	*297*	*331*	*918*
Women		*360*	*330*	*329*	*1019*
All		*650*	*627*	*660*	*1937*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork.

Table 6-7 Wave 3 main interview response, by highest educational qualification (at HSE) and sex

Age-eligible sample members followed up from 2001-2004 HSE years

Highest educational qualification at HSE	Degree or equivalent	A level/ higher education below degree	O level or other	CSE or other	No qualifications
	%	%	%	%	%
Men					
Respondents	64.2	60.2	64.2	52.5	47.3
Non-respondents	35.8	39.8	35.8	47.5	52.7
Women					
Respondents	68.8	65.3	60.5	53.2	60.2
Non-respondents	31.2	34.7	39.5	46.8	39.8
All					
Respondents	66.4	62.5	62.0	52.9	54.6
Non-respondents	33.6	37.5	38.0	47.1	45.4
Bases (unweighted)					
Men	*201*	*261*	*190*	*59*	*207*
Women	*189*	*219*	*263*	*79*	*269*
All	*390*	*480*	*453*	*138*	*476*

6.3 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 (who may not be assigned a positive longitudinal weight).

In the second wave of ELSA (2004-05), however, only responding core members in wave 1 were followed up for interview. It is for this reason that the wave 2 main interview weight supplied with the data supported both cross-sectional and longitudinal analysis. At wave 3, however, this no longer held true as new entrants joined the study (the 'refresher' cohort of persons just entering their 50s in wave 3) and a significant number of Cohort 1 core members returned to the study in wave 3 after being unproductive in wave 2.

Both longitudinal and cross-sectional weights were created in wave 3. This section describes the weighting strategies used to create the weights in order to: (1) account for non-response and (2) combine Cohorts 1 and 3 to facilitate weighted analysis of respondents aged 50 and over in 2006-07. The cross-sectional and longitudinal weights constructed using response to the ELSA 2006-07 interview as the outcome variable are described in turn, beginning with the longitudinal weight. The weighting strategy employed to account for non-response to the self-completion questionnaire is covered in Section 6.4.

6.3.1 Longitudinal weight

An analysis of non-respondents using the full range of information collected at earlier waves helped to identify the potential for bias in the respondent sample. For 8,360 Cohort 1 core members who took part in waves 1 and 2 and were eligible for the main interview in wave 3 (irrespective of whether followed up for interview in wave 3), response in 2006-07 was modelled on a full range of household and individual level information collected from both HSE and ELSA waves 1 and 2.[23] The analysis was conducted on data weighted by the wave 2 main interview weight so that the wave 3 non-response adjustment was made contingent on the already derived weight (the final wave 3 *longitudinal* weight was a product of the existing wave 2 weight and the wave 3 non-response adjustment).

The results showed significant differences between core member respondents and non-respondents on a number of characteristics.[24] Non-responders in wave 3 (14% of those eligible) were more likely than responders to have the following socio-demographic features:

- not interviewed in HSE[25];
- sampled from HSE 1998 or 1999 (rather than 2001);
- living in London during wave 2;
- non-white ethnicity;
- renting in wave 2 compared with those who owned their property outright;
- fair or poor self-assessed health in wave 2;

[23] Groups XXX and XXO in Figure 6-1.
[24] The logistic regression model of response to the main interview is shown in Appendix B.
[25] A small minority (1.6%) of the 11,391 Cohort 1 core members successfully interviewed in wave 1 were non-respondents in HSE.

- living in urban areas during wave 2 compared with those in 'villages'[26];
- limiting long-standing illness in wave 2; and
- CSE/other or no educational qualifications compared with those with a degree or equivalent (recorded in wave 1).

Differences in the age-by-sex distribution of achieved samples of Cohort 1 core members across all three waves are shown in Table 6-8. The analysis focused on those core members who had responded at all waves up to and including wave *t* ('total respondents at each wave': shown in Figure 6-1 by groups XX and XXX in waves 2 and 3 respectively). Among men, the percentage of core member respondents aged 75 and over decreased from 17% in wave 1 (2002-03) to 14% in wave 3 (2006-07). The equivalent figures for women were 25% and 19% respectively.

Table 6-8 Weighted comparison of wave 1-3 achieved samples, by age and sex

Cohort 1 core member respondents in all waves up to and including wave t

Age in wave 1	Wave 1			Wave 2			Wave 3		
	Men %	Women %	Total %	Men %	Women %	Total %	Men %	Women %	Total %
50-54	23	20	21	24	21	22	24	22	23
55-59	18	16	17	19	17	18	20	18	19
60-64	16	14	15	16	15	15	16	15	16
65-69	14	13	13	14	13	14	15	13	14
70-74	12	12	12	12	12	12	12	13	12
75-79	9	11	10	8	11	10	8	10	9
80-84	5	7	6	5	7	6	4	6	5
85 and over	3	6	5	2	5	4	2	3	3
Bases									
Unweighted	*5186*	*6205*	*11391*	*3950*	*4831*	*8781*	*3192*	*3976*	*7168*
Weighted	*5279*	*6111*	*11390*	*4047*	*4734*	*8781*	*3269*	*3899*	*7168*

Notes: Age in wave 1 defined as age in 1 April 2002, beginning of wave 1 fieldwork. Each distribution weighted by the weight defined at wave t (longitudinal weight in wave 3).

A longitudinal weight was calculated in wave 3 for the set of 7,168 Cohort 1 core members who had responded to all three waves of ELSA and were, at the time of each interview, still living in a private residential address. The sequential nature of the longitudinal weighting[27] meant that the intention was to reduce any bias arising specifically from:

- failure to respond at HSE 1998, 1999 or 2001;
- refusals to be recontacted post HSE; and
- non-response in ELSA waves 1, 2 and 3.

[26] For more information on the urban/rural indicator used in the analysis of response (produced by the Department of the Environment, Food and Rural Affairs and available at the Census Output Area level) see Bibby and Shephard (2005).

[27] That is to say, longitudinal weights are based on a sequence of non-response models for each wave. The non-response weight created in wave *t* is multiplied by the weight created at the preceding wave. In this case, the longitudinal weight derived in wave 3 (2006-07) built on the wave 2 weight (created in 2004-05), which, in turn, built on the weight created in wave 1 (2002-03).

Wave 1 weighting strategy

In summary, the main wave 1 interview weight was created in two steps. First, non-response in wave 1 was modelled using information collected at the HSE interview (age-eligible sample members were selected from HSE responding households only; see Section 2.1). The modelling was conducted in a similar way to the wave 3 modelling described above, but only using information collected at HSE. The non-response weighting aimed to correct for any differences in characteristics found between respondents and non-respondents by giving greater weight to those subgroups with lower response rates (e.g. men aged 50-54, women aged 85 and over and those living in London). The second step was a (post-stratification) adjustment to ensure that the ELSA 2002-03 core member respondent age-by-sex distribution[28] matched the Census 2001 non-institutionalised distribution.

Wave 2 weighting strategy

The weighting strategy in wave 2 (2004-05) was similarly aimed at reducing any bias arising from sample loss after wave 1. For those Cohort 1 core members eligible for interview in wave 2, a response/non-response indicator was statistically modelled on a full range of household and individual-level information collected from both HSE and ELSA wave 1 interviews (details given in Scholes et al., 2008a).

Wave 3 longitudinal weighting strategy

The longitudinal weighting strategy in wave 3 aimed to reduce any bias arising from sample loss after wave 2. For those Cohort 1 core members eligible for interview in wave 3, *and* who had responded in waves 1 and 2, a response/non-response indicator was modelled on household and individual-level information collected from the previous waves.

Taking the inverse of the estimated probability of responding created a non-response weight in wave 3. For example, a response probability of 0.8 corresponds to a weight of 1.25, while a lower response probability of 0.5 corresponds to a greater weight of 2. The non-response weighting factor in wave 3 (trimmed at the top one per cent; see Appendix B) was then multiplied into the existing wave 2 main interview weight.

As an illustration of the extent to which the longitudinal weighting strategy had been successful in reducing any bias from differential non-response, Tables 6-9 and 6-10 show the relative comparison of the wave 1 and wave 3 distributions for educational status and self-assessed health respectively. Both outcomes were measured in the ELSA wave 1 (2002-03) interview. The following paragraphs discuss each variable in turn.

Educational status

In order to enable comparison, Table 6-9 shows the educational status distribution for: (1) all Cohort 1 core members in wave 1 (the 'baseline' year, shown by grey shading), (2) those responding in both the first and second waves, and (3) those responding in all three waves. The latter is shown both unweighted and weighted.

[28] Only core members were assigned positive weights in each wave; responding partners of core members were given zero weights.

Table 6-9 Weighted comparison of wave 1-3 achieved samples of core members, by educational status in wave 1

Cohort 1 core member respondents in each wave

Educational status in Wave 1	Wave 1 (wtd)	Wave 2 (wtd)	Wave 3 (unwtd)	Wave 3 (wtd)	Wave 3 relative to wave 1	
	%	%	%	%	Unwtd	Wtd
Degree or equivalent	10.8	11.1	13.1	11.4	1.22	1.06
A-level/Higher education below degree	16.8	17.3	19.3	17.6	1.15	1.05
O-level or other	15.5	16.0	17.3	16.3	1.12	1.05
CSE or other	13.4	13.3	13.3	13.2	1.00	0.99
No qualifications	43.6	42.4	37.0	41.5	0.85	0.95
Bases						
Unweighted	*11391*	*8781*	*7168*	*7168*	-	-
Weighted	*11391*	*8781*	-	*7168*	-	-

If non-response to ELSA had been uniform, then we would have expected the wave 2 and 3 distributions to mirror that for wave 1. Table 6-9 clearly shows, however, that Cohort 1 core members with a degree or equivalent were over-represented in wave 3 (13.1% compared to 10.8% in wave 1) while those with no qualifications were under-represented (37% compared to 43.6%).

Using the example of Vandecasteele and Debels (2007), the under or over-representation of a certain educational status category in wave 3 relative to wave 1 (the 'baseline' year) can be expressed by dividing the former by the latter. This is shown in the last two columns of Table 6-9. A number less than 1 indicated under-representation of the educational status category in the longitudinal sample, while a number greater than 1 denoted over-representation. So, the closer to the benchmark value of 1, the closer the wave 3 distribution mirrored the distribution in the baseline year (wave 1). Performing this analysis on both unweighted and weighted data illustrated the potential effectiveness of the longitudinal weighting in reducing bias.

Looking at the unweighted distribution in wave 3 first, it is clear that Cohort 1 core members with a degree or equivalent were over-represented in 2006-07 compared to the under-representation of those without qualifications (ratios of 1.22 and 0.85 respectively).

As to be expected, the longitudinal weighting strategy reduced, but did not eliminate, the under-representation of Cohort 1 core members without qualifications. After applying the wave 3 longitudinal weight, 41.5% of core members did not have an educational qualification in wave 1 compared to the baseline estimate of 43.6% (the unweighted estimate in wave 3 was 37%). The upweighting of Cohort 1 core members without educational qualifications via the sequential modelling of response across the waves, therefore, moved the wave 3 weighted distribution closer to that in wave 1 (increasing the ratio from 0.85 unweighted to 0.95 weighted).

Self-assessed health

A similar story emerged for self-assessed health (Table 6-10). After applying the wave 3 longitudinal weight, 6.1% of Cohort 1 core members had poor self-assessed health in wave 1 compared to the baseline estimate of 7.4% (the unweighted estimate in wave 3 was 5.6%). The upweighting of Cohort 1 core members with poor self-assessed health therefore, moved the wave 3 distribution closer to that in wave 1 (increasing the ratio from 0.75 unweighted to 0.82 weighted).

Table 6-10 Weighted comparison of wave 1-3 achieved samples of core members, by self-assessed health in wave 1 (2002-03)

Cohort 1 core member respondents in each wave

Self-assessed health in Wave 1	Wave 1 (wtd)	Wave 2 (wtd)	Wave 3 (unwtd)	Wave 3 (wtd)	Wave 3 relative to wave 1	
	%	%	%	%	Unwtd	Wtd
Excellent	12.7	13.3	14.3	14.1	1.12	1.11
Very good	28.6	29.6	30.8	29.9	1.08	1.05
Good	32.4	32.2	32.1	32.1	0.99	0.99
Fair	18.9	18.4	17.3	17.8	0.92	0.94
Poor	7.4	6.5	5.6	6.1	0.75	0.82
Bases						
Unweighted	*11391*	*8781*	*7168*	*7168*	-	-
Weighted	*11391*	*8781*	-	*7168*	-	-

Cohort 1 core members who received a longitudinal weight

The statistical literature on weighting longitudinal survey data (e.g. Kalton and Brick, 2000) distinguishes between two types of non-response:

- *Attrition* patterns of non-response describe the situation in which the longitudinal sample member appears in a wave of data collection and then fails to respond at any subsequent wave (e.g. groups XOO and XXO in Figure 6-1); and

- *Non-attrition* patterns of non-response which represent the case in which respondents at the present wave had failed to respond to one or more of the previous waves (group XOX in Figure 6-1).

Typically, longitudinal surveys only provide longitudinal weights to compensate for attrition patterns of non-response. Compensating for non-attrition non-response necessitates constructing an independent weight for each pattern of response. As Lynn et al. (1994) explain, the potential for error in such a situation is considerable. Furthermore, although the purpose of weighting a dataset is to make it 'representative' of the population, small differences between survey estimates will inevitably occur when using the different sets of weights.

Hence, as with other longitudinal studies (e.g. The British Household Panel Study or The Families and Children's Study), the longitudinal weighting strategy focused on only those Cohort 1 core members who had responded at all waves up to and including wave 3 ('total responders': shown by group XXX in Figure 6-1). At each wave, as described above, the fully

responding Cohort 1 core members were re-weighted to take account of the previous wave's respondents lost through refusal at the *current* wave or through some other form of non-response. The longitudinal weight derived in wave 3, therefore, was defined only for the set of 7,168 Cohort 1 core members who had responded at each wave up to and including the third wave.[29]

Cohort 1 core members who returned to the study in wave 3 (2006-07) after missing wave 2 were not, therefore, assigned a longitudinal weight. Possible longitudinal weighting strategies to accommodate non-attrition non-response are outlined in Lepkowski (1989) and Lynn et al. (1994). These Cohort 1 core members were, however, assigned a positive cross-sectional weight, discussed in the next section.

6.3.2 Cross-sectional weight

Longitudinal surveys are often not as good as cross-sectional surveys at providing cross-sectional estimates. For example, compared with estimates from a cross-sectional survey, cross-sectional estimates from a longitudinal survey (from wave 2 onwards) may be more likely to suffer from coverage error (because the sample was selected longer ago and may not include recent additions to the population of interest such as immigrants). Also, a longitudinal survey may experience lower response rates than a cross-sectional survey (Lynn, 2009).

Nevertheless, in order to support cross-sectional analysis of the wave 3 data (core members aged 50 and over in 2006-07), a cross-sectional weight was derived that allowed for the inclusion of new entrants (Cohort 3 core members) who, by definition, were not assigned a longitudinal weight. A number of Cohort 1 core members also returned to the study in wave 3 after missing wave 2 (groups XOX and XIX in Figure 6-1); such cases also had a zero longitudinal weight in wave 3.

All core members successfully responding in wave 3 can be described as the *combined sample*. The cross-sectional weight defined for the combined sample in wave 3 was calculated separately for the following *core members* who, at the time of the ELSA 2006-07 interview, were living in a private residential address:

- Cohort 1: fully responding cases and those who returned to the study after missing wave 2; and

- Cohort 3: the wave 3 'refreshment' sample of people just entering their 50s in 2006-07, including a number of Cohort 1 young partners who changed status in 2006-07 to become Cohort 3 core members.

The derivation of the cross-sectional weight for these two groups is discussed in turn.

[29] Proxy respondents were assigned positive weights. Cohort 1 core members interviewed in an institution (either in person or by proxy) were treated as *ineligible* for the purposes of weighting as they no longer belong to the population of interest.

Cross-sectional weight for Cohort 1 core members

Cohort 1 core members successfully interviewed in wave 3 belonged to one of two groups:

- 7,168 individuals who had taken part in waves 1, 2 and 3 (by definition, therefore, were assigned a wave 3 longitudinal weight)[30]; and
- 320 cases who had returned to the study in wave 3 after missing wave 2.[31]

It is often speculated that individuals with non-attrition non-response (i.e. who return to a longitudinal study in the current wave after missing one or more of the preceding waves) are likely to have characteristics that differ from those who have taken part in all waves (Lynn et al., 1994). To examine this, a group membership indicator variable (0 = having taken part in all waves, 1 = returning to the study after missing wave 2) was modelled on a full range of household and individual-level information collected from HSE and ELSA wave 1.[32] The following socio-demographic features were found to be useful predictors of group membership:

- tenure;
- white/non-white ethnicity;
- educational status;
- marital status; and
- whether interviewed at HSE.

For the total responders (group XXX), the wave 3 longitudinal weight was used to generate 'benchmark' distributions across these five variables. Then, using the techniques of calibration/generalised raking[33], weighting factors were calculated that, when applied to the *combined* Cohort 1 sample (XXX + XOX in Figure 6-1), gave estimates for the survey that matched the benchmark distributions for the total responders. The distribution of tenure, for example, for the weighted combined (XXX+XOX) sample corresponded exactly to the weighted (XXX) sample after the raking adjustment. This is shown in Table 6-11.

Column 2 of Table 6-11 shows the weighted (wave 3 longitudinal weight) marginal distributions across the five variables for the 7,168 Cohort 1 core members who had taken part in all ELSA waves. These distributions can be considered as the 'target population' since the intention of the longitudinal weighting is to correct for *all* differential non-response since HSE. Column 3 shows the unweighted marginal distributions for the 7,482 Cohort 1 core members interviewed in a private residential address at the time of the ELSA wave 3

[30] Group XXX in Figure 6-1 ('total response').
[31] Groups XOX and XIX in Figure 6-1. Group XIX consisted of six Cohort 1 core members interviewed in wave 3 who returned to living in a private residential address after being treated as ineligible (for the purposes of weighting) in wave 2 (2004-05): five were living in an institution and one core member had moved outside of Britain.
[32] This model is shown in Appendix C.
[33] Generalised raking involves modifying the weights to satisfy certain marginal constraints while minimising the distance between the unadjusted and adjusted weights. As Kalton and Brick (2000) explain, generalised raking includes the familiar technique of raking or rim weighting that is obtained by means of an iterative proportional fitting algorithm. In this case, raking was used to force the wave 3 respondents' (XXX and XOX) marginal distributions for each of the selected variables in Table 6-11 to equal the corresponding distributions for XXX respondents. See Deville and Särndal (1992) for a description of distance functions that can be used to minimise the distance between the initial and final weights and a derivation of the corresponding raking methodologies.

interview. Six core members returning to the ELSA study in wave 3 after being ineligible in wave 2 were excluded from this analysis (see note to Table 6-11).

Column 4 shows the pre-raking weighted marginal distributions for the combined (XXX + XOX) sample of 7,482 Cohort 1 core members. The weight prior to the raking adjustment was the wave 3 longitudinal weight for XXX cases; the wave 1 main interview weight for XOX cases. Both components of the pre-raking weight were scaled to the achieved sample size in each group (7,168 and 314 respectively). Column 5 shows the post-raking weighted marginal distributions across the five variables. As expected, the post-raking weighted data matched the target distributions across these five dimensions.

The post-raking weight was further adjusted by calibrating to the age-by-sex household population estimates provided by the Office for National Statistics. This final step in deriving the wave 3 cross-sectional weight is discussed later in this section.

Table 6-11 Unweighted and weighted distributions of key variables

Cohort 1 core member respondents in wave 3 (2006-07), excluding those in institutions

Wave 3 characteristics	Col.2 Target distribution (wave 3 longitudinal weight)	Col.3 Combined sample (unwtd)	Col.4 Combined sample (pre-raking weight)	Col.5 Combined sample (post-raking weight)
	%	%	%	%
Tenure				
Own outright	62.6	64.5	62.0	62.6
Mortgage	18.0	17.7	18.0	18.0
Other	19.4	17.8	20.0	19.4
Marital status				
Single, never married	5.4	5.2	5.4	5.4
Married, first and only marriage	53.9	53.2	53.6	53.9
Remarried	10.9	11.0	10.9	10.9
Separated/divorced	10.1	10.6	10.2	10.1
Widowed	19.7	20.0	19.9	19.7
Ethnicity				
White	97.1	97.9	97.0	97.1
Non-white	2.9	2.1	3.0	2.9
Interviewed at HSE				
No	1.5	1.1	1.6	1.5
Yes	98.5	98.9	98.4	98.5
Educational status				
Degree or equivalent	11.4	12.9	11.3	11.4
A level/higher education below degree	17.6	19.1	17.4	17.6
O level or other	16.3	17.1	16.2	16.3
CSE or other	13.2	13.1	13.1	13.2
No qualifications	41.5	37.8	42.1	41.5
Bases				
Unweighted	*7168*	*7482*	*7482*	*7482*
Weighted	*7168*	*7482*	*7482*	*7482*

Notes: Excludes six Cohort 1 core members interviewed in wave 3 who returned to living in a private residential address after being treated as ineligible (for the purposes of weighting) in wave 2 (2004-05): five were living in an institution and one core member had moved outside of Britain (group XIX in Figure 6-1). These were assigned a post-raking weight of 1.

Cross-sectional weight for Cohort 3 core members

A refresher cohort of people just entering their 50s in 2006-07 (born between 1 March 1953 and 29 February 1956) was added to the Cohort 1 sample in wave 3. The refresher cohort was selected from the 2001-2004 HSE years (see Figure 1-1).

The cross-sectional weighting for Cohort 3 was complicated by the omission from the wave 3 sample of those born between 1 March 1952 and 28 February 1953. As mentioned in Section 5.5 (Table 5-10), 103 individuals originally classified as young or old partners were reclassified as Cohort 3 core members. These individuals were assigned a zero cross-sectional weight (as they did not represent a random sample of persons in the HSE 2001-04 born during the omitted year of births). A non-zero weight will be assigned to these cases in wave 4. Age-eligible sample members from the 2001-2004 HSE years mistakenly not issued in wave 3 have been followed up for interview in wave 4 (2008-09).

The following discussion, therefore, relates to the cross-sectional weight assigned to Cohort 3 core members born between 1 March 1953 and 29 February 1956 (that is to say, excluding the missing year of birth). As with Cohort 1, an analysis of the non-respondents helped to identify the potential for bias in the respondent sample. For the 1,937 age-eligible cases sampled from the 2001-2004 HSE years (excluding the cases in the missing year of birth), response in 2006-07 was modelled on a full range of household and individual level information collected from the relevant HSE interview.[34] The results showed significant differences between age-eligible sample member respondents and non-respondents on a number of characteristics.[35] Non-responders in wave 3 were more likely than responders to have the following characteristics:

- sampled from HSE 2001 (rather than 2003 or 2004);
- no limiting long-standing illness;
- non-white ethnicity;
- CSE/other or no educational qualifications compared with those with a degree or equivalent;
- not already in the ELSA study; and
- living in a single adult aged 16-59 household with no children (compared with households with two adults aged 16-59 with no children).

Taking the inverse of the estimated probability of responding created a non-response weight to correct for possible non-response bias between HSE and ELSA.

Putting the cross-sectional weights together

The final step in the calculation of the wave 3 cross-sectional weight was to compute a scaling factor to ensure that the *combined* sample of Cohorts 1 and 3 were represented in the same proportions in which they appear in the population. The target age-by-sex distribution was taken from the latest household population estimates provided by the Office for National Statistics. Age for ELSA respondents was defined as age in 1 March 2006, the starting date of wave 3 fieldwork. To account for the missing year of birth (exact age at 1 March 2006 in the

[34] Age-eligible sample members with known deaths and moves out of Britain were excluded from the analysis. 80 Cohort 1 young partners correctly issued as age-eligible sample members born between 1 March 1953 and 29 February 1956 *were* included.
[35] The logistic regression model of response to the main interview is shown in Appendix D.

range 53.0 to 53.99 years), half of the population aged 53 was allocated to the 50-52 age band and the remaining half to the 54-59 category. The 2006 household population estimates are shown in Table 6.12. The profile of the *combined* core member respondents, weighted by the wave 3 cross-sectional weight, is presented in Table 6.13.

Table 6-12 Household population estimates

Mid-2006 England household population (aged 50 and over)

Age	Men	Women	Total	Men	Women	Total
				%	%	%
50-52	1,058,968	1,086,003	2,144,971	14	12	13
54-59	2,040,835	2,099,561	4,140,396	26	24	25
60-64	1,311,280	1,369,882	2,681,162	17	15	16
65-69	1,066,203	1,147,579	2,213,782	14	13	13
70-74	894,467	1,019,937	1,914,404	11	12	11
75-79	697,071	892,960	1,590,031	9	10	10
80 and over	740,521	1,252,911	1,993,432	9	14	12
Base	*7,809,345*	*8,868,832*	*16,678,177*	*100*	*100*	*100*

Table 6-13 Achieved (combined) sample of core members, by age in 2006 and sex

Core member respondents in wave 3 (2006-07), including proxies but excluding those in institutions

Age in wave 3	Men	Women	Total	Men	Women	Total
				%	%	%
50-52	550	564	1114	14	12	13
54-59	1060	1090	2151	26	24	25
60-64	681	711	1392	17	15	16
65-69	554	596	1150	14	13	13
70-74	465	530	995	11	12	11
75-79	362	463	825	9	10	10
80 and over	385	650	1035	9	14	12
Bases						
Unweighted	*3878*	*4873*	*8661*	*100*	*100*	*100*
Weighted	*4057*	*4604*	*8661*	*100*	*100*	*100*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork.

Summary statistics for the wave 3 cross-sectional weight and a flowchart showing its derivation are provided in Appendices F and G respectively.

6.4 Response to self-completion

Profile of response to the self-completion questionnaire

Core members were eligible for the self-completion stage if they had completed a wave 3 main interview in person (i.e. not by proxy). The analysis of response to the self-completion questionnaire excluded the Cohort 3 core members born between 1 March 1952 and 28 February 1953 (the missing year of birth). Of the 8,527 core members who completed a full/partial wave 3 main interview in person, 7,406 individuals went on to complete the self-completion questionnaire (6,495 and 911 from Cohorts 1 and 3 respectively). As a percentage of all core members eligible for main interview this constituted a yield of 63% and 49% for

Cohorts 1 and 3 respectively.[36] The age-by-sex profile of self-completion respondents is shown in Table 6-14.

Table 6-14 Respondents to self-completion questionnaire (core members), by age and sex

Core member self-completion respondents in wave 3 (2006-07)

Age in wave 3	Men	Women	Total	Men	Women	Total
				%	%	%
50-54	527	654	1181	16	16	16
55-59	674	805	1479	20	20	20
60-64	533	663	1196	16	16	16
65-69	485	572	1057	15	14	14
70-74	463	520	983	14	13	13
75-79	317	438	755	10	11	10
80-84	214	266	480	6	7	6
85 and over	105	170	275	3	4	4
Base (unweighted)	*3318*	*4088*	*7406*	*100*	*100*	*100*

Note: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork.

Although overall 86% of core members giving a full/partial interview went on to successfully return the self-completion questionnaire (excluding the missing year of birth cohort), the response rate varied according to respondent age (Table 6-15). Response ranged from 91% (among core members aged 65-69 in wave 3) to 69% (among the oldest Cohort 1 core members who were aged 85 and over).

Table 6-15 Returned self-completion questionnaires as a proportion of wave 3 full/partial interviews, by age

Core members who gave a full/partial interview in wave 3 (2006-07)

Age in wave 3	Productive main interview	Returned self-completions	Full/partial interviews resulting in a returned self-completion questionnaire
			%
50-54	1466	1181	80.3
55-59	1678	1479	87.4
60-64	1325	1196	89.6
65-69	1157	1057	91.0
70-74	1087	983	90.0
75-79	857	755	87.8
80-84	571	480	83.3
85 and over	386	275	69.5
Bases			
Unweighted	*8527*	*7406*	
Weighted	*8527*	*7354*	*86.2*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Response rates weighted by wave 3 cross-sectional weight. Analysis excluded Cohort 3 core members born between 1 March 1952 and 28 February 1953.

[36] For this calculation we took 10,278 to be the number of Cohort 1 core members eligible for main interview in 2006-07 (see Table 5-8) and 1,842 the equivalent figure for Cohort 3 (see Table 5-10).

Analysis of response to self-completion questionnaire

Table 6-16 shows response to the self-completion questionnaire by equivalised household income quintile (as measured in 2006-07). Response to the self-completion questionnaire in wave 3 increased from the lowest income quintile to the highest. 88% of men in the highest income quintile completed the questionnaire, compared with 81% in the poorest quintile. The equivalent figures for women were 89% and 83%.

Table 6-16 Self-completion respondents, by equivalised household income quintile in wave 3 and sex

Core members who gave a full/partial interview in wave 3 (2006-07)

Wealth quintile in wave 3	Poorest %	2nd %	3rd %	4th %	Richest %
Men					
Respondents	80.9	86.2	89.1	88.4	87.9
Non-respondents	19.1	13.8	10.9	11.6	12.1
Women					
Respondents	82.6	85.4	87.7	88.7	88.9
Non-respondents	17.4	14.6	12.3	11.3	11.1
All					
Respondents	81.9	85.8	88.4	88.5	88.4
Non-respondents	18.1	14.2	11.6	11.5	11.6
Bases (unweighted)					
Men	*668*	*730*	*749*	*784*	*803*
Women	*1079*	*1009*	*925*	*823*	*761*
All	*1747*	*1739*	*1674*	*1607*	*1564*
Bases (weighted)					
Men	*726*	*778*	*781*	*810*	*810*
Women	*1070*	*988*	*891*	*772*	*693*
All	*1796*	*1766*	*1670*	*1583*	*1503*

Notes: Response rates weighted by wave 3 cross-sectional weight. Analysis excluded Cohort 3 core members born between 1 March 1952 and 28 February 1953.

Multivariate model of response to self-completion questionnaire

For the 8,527 core members who completed a full/partial wave 3 main interview in person (excluding Cohort 3 core members born between 1 March 1952 and 28 February 1953), response to the self-completion questionnaire was modelled on a full range of household and individual level information collected from the ELSA wave 3 main interview. The analysis was conducted on data weighted by the wave 3 cross-sectional 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.[37] Non-respondents to the self-completion questionnaire were more likely than responders to have the following characteristics:

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

- male aged 85 and over compared with male aged 50-54;
- female aged 85 and over compared with male aged 50-54;
- separated/divorced compared with single, never married;
- living in North-West compared with North-East;
- being in a couple with separate or joint finances compared with being single;
- having fair, bad or very bad self-assessed health;
- living in a household with four or more persons compared with a single-person household;
- non-white ethnicity;
- CSE as highest educational qualification compared with those with a degree or equivalent;
- being employed, self-employed, unemployed, permanently sick/disabled compared with retired/semi-retired in wave 3; and
- renting or having a mortgage compared with those who owned their property outright.

The weighting strategy was aimed at reducing any bias arising from differential non-response between the main interview in 2006-07 and return of the self-completion questionnaire. A non-response weight for the 7,406 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 3 cross-sectional weight and the non-response adjustment.

6.5 Response to life-history interview

Profile of response to the life-history interview

Core members were eligible for the life-history interview if they had completed a wave 3 main interview in person (i.e. not by proxy). The analysis of response to the life-history interview excluded 103 Cohort 3 core members born between 1 March 1952 and 28 February 1953 (the missing year of birth). In addition, the analysis also excluded 177 core members who had a wave 3 main interview after 19 April 2007, the cut-off point for issuing cases. 77 core members known to be ineligible by the time of the life-history interview were also excluded (comprising 64 deaths, seven moves out of Britain and six institutional moves).

Of the 8,273 core members satisfying the eligibility criteria (irrespective of whether issued[38]), 7,049 individuals went on to complete the life-history interview (6,173 and 876 from Cohorts 1 and 3 respectively). The age-by-sex profile of respondents to the life-history interview is shown in Table 6-17.

[38] 96% of the 8,273 eligible core members agreed to be recontacted for the life-history interview.

Table 6-17 Respondents to the life history interview (core members), by age and sex

Core member respondents to the life-history interview

Age in wave 3	Men	Women	Total	Men	Women	Total
				%	%	%
50-54	504	634	1138	16	16	16
55-59	638	780	1418	20	20	20
60-64	511	615	1126	16	16	16
65-69	451	527	978	14	13	14
70-74	438	498	936	14	13	13
75-79	294	421	715	9	11	10
80-84	204	255	459	7	7	7
85 and over	97	182	279	3	5	4
Base (unweighted)	*3137*	*3912*	*7049*	*100*	*100*	*100*

Note: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork (main interview).

Response to the life-history interview varied according to respondent age (Table 6-18). Response ranged from 88% (among core members aged 70-74 in wave 3) to 75% (among the oldest Cohort 1 core members who were aged 85 and over.

Table 6-18 Life history interview respondents as a proportion of eligible wave 3 full/partial interviews, by age

Core members who gave a full/partial interview in wave 3 (2006-07)

Age in wave 3	Productive main interview	Life history interview respondents	Full/partial interviews resulting in a life-history interview
			%
50-54	1399	1138	81.1
55-59	1645	1418	85.6
60-64	1305	1126	85.0
65-69	1123	978	86.4
70-74	1058	936	87.6
75-79	834	715	85.2
80-84	549	459	82.6
85 and over	360	279	75.3
Bases			
Unweighted	*8273*	*7049*	*84.4*
Weighted			

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Response rates weighted by wave 3 cross-sectional weight. Analysis excluded 103 Cohort 3 core members born between 1 March 1952 and 28 February 1953. Analysis also excluded 77 core members known to be ineligible by time of life history interview and 177 core members who had a wave 3 main interview date after 19 April 2007 (the cut-off point for issuing cases).

Analysis of response to life-history interview

Table 6-19 shows response to the life-history interview by equivalised household income quintile (as measured in wave 3). Response to the life history interview increased from the lowest quintile to the highest. 87% of men in the highest income quintile responded to the life history interview, compared with 81% in the poorest quintile. The equivalent figures for women were 87% and 82%.

Table 6-19 Life history interview respondents, by equivalised household income quintile in wave 3 and sex

Core members who gave a full/partial interview in wave 3 (2006-07)

Wealth quintile in wave 3	Poorest %	2nd %	3rd %	4th %	Richest %
Men					
Respondents	80.8	83.2	84.8	86.0	86.9
Non-respondents	19.2	16.8	15.2	14.0	13.1
Women					
Respondents	82.4	83.4	86.1	86.9	86.8
Non-respondents	17.6	16.6	13.9	13.1	13.2
All					
Respondents	81.7	83.3	85.5	86.4	86.8
Non-respondents	18.3	16.7	14.5	13.6	13.2
Bases (unweighted)					
Men	*633*	*701*	*726*	*769*	*791*
Women	*1043*	*973*	*904*	*805*	*746*
All	*1676*	*1674*	*1630*	*1574*	*1537*
Bases (weighted)					
Men	*683*	*745*	*755*	*794*	*799*
Women	*1032*	*950*	*869*	*754*	*681*
All	*1715*	*1695*	*1624*	*1548*	*1480*

Notes: Age in wave 3 defined as age in 1 March 2006, beginning of wave 3 fieldwork. Response rates weighted by wave 3 cross-sectional weight. Analysis excluded 103 Cohort 3 core members born between 1 March 1952 and 28 February 1953. Analysis also excluded 77 core members known to be ineligible by time of life history interview and 177 core members who had a wave 3 main interview date after 19 April 2007 (the cut-off point for issuing cases).

Multivariate model of response to life-history interview

The model of response to the life-history interview followed a similar procedure to modelling response to the self-completion questionnaire. For the 8,273 core members who completed a full/partial wave 3 main interview in person (excluding Cohort 3 core members born between 1 March 1952 and 28 February 1953) before April 19 2007[39] response to the life-history interview was modelled on a full range of household and individual level information collected from the ELSA wave 3 main interview. The analysis was conducted on data weighted by the wave 3 cross-sectional weight (with an adjustment to ensure that the data was balanced across the four quarters defined by the wave 3 main interview date) so that the non-response adjustment for the life-history interview was made contingent on the already derived weight (the final life-history weight was a product of these weights). The results showed significant differences between core member respondents to the life-history and non-respondents on a number of characteristics.[40] Non-responders to the life-history interview were more likely than responders to have the following characteristics:

- having bad or very bad self-assessed health;
- living in a household with two or three persons compared with a single-person household;
- non-white ethnicity;

[39] This was the cut-off date for issuing cases for the life-history interview.
[40] The logistic regression model of response to the life-history interview is shown in Appendix H.

- no educational qualifications compared with those with a degree or equivalent;
- renting or having a mortgage compared with those who owned their property outright; and
- living in an area in the 4th or most deprived IMD 2004 quintile.

The weighting strategy was aimed at reducing any bias arising from differential non-response between the main interview in 2006-07 and the life-history interview. A non-response weight for the 7,049 life-history core member respondents was created by taking the inverse of the estimated probability of responding. The final weight to analyse the life-history data was a product of the wave 3 cross-sectional weight (adjusted to ensure balance across the four quarters defined by the wave 3 main interview date) and the non-response adjustment.

6.6 Differential non-response across waves

In Section 6.1 we focused on the subset of 10,180 Cohort 1 core members who were considered eligible at every wave and classified the response pattern over the ELSA waves 1-3 into the following groups:

- total respondents: who provided data on every wave (group XXX in Figure 6-1);
- *attrition* non-respondents: who dropped out of the study at some wave after the first and remained out of the study for all subsequent waves (XOO and XXO); and
- *non-attrition* non-respondents: who returned to the study after missing one or more waves (XOX).[41]

For studies of attrition from longitudinal surveys baseline characteristics are available for the groups who do not respond in later waves. HSE and ELSA wave 1 characteristics were used to explore the socio-demographic factors associated with each response pattern. Table 6-20 shows the HSE/ELSA wave 1 characteristics of Cohort 1 core members by type of participation over ELSA waves 1-3. Note that this preliminary analysis focused upon respondent rather than interviewer characteristics. The analysis was conducted on data weighted by the wave 1 main interview weight.

Table 6-20 shows that non-responding core members were quite different from total respondents. 6% of both non-attritors (returned in wave 3 after missing wave 2) and attritors (left the study in wave 1 and did not return subsequently) were non-white, compared with 2% of total responders. 4% of core members who dropped out in wave 1 and did not return subsequently were not interviewed in HSE, compared with 1% of total responders. 51% of attritors (groups XXO and XOO) had no educational qualifications, compared with 37% of total responders. About four-in-ten non-responding core members were in semi-routine and routine households (at HSE), compared with 30% of total responders.

[41] As Kapteyn et al. (2006) note, attempting to reinterview those individuals who may have skipped a wave can be of major importance for the representativity of the sample over time. It may help to keep cumulative attrition down compared to other surveys that might not attempt to re-contact respondents missing in a given wave. If those returning to the study after missing a wave have different socio-demographic characteristics than those taking part at all waves then this can also attenuate the attrition bias on cross-sectional analysis.

In the ELSA wave 1 main interview 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 interviews 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. Table 6-20 shows that the willingness of core members to give consent for linking their survey data to administrative data was associated with response over subsequent waves. 96% of total responders gave consent to link their survey data to the National Health Service Central Register (NHSCR) by wave 1, compared with 90% of core members who had only taken part in wave 1 (group XOO). The equivalent figures for giving consent to link their survey data to Government economic databases were 81% and 61% respectively.

Table 6-20 HSE/ELSA wave 1 characteristics by pattern of response over waves 1-3

Cohort 1 core members eligible over all three waves

HSE/wave 1 characteristics	N	Total respondents (XXX)	Non-attrition non-respondents (XOX)	Attrition non-respondents (XXO)	Attrition non-respondents (XOO)	Total
						Column percentages
		%	%	%		%
Male						
50-54	955	25	25	26	22	25
55-59	931	20	18	16	20	19
60-64	749	16	16	17	19	17
65-69	724	14	14	15	12	14
70-74	554	11	13	11	12	11
75-79	375	8	7	8	8	8
80-84	194	4	4	4	5	4
85 and over	80	2	3	3	2	2
Female						
50-54	1152	22	24	18	21	22
55-59	1089	18	14	16	19	17
60-64	849	15	14	16	13	15
65-69	830	14	15	14	13	14
70-74	715	12	11	12	13	12
75-79	489	10	10	11	9	10
80-84	355	6	6	7	6	6
85 and over	139	3	7	4	5	4
Highest educational qualification						
Degree or equivalent	1177	13	9	7	8	11
A level/higher education below degree	1780	19	14	14	12	18
O level or other	1674	17	14	14	14	16
CSE or other	1355	13	9	13	14	13
No qualifications	4194	37	55	51	51	42
Whether interviewed in HSE						
Interviewed	10013	99	97	98	96	98
Not interviewed	167	1	3	2	4	2

…continued

HSE/wave 1 characteristics	N	Total respondents (XXX)	Non-attrition non-respondents (XOX)	Attrition non-respondents (XXO)	Attrition non-respondents (XOO)	Total
						Column percentages
		%	%	%		%
Year of HSE selection						
1998	4363	40	39	43	41	40
1999	1916	19	17	22	24	20
2001	3901	41	44	36	35	40
Government Office Region						
North East	662	6	4	5	7	6
North West	1331	12	16	17	15	13
Yorkshire & The Humber	1090	11	13	9	9	10
East Midlands	994	10	6	10	8	9
West Midlands	1124	11	13	12	11	11
East of England	1187	13	11	9	12	12
London	1004	10	10	11	13	10
South East	1632	16	16	15	16	16
South West	1156	12	11	11	10	11
Tenure						
Owners	8243	83	69	76	76	81
Renters	1771	16	29	23	22	18
Other	166	1	2	2	2	2
Marital status						
Single, never married	535	5	5	5	6	5
Married, first and only marriage	5859	56	52	58	63	57
Remarried	1128	11	14	12	10	11
Separated/divorced	1088	11	15	10	8	11
Widowed	1570	16	15	14	13	16
Self-assessed health						
Excellent	1367	15	15	10	12	14
Very good	3030	31	29	29	27	30
Good	3298	32	26	33	34	32
Fair	1850	17	21	20	20	18
Poor	635	5	9	7	8	6
Ethnicity						
White	9892	98	94	96	94	97
Non-white	288	2	6	4	6	3
Index of Multiple Deprivation 2004						
Least deprived	2369	24	22	21	20	23
2nd quintile	2404	24	20	20	24	24
3rd quintile	2064	21	18	19	20	20
4th quintile	1858	18	17	22	18	18
Most deprived	1485	13	23	19	18	15
Social class in HSE						
Managerial & professional	3042	32	22	24	19	29
Intermediate	1339	14	9	12	12	13
Small employers & own account workers	978	10	9	10	9	10
Lower supervisory & technical	1143	11	11	11	13	11
Semi-routine	3308	30	40	39	40	33
Missing	370	3	9	5	7	4

…continued

HSE/wave 1 characteristics	N	Total respondents (XXX)	Non-attrition non-respondents (XOX)	Attrition non-respondents (XXO)	Attrition non-respondents (XOO)	Total
						Column percentages
		%	%	%		%
Consent for linkage to National Health Service Central Register						
Given	9672	96	91	94	90	95
Not given	438	4	6	6	6	5
Not asked	70	0	3	0	4	1
Consent for linkage to Government economic data						
Given	7759	81	70	70	61	76
Not given	2235	18	25	27	34	22
Not asked	186	1	5	3	5	2
Whether consulted documents answering Income & Assets module						
Frequently	1808	20	11	16	10	17
Occasionally	2345	24	24	19	20	23
Never	5348	51	54	58	58	53
Missing	679	6	11	7	12	7
Cognitive function score						
Low (0-37)	2880	25	37	34	37	29
Medium (38-46)	3523	35	29	33	32	34
High (47+)	3230	35	27	25	21	32
Missing	547	4	8	7	10	5
Number of people in household						
1	2339	24	24	21	19	23
2	5784	54	58	59	59	56
3	1305	14	10	12	15	13
4	567	6	5	5	5	6
5+	185	2	2	2	2	2
Current economic activity						
Retired/semi-retired	4978	48	43	49	47	48
Employed	2871	30	26	27	28	29
Self-employed	607	6	7	6	6	6
Unemployed	112	1	2	2	2	1
Permanently sick/disabled	596	5	11	6	7	6
Looking after home/family	1016	10	12	10	11	10

Since none of the comparisons in the previous section took account of the correlations among characteristics, a multinomial logistic regression model was used to explain the pattern of response across ELSA waves 1-3 using the HSE/Wave 1 variables. For nominal outcome variables, multinomial logistic regression is an extension of the binary logistic regression model. The dependent variable took the values: (1) total respondents (group XXX), (2) non-attrition non-respondents (group XOX), (3) attrition non-respondents who dropped out in wave 2 (group XXO) and (4) attrition non-respondents who dropped out in wave 1 (group XOO). Total respondents was chosen as the reference category. The results of the model are shown in Table 6-21.

Choosing total respondents as the reference category, the probability of having an non-attrition pattern of non-response (XOX) was modelled as:

$$\Pr(y=2)=\frac{e^{X\beta^{(2)}}}{1+e^{X\beta^{(2)}}+e^{X\beta^{(3)}}+e^{X\beta^{(4)}}}$$

where *Pr* denotes the estimated probability, *y* the outcome variable, *e* the exponential function, *X* the explanatory/predictor variables and β the coefficients estimated from the survey data. Similarly, the probability of having an XXO attrition pattern of response was modelled as:

$$\Pr(y=3)=\frac{e^{X\beta^{(3)}}}{1+e^{X\beta^{(2)}}+e^{X\beta^{(3)}}+e^{X\beta^{(4)}}}$$

Finally, the probability of having an XOO attrition pattern of response was modelled as:

$$\Pr(y=4)=\frac{e^{X\beta^{(4)}}}{1+e^{X\beta^{(2)}}+e^{X\beta^{(3)}}+e^{X\beta^{(4)}}}$$

The exponentiated value of a coefficient is the relative risk ratio for a one unit change in the corresponding variable, it being understood that risk is measured as the risk of the particular response pattern relative to the reference category - total response in this case (StataCorp, 2003).

As an illustration, the relative risk of being in the non-attritors group (XOX) over the total responders (reference category) group was 1.99 for non-whites relative to whites (reference category). The relative risk of being in the non-attritors group over the total responders was 1.75 for those with no educational qualifications relative to those with a degree or equivalent (reference category).

In an analogous fashion, the relative risk of a core member having an XXO pattern of non-response (i.e. took part in waves 1 and 2 but missed wave 3) over the total responders (reference category) group was 1.46 for non-whites relative to whites (reference category). The relative risk of having an XXO pattern of non-response over total response was 2.38 for those with no educational qualifications relative to those with a degree or equivalent (reference category).

Table 6-21 Multinomial logistic regression model of response

Term	N	Parameter estimates (reference category: total response XXX)					
		Non-attrition response (XOX)		Attrition non-response (XXO)		Attrition non-response (XOO)	
		Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
Ethnicity		**(p=0.017)**		**(p=0.041)**		**(p=0.002)**	
White	9892	1	-	1	-	1	-
Non-white	288	1.99	0.57	1.46	0.27	1.66	0.27
Whether interviewed in HSE		**(p=0.771)**		**(p=0.232)**		**(p=0.013)**	
Interviewed	10013	1	-	1	-	1	-
Not interviewed	167	1.14	0.51	1.47	0.48	1.92	0.50
Highest educational qualifications		**(p=0.007)**		**(p<0.001)**		**(p<0.001)**	
Degree or equivalent	1177	1	-	1	-	1	-
A level/higher education below degree	1780	0.99	0.26	1.35	0.20	0.91	0.12
O level or other	1674	1.14	0.31	1.62	0.25	1.14	0.15
CSE or other	1355	0.95	0.28	1.87	0.31	1.28	0.17
No qualifications	4194	1.75	0.44	2.38	0.36	1.44	0.18
Social class in HSE[a]		**(p=0.323)**		**(p=0.133)**		**(p<0.001)**	
Managerial & professional	3042	1	-	1	-	1	-
Intermediate	1339	0.87	0.21	0.91	0.11	1.22	0.13
Small employers & own account workers	978	1.00	0.24	0.94	0.12	1.08	0.13
Lower supervisory & technical	1143	1.03	0.24	0.94	0.12	1.47	0.17
Semi-routine	3308	1.30	0.25	1.14	0.12	1.63	0.15
Missing	370	2.53	0.85	1.34	0.32	1.71	0.34
Consent for linkage to Government economic data[a]		**(p=0.008)**		**(p<0.001)**		**(p<0.001)**	
Given	7759	1	-	1	-	1	-
Not given	2235	1.46	0.21	1.61	0.12	2.21	0.15
Not asked	186	6.92	3.04	2.67	0.76	4.41	1.04
Cognitive function score[a,b]		**(p=0.014)**		**(p<0.001)**		**(p<0.001)**	
Low (0-37)	2880	1	-	1	-	1	-
Medium (38-46)	3523	0.67	0.10	0.76	0.06	0.71	0.05
High (47+)	3230	0.70	0.12	0.67	0.06	0.52	0.05
Missing	547	0.55	0.19	0.85	0.15	0.86	0.13
Year of HSE selection		**(p=0.591)**		**(p=0.004)**		**(p<0.001)**	
2001	3901	1	-	1	-	1	-
1998	4363	0.89	0.11	1.17	0.09	1.12	0.08
1999	1916	0.88	0.15	1.35	0.12	1.51	0.12

Note: [a] Significance testing based on valid (i.e. non-missing) categories. [b] The cognitive function score comprises scores on both memory and executive function. Scores on the continuous scale were divided into tertiles. Higher scores indicate higher cognitive performance (see Huppert et al., 2006)

…continued

Term	N	Parameter estimates (reference category: total response XXX)					
		Non-attrition response (XOX)		Attrition non-response (XXO)		Attrition non-response (XOO)	
		Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
Government Office Region		**(p=0.065)**		**(p<0.001)**		**(p=0.001)**	
North East	662	1	-	1	-	1	-
North West	1331	1.87	0.59	1.93	0.31	1.10	0.15
Yorkshire & The Humber	1090	1.72	0.55	1.10	0.19	0.71	0.10
East Midlands	994	0.79	0.29	1.33	0.23	0.70	0.11
West Midlands	1124	1.43	0.47	1.39	0.24	0.83	0.12
East of England	1187	1.35	0.45	1.04	0.18	0.94	0.13
London	1004	1.16	0.39	1.48	0.26	1.09	0.16
South East	1632	1.59	0.50	1.36	0.22	1.00	0.13
South West	1156	1.41	0.48	1.39	0.24	0.92	0.13
Marital status		**(p=0.014)**		**(p<0.001)**		**(p<0.001)**	
Married, first and only marriage	5859	1	-	1	-	1	-
Single, never married	535	0.89	0.26	0.89	0.13	0.86	0.12
Remarried	1128	1.40	0.25	1.05	0.11	0.79	0.08
Separated/divorced	1088	1.44	0.25	0.84	0.09	0.59	0.06
Widowed	1570	0.75	0.14	0.66	0.06	0.53	0.05
Total number of calls in wave 1		**(p=0.469)**		**(p=0.142)**		**(p=0.004)**	
1	795	1	-	1	-	1	-
2	3748	1.06	0.25	0.96	0.12	1.01	0.12
3	2188	0.94	0.24	1.09	0.15	1.15	0.15
4+	3449	1.21	0.28	1.14	0.15	1.29	0.16
Whether consulted documents answering Income & Assets module[a]		**(p=0.019)**		**(p<0.001)**		**(p<0.001)**	
Frequently	1808	1	-	1	-	1	-
Occasionally	2345	1.65	0.34	0.87	0.09	1.49	0.16
Never	5348	1.67	0.31	1.23	0.11	1.91	0.19
Missing	679	2.04	0.54	0.97	0.15	2.46	0.33

Notes: [b] Significance testing based on valid (i.e. non-missing) categories.

Controlling for the other explanatory variables in the model, the following socio-demographic characteristics were associated with *each* pattern of non-response (relative to total response):

- non-white ethnicity;
- no educational qualifications compared with those with a degree or equivalent;
- not giving consent for linking survey data to Government economic data;
- low cognitive function score; and
- not consulting documents when answering Income & Assets module in wave 1.

Controlling for the other explanatory variables in the model, the following socio-demographic characteristics were associated with both attrition patterns of non-response (groups XXO and XOO: relative to total response)

- non-white ethnicity;
- no educational qualifications compared with those with a degree or equivalent;
- not giving consent for linking survey data to Government economic data;
- sampled from HSE year 1999 (rather than 2001);
- widowed compared with those in their first and only marriage; and
- not consulting documents when answering Income & Assets module in wave 1.

7 A RESPONSE RATES FRAMEWORK FOR LONGITUDINAL STUDIES

The final chapter takes advantage of recent developments in longitudinal survey methodology and sets out a number of response rates that summarise the progress of the ELSA sample from HSE (often referred to as wave 0) up to and including wave 3. Such response rates enable users to more easily compare ELSA with other longitudinal studies. The response rates presented in this chapter have been calculated using the same recently developed standard approach as used in wave 2 (Scholes et al., 2008a). This framework draws heavily on the work of Lynn (2005). Response rates were calculated for Cohort 1 only (persons born before 1 March 1952).

Table 7-1 summarises the response rates presented in this chapter. No single rate can represent the overall 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;
- longitudinal unconditional rate; and
- longitudinal conditional rate.

These are shown in Table 7-1. At the time of wave 3 (2006-07):

- 36% of age-eligible sample members (Cohort 1) in wave 3 were successfully interviewed in wave 3 (RR_3): a cross-sectional unconditional rate.

- 86% of the eligible sample members who responded in wave 2 were successfully reinterviewed in wave 3 ($RR_{3|2}$): a cross-sectional conditional rate (conditioning on participation in wave 2).

- 34% of sample members eligible in every wave from wave 0 up to and including wave 3 had successfully responded in every wave up to and including wave 3 ($RR_{0,1,2,3}$): a longitudinal unconditional rate

- 71% of remaining eligible wave 1 respondents had given an interview in every wave up to and including wave 3 ($RR_{3,2|1}$): a longitudinal conditional rate (conditioning on participation in ELSA wave 1).

The subscript '|' indicates a conditional response rate. For example, $RR_{3,2|1}$ indicates a response rate with respondents in waves 2 and 3 as the numerator and respondents in wave 1 as the denominator. $RR_{3|2}$ indicates a response rate with respondents in wave 3 as the

numerator and respondents in wave 2 as the denominator. The rest of this chapter gives the background to these response rate calculations.

Table 7-1 Response rates from wave 0 to ELSA wave 3

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%
3	RR_3	The unconditional W3 response rate	Responding in W3	Eligible in W3	36%
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%
3	$RR_{3\|2}$	The (cross-sectional) W3 response rate conditional upon W2 response	Responding in W3	Eligible in W3 & respondent in W2	86%
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%
3	$RR_{0,1,2,3}$	The (longitudinal) unconditional W3 response rate	Responding in W0, W1, W2 & W3	Eligible in W0, W1, W2 & W3	34%
Longitudinal conditional rates					
2	$RR_{2\|1}$	The (longitudinal) conditional W2 response rate	Responding in W2	Eligible in W2 & respondent in W1	82%
3	$RR_{3,2\|1}$	The (longitudinal) conditional W3 response rate	Responding in W2 & W3	Eligible in W1, W2 & W3 & respondent in W1	71%

7.1 Background

The response rates presented in this chapter were defined for individuals since they represent the primary unit of interest. Response rates are presented for the main interview. A respondent was defined as giving a full or partial interview at a private residential address either in person or by proxy. Note, therefore, that institutional interviews were defined as ineligible cases.

Field and study response rates
A distinction can be 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 irrespective of whether cases belonging to the target population (i.e. eligible from a study perspective) are issued for 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 compared with other longitudinal studies. An overall impression of the representativeness of respondents remaining in the ELSA study in wave 3 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 the current 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 from the origin of the survey up to and including the current wave 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.[42]

Unconditional and conditional response rates

Whether measuring response cross-sectionally (focusing on the current 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.
- Longitudinal response rates (unconditional and conditional).

Eligible sample members

Response rates are presented for age-eligible sample members only (individuals born before 1 March 1952). Interviewed cases were either core members or core partners. Young and new partners, therefore, are not considered.[43]

Figure 7-1 shows the pattern of response across HSE (wave 0) and ELSA waves 1-3. The 11,391 Cohort 1 core members successfully interviewed in wave 1 are shown in Figure 7-1 by groups D and G. Figure 7-1 makes the distinction at HSE between co-operating and non co-operating households, and between responding (R), non-responding (NR) and ineligible (I) cases.

[42] As Lynn (2009) explains, the response rate at any one wave of a longitudinal survey may be just as good as that for any other survey but after a number of waves the proportion of cases that have successfully responded at every wave may be quite low. Thus, the effective response rate for longitudinal analysis – for which data from every wave is required – may be lower than the response rates achieved from cross-sectional surveys.

[43] Core partners, by definition, were age-eligible (born before 1 March 1952) but non-respondents in wave 1. Core partners interviewed in waves 2 or 3 were included in the numerator for unconditional response rates. Response rates conditioning on participation in wave 1 were, by definition, calculated for core members only.

As the ELSA sample ages those with known or estimated 'terminating events' such as deaths, institutional moves and moves out of Britain are taken out of the target population and so are considered ineligible. HSE co-operating households were 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 age-eligible for ELSA wave 1 (the calculations for this estimate are shown in Appendix J).

Table 7-2 provides the most up-to-date numbers. 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 presents the longitudinal rates using wave 0 as the starting point; Section 7.4 uses ELSA wave 1 as the starting point.

Figure 7-1 Pattern of response from wave 0 to ELSA wave 3 (age-eligible sample members)

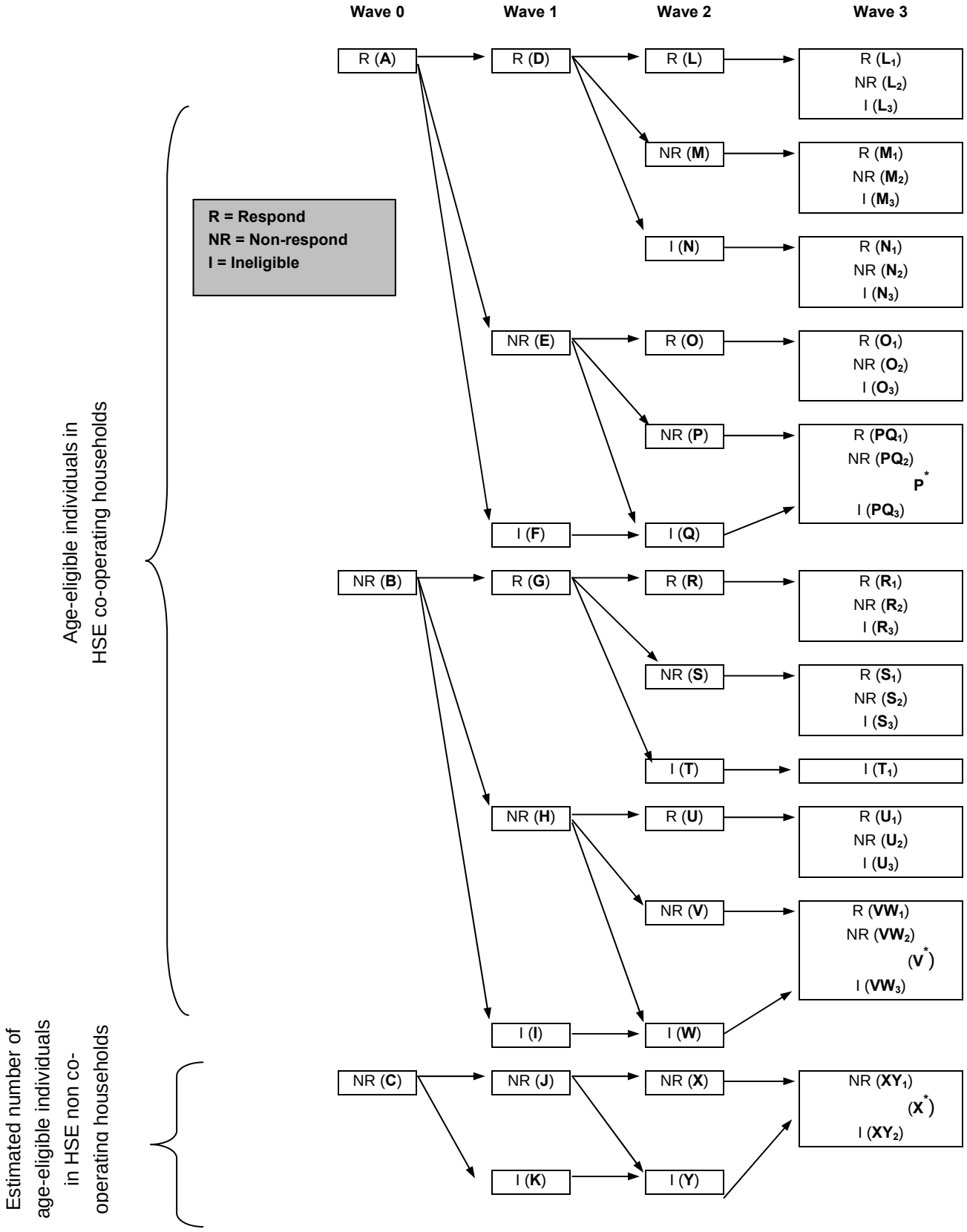


Table 7-2 Response to ELSA (wave 0 to wave 3)

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

…continued

Identifier in Figure 7-1	Outcome status	Number of individuals
Wave 3		
Respondents in W0, W1 & W2		
L_1	Respond in W3 (CM)	7094
L_2	Non-respond in W3	1164
L_3	Ineligible in W3	417
Respondents in W0 & W1, non-respond in W2		
M_1	Respond in W3 (CM)	303
M_2	Non-respond in W3	1398
M_3	Ineligible in W3	220
Respondents in W0 & W1, Ineligible in W2		
N_1	Respond in W3 (CM)	6
N_2	Non-respond in W3	8
N_3	Ineligible in W3	595
Respondents in W0, non-respondents in W1, respond in W2		
O_1	Respond in W3 (CP)	24
O_2	Non-respond in W3	10
O_3	Ineligible in W3	1
Respondents in W0, non-respondents & ineligible in W1, non- respond & ineligible in W2		
PQ_1	Respond in W3 (CP)	39
PQ_2	Non-respond in W3	4877
P*	"	4705
PQ_3	Ineligible in W3	2495
Non-respondents in W0, respondents in W1 & W2		
R_1	Respond in W3 (CM)	74
R_2	Non-respond in W3	27
R_3	Ineligible in W3	4
Non-respondents in W0, respondents in W1, non-respond in W2		
S_1	Respond in W3 (CM)	11
S_2	Non-respond in W3	55
S_3	Ineligible in W3	3
Non-respondents in W0, respondents in W1, ineligible in W2		
T_1	Ineligible in W3	12
HSE co-operating HH: non-respondents in W0, non-respondents in W1, respond in W2		
U_1	Respond in W3 (CP)	11
U_2	Non-respond in W3	9
U_3	Ineligible in W3	2
HSE co-operating HH: non-respondents in W0, non-respondents & ineligible in W1, respond & non-respond & ineligible in W2		
VW_1	Respond in W3 (CP)	15
VW_2	Non-respond in W3	895
V*	"	847
VW_3	Ineligible in W3	152

…continued

Identifier in Figure 7-1	Outcome status	Number of individuals
HSE non co-operating HH: non-respondents in W0, non-respondents & ineligible in W1, non-respond & ineligible in W2		
XY_1	Non-respond	4941
X*	"	4838
XY_2	Ineligible	1689

Note: The response rate calculations in wave 3 required an assumption to be made about the proportion of non-respondents in W2 (groups P, S, V and X) who remained eligible in W3 (groups P, V* and X*). We have assumed an eligibility rate of 89% based on the proportion of group M (respondents in W0 & W1, non-respondents in W2) who were known to remain eligible in wave 3 (groups M_1 and M_2)*

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*. In this section we present the unconditional response rates from wave 0 to wave 3.

Wave 0

In wave 0, the denominator for the unconditional response rate focused 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 was calculated as follows:

$$RR_0 = \frac{\text{Respond in wave 0}}{\text{Age-eligible sample members in wave 0}}$$

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

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

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 ELSA wave 1). Hence, the estimated unconditional response rate in wave 0 was 18,651/(18,651 + 1,270 + 6,630) = 0.70 × 100 = 70%.

(Group C represented an estimate of the number age-eligible in wave 0 amongst those cases whose eligibility for ELSA was unknown. That is, the denominator for the wave 0 response rate contained 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+. The calculations used to estimate the number of age-eligible sample members in HSE non co-operating households are shown in Appendix J).

Wave 1

In wave 1, the denominator focused 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 by the time of ELSA wave 1 using age-sex mortality rates and annual rates of moves into an institution. These cases, having moved outside the target population, were set aside *before* the response rate was calculated. The wave 1 unconditional response rate was calculated as follows:

$$RR_1 = \frac{\text{Respond in wave 1}}{\text{Age-eligible sample members in wave 1}}$$

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

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

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 age-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. The calculations used to produce this estimate are shown in Appendix K).

Wave 2

In wave 2, the denominator for the unconditional response rate focused 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 and annual rates of moves into an institution. Ineligible cases were set aside before the response rate was calculated. The unconditional response rate in wave 2 was calculated as follows:

$$RR_2 = \frac{\text{Respond in wave 2}}{\text{Age-eligible sample members in wave 2}}$$

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

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

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). The number of individuals estimated to be 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 remained eligible sample members in wave 2).

Wave 3

In wave 3, the denominator for the unconditional response rate focused on those individuals eligible in wave 3. Known deaths, moves out of Britain and institutional moves were removed from the denominator. In addition, a number of cases with unknown eligibility were estimated to be ineligible in wave 3 using age-sex mortality rates and annual rates of moves into an institution. Known and estimated 'unknown, but likely to be' ineligible cases were set aside before the response rate was calculated. The unconditional response rate in wave 3 was calculated as follows:

$$RR_3 = \frac{\text{Respond in wave 3}}{\text{Age-eligible sample members in wave 3}}$$

The relevant groups can be identified from the wave 3 column in Figure 7-1 as follows:

$$RR_3 = \frac{L_1+M_1+N_1+O_1+PQ_1+R_1+S_1+U_1+VW_1}{L_1+L_2+M_1+M_2+N_1+N_2+O_1+O_2+PQ_1+PQ_2+R_1+R_2+S_1+S_2+U_1+U_2+VW_1+VW_2+XY_1}$$

From Table 7-2, the number of age-eligible sample members taking part in wave 3 was 7,577 (7,488 core members and 89 core partners). The number of individuals estimated to be eligible in wave 3 was 20,961. Hence, the estimated unconditional response rate in wave 3 was 7,577/20,961 = 0.36 × 100 = 36%. That is to say, 36% of eligible sample members were estimated to be successfully interviewed in wave 3.

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 the ELSA wave 1 interview (2002-03). Analogous unconditional response rates were also calculated at each wave for the subsample of individuals within *HSE co-operating households* - for whom age information was available. Waves 1-3 are discussed in turn.

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):

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

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%.

Wave 2

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

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

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

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

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%.

Wave 3

The unconditional response rate in wave 3 for eligible sample members in HSE co-operating households was calculated as follows:

$$RR_3^a = \frac{\text{Respond in wave 3}}{\text{Age-eligible sample members in wave 3 (HSE co-operating households)}}$$

The relevant groups can be identified from the wave 3 column in Figure 7-1 as follows:

$$RR_3^a = \frac{L_1+M_1+N_1+O_1+PQ_1+R_1+S_1+U_1+VW_1}{L_1+L_2+M_1+M_2+N_1+N_2+O_1+O_2+PQ_1+PQ_2+R_1+R_2+S_1+S_2+U_1+U_2+VW_1+VW_2}$$

From Table 7-2, the number of productive outcomes in wave 3 was 7,577 (core members and core partners). The number of individuals eligible in wave 3 (among HSE co-operating households) was 16,020. Hence, the estimated unconditional response rate in wave 3 (for this subsample of cases) was estimated to be 7,577/16,020 = 0.47 × 100 = 47%.

Note again that this is a *study* response rate: it relates to the original age-eligible 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 3.

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 had a successful response in the previous wave. This is the definition used in this section. Conditional response rates for waves 1-3 are discussed in turn.

Wave 1

The denominator for the wave 1 response rate conditional on having responded in wave 0 focused on those individuals eligible in wave 1 and who responded in wave 0. The conditional 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 to say, 11,205 of the 11,391 core members in wave 1 had also responded in wave 0). Hence, the estimated response rate in wave 1 conditional on successfully responding in wave 0 was 11,205/17,330 = 0.65 $\times$ 100 = 65%.

Wave 2

In wave 2, the denominator for the conditional response rate focused on those individuals who successfully responded in wave 1 and who remained eligible in wave 2 (focusing, therefore, on core members). The conditional 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 Table 7-2 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%.

Wave 3

In wave 3, the denominator for the conditional response rate focused on those individuals who successfully responded in wave 2 and who remained eligible in wave 3.[44]

From Table 7-2, the number of productive outcomes in wave 2 was 8,837 (groups L, O, R and U). Of these, 424 were estimated to be ineligible in wave 3 (groups L_3, O_3, R_3 and U_3), leaving a denominator of 8,413. Of these, 7,203 were successfully interviewed in wave 3. The conditional response rate was calculated as follows:

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

The relevant groups can be identified from the wave 3 column in Figure 7-1 as follows:

$$RR_{3|2} = \frac{L_1+O_1+R_1+U_1}{L_1+L_2+O_1+O_2+R_1+R_2+U_1+U_2}$$

Hence, the estimated (cross-sectional) response rate in wave 3 conditional upon having taken part in wave 2 was 7,203/8,413 = 0.86 × 100 = 86%.

7.3 Longitudinal response rates (HSE as starting point)

Longitudinal response rates are cumulative. That is, they show response up to and including the current wave *t* in relation to the original sample (minus the terminating events such as deaths or institutional moves that take individuals out of the target population). 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*: inclusion in the denominator, therefore, is not conditional on having responded in one or more previous waves. The rate indicates the proportion of

[44] The denominator, therefore, included 57 core partners who took part in wave 2.

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 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 longitudinal 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 Cohort 1 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 focused on those original age-eligible sample members in waves 0 and 1 (irrespective of their outcome status at either wave or whether issued to field in wave 1). The numerator focused 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 (longitudinal) unconditional 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 × 100 = 46%.

Wave 2

The denominator for the wave 2 (longitudinal) unconditional rate focused 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 focused 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 2 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%.

Wave 3

The denominator for the wave 3 (longitudinal) unconditional rate focused on those original sample members eligible for interview in waves 0, 1, 2 and 3 (irrespective of their participation history or whether issued to field). The numerator focused on those eligible sample units that responded in every wave up to and including wave 3. The response rate, therefore, indicates the proportion of eligible sample units that responded in every wave, and was calculated in wave 3 as follows:

$$RR_{0,1,2,3} = \frac{\text{Respond in waves 0, 1, 2 and 3}}{\text{Eligible sample members in waves 0, 1, 2 and 3}}$$

Calculation of the response rate in wave 3 required an assumption to be made about the proportion of non-respondents in wave 2 (groups P, V and X in Figure 7-1) who remained eligible in wave 3 (groups P*, V* and X*). We have assumed an eligibility rate of 89% based on the proportion of group M in wave 2 (respondents in waves 0 and 1, non-respondents in wave 2) who were known to remain eligible in wave 3 (groups M_1 and M_2).

Having made this assumption, the relevant groups can be identified as follows:

$$RR_{0,1,2,3} = \frac{L_1}{L_1+L_2+M_1+M_2+O_1+O_2+P^*+R_1+R_2+S_1+S_2+U_1+U_2+V^*+X^*}$$

The number of age-eligible individuals who responded in waves 0, 1, 2 and 3 was 7,094. In total, 20,570 individuals were estimated to be eligible for interview in all waves up to and including wave 3. Hence, the estimated (longitudinal) unconditional response rate defined in wave 3 was 7,094/20,570 = 0.34 × 100 = 34%.

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). In this section longitudinal response is defined conditional on response in the preceding wave.

Wave 2

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%.

Wave 3

A longitudinal response rate in wave 3 can be calculated conditional upon having taken part in wave 2. This response rate was calculated as follows:

$$RR_{0,1,2,3|2} = \frac{\text{Respond in waves 0, 1, 2 and 3}}{\text{Eligible sample members in waves 0, 1, 2 and 3 (if also respond in wave 2)}}$$

The relevant groups can be identified from the wave 3 column in Figure 7-1 as follows:

$$RR_{0,1,2,3|2} = \frac{L_1}{L_1+L_2+O_1+O_2+R_1+R_2+U_1+U_2}$$

From Table 7-2, the number of age-eligible sample members who successfully responded in waves 0, 1, 2 and 3 was 7,094. In total, 8,413 individuals were estimated to be eligible for interview in all waves up to and including wave 3 *and* who were successfully interviewed in wave 2. Hence, the estimated longitudinal response rate in wave 3 conditional upon response in wave 2 was 7,094/8,413 = 0.84 × 100 = 84%.

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. 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 was calculated as follows:

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

This rate was set out in Section 7.2.3 ($RR_{2|1}$ = 82%).

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 was calculated as follows:

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

The relevant groups can be identified from the wave 3 column in Figure 7-1 as follows:

$$RR_{3,2|1} = \frac{L_1+R_1}{L_1+L_2+M_1+M_2+R_1+R_2+S_1+S_2}$$

From Table 7-2, the number of Cohort 1 core members who successfully responded in ELSA waves 1-3 was 7,168 (described in this report as 'total responders'). 10,126 Cohort 1 core members were estimated to be eligible for interview in waves 2 and 3 (core members, by definition, took part in wave 1). Hence, the estimated longitudinal response rate in wave 3 conditional upon response in wave 1 was 7,168/10,126 = 0.71 $\times$ 100 = 71%.

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.[45]

[45] Inclusion in the denominator in wave 3 depended on being eligible in ELSA waves 1-3 and having taken part in wave 1. Note, therefore, that this rate is *not* conditional on having taken part in wave 2.

8 REFERENCES

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Appendix A INCOME AND WEALTH ITEM NON-RESPONSE

Section 5.3 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).

Table A-1 Income variable data type

Income variable	Zero	Continuous	Closed band	Open band	Missing, >0	Missing completely
	%	%	%	%	%	%
Wages and salaries (BU)	48.4	44.3	2.3	0.4	2.0	0.2
Private pension (BU)	47.9	44.5	1.77	0.4	2.4	0.6
State pension	48.3	46.2	0.7	0.2	1.6	0.4
Annuity income	95.3	1.4	0.0	0.0	0.1	0.7
Incapacity benefit	92.7	3.8	0.1	0.2	0.5	0.0
Severe disablement allowance	92.7	3.8	0.1	0.2	0.5	0.0
Statutory sick pay	96.6	0.3	0.0	0.0	0.1	0.5
Attendance allowance	92.8	2.9	0.1	0.0	0.4	0.5
Disability living allowance	91.2	4.8	0.1	0.0	0.5	0.5
Industrial injuries allowance	96.2	0.7	0.0	0.0	0.0	0.5
War pension	96.3	0.6	0.0	0.0	0.0	0.5
Carer's allowance	95.4	1.3	0.1	0.0	0.1	0.5
Other health benefits	96.5	0.3	0.0	0.0	0.1	0.5
Income support	94.4	1.7	0.1	0.0	0.4	0.6
Pension credit	91.0	4.2	0.3	0.0	0.6	0.6
Working tax credit	96.0	0.9	0.0	0.0	0.0	0.6
Job seeker's allowance	96.6	0.3	0.0	0.0	0.0	0.6
Guardian's allowance	96.9	0.0	0.0	0.0	0.0	0.6
Widow's pension	96.0	0.7	0.1	0.0	0.1	0.6
Child benefit	93.5	3.2	0.1	0.0	0.1	0.6
Child tax credit	95.4	1.3	0.0	0.0	0.2	0.6
Other benefits	96.6	0.3	0.0	0.0	0.0	0.6
Other income	96.0	0.9	0.0	0.0	0.1	0.6
Take home pay	66.5	30.6	0.9	0.1	1.4	0.1
Net profit (self employment)	94.2	3.5	1.0	0.1	0.7	0.0
Self employment drawings	97.3	1.5	0.1	0.0	0.6	0.1
Odd jobs	95.6	3.3	0.2	0.0	0.1	0.2
Savings income	25.4	43.0	15.3	1.2	11.2	1.4
TESSA income	87.3	4.1	1.8	0.1	2.6	1.5
ISA income	73.8	12.4	2.6	0.5	4.3	1.7
Premium bonds income	82.0	12.3	0.1	0.1	1.5	1.5
National savings income	92.2	1.8	0.7	0.1	1.2	1.6
PEP income	90.1	2.2	0.9	0.1	2.7	1.5
Shares income	70.1	17.3	2.9	0.4	5.3	1.5

…continued

Income variable	Zero	Continuous	Closed band	Open band	Missing, >0	Missing completely
	%	%	%	%	%	%
Trusts income	91.9	1.8	0.5	0.1	1.7	1.5
Bonds income	89.9	3.4	0.6	0.1	2.0	1.6
Income from other savings	91.9	2.0	0.5	0.1	16	1.6
Rental income	93.5	2.9	0.1	0.3	0.6	0.1
Farm income	96.0	0.7	0.1	0.0	0.1	0.6

BU denotes Benefit unit (defined in Section 3.2).

Table A-2 Wealth variable data type

Wealth variable	Zero	Continuous	Closed band	Open band	Missing, >0	Missing completely
	%	%	%	%	%	%
Savings	8.9	72.9	5.7	1.6	7.0	1.4
TESSAs	84.7	8.8	0.6	0.1	1.8	1.5
Cash ISA	49.6	39.0	1.6	0.5	3.3	1.7
Life insurance ISA	93.0	0.5	0.1	0.0	0.3	1.9
Shares ISA	81.3	10.1	0.9	0.3	1.2	1.8
Premium bonds	57.6	35.5	0.6	0.3	2.1	1.4
National savings	90.5	4.5	0.3	0.0	0.7	1.6
PEPs	82.2	9.7	1.7	0.2	2.3	1.5
Shares	64.6	24.0	2.9	0.5	4.1	1.5
Trusts	86.7	6.7	0.9	0.1	1.6	1.5
Bonds	95.4	8.2	0.7	0.1	1.6	1.6
Other savings	90.0	4.5	0.2	0.2	1.1	1.6
Life insurance (savings component)	86.9	5.8	1.4	0.1	0.9	2.5
Property	86.1	9.7	0.4	0.1	0.7	0.6
Farms	95.1	1.4	0.1	0.0	0.2	0.6
Other physical assets	86.8	8.4	0.7	0.2	0.7	0.7
Primary business wealth	98.5	0.5	0.3	0.0	0.2	0.1
Other business assets	95.2	1.3	0.5	0.0	0.3	2.2
Credit card debt	78.6	17.3	0.4	0.1	0.5	0.6
Other private debt	95.5	1.4	0.0	0.0	0.0	0.5
Other debt	75.6	20.1	0.5	0.1	0.6	0.6
Joint assets	95.4	1.4	0.0	0.1	0.3	0.2
House value	18.6	76.6	2.5	0.6	1.1	0.0
Housing debt	74.1	10.0	12.9	2.4	0.1	0.0

Appendix B MODEL OF RESPONSE TO MAIN INTERVIEW (COHORT 1)

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.

For Cohort 1 core members eligible for the main interview in wave 3 (2006-07), *and* who responded in wave 2, response to the ELSA wave 3 main interview was modelled using logistic regression. 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 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) whether interviewed in HSE, (2) year sampled for HSE, (3) Government Office Region, (4) Index of Multiple Deprivation quintiles (IMD 2004)[46], (5) ethnicity, (6) tenure, (7) social class, (8) self-assessed health, (9) Urban/Rural indicator, (10) household size, (11) educational status, and (12) long-standing illness. 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 (trimmed at the 99th percentile)[47] was then combined with the wave 2 interview weight to create the final longitudinal weight to use with the wave 3 main interview data (for Cohort 1 core members who had taken part in waves 1-3). The wave 3 longitudinal weight was scaled to the achieved sample size (resulting in the weight for 7,168 Cohort 1 core members who had taken part in waves 1-3 being standardised around an average of one).

[46] 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 households. The dimensions are: income deprivation; employment 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.

[47] 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).

Table B-1 Model of response to main interview (Cohort 1)

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Whether interviewed in HSE (p<0.001)					
Interviewed (ref)	8258	1	-	-	-
Not interviewed	101	0.43	0.10	0.28	0.68
Year of HSE selection (p=0.006)					
2001 (ref)	3265	1	-	-	-
1998	3579	0.84	0.06	0.72	0.97
1999	1515	0.76	0.07	0.63	0.91
Government Office Region (p<0.001)					
North East (ref)	542	1	-	-	-
North West	1064	0.45	0.07	0.33	0.62
Yorkshire & The Humber	911	0.82	0.14	0.58	1.15
East Midlands	854	0.65	0.12	0.46	0.92
West Midlands	911	0.63	0.11	0.45	0.89
East of England	983	0.84	0.15	0.59	1.20
London	771	0.64	0.12	0.44	0.91
South East	1341	0.59	0.10	0.42	0.83
South West	982	0.58	0.10	0.41	0.81
Index of Multiple Deprivation 2004 (p=0.094)					
Least deprived (ref)	1996	1	-	-	-
2nd quintile	1991	1.09	0.11	0.89	1.33
3rd quintile	1701	1.14	0.12	0.92	1.41
4th quintile	1529	0.87	0.09	0.70	1.08
Most deprived	1142	0.94	0.12	0.73	1.21
Ethnicity (p=0.010)					
White (ref)	8169	1	-	-	-
Non-white	190	0.61	0.12	0.42	0.89
Tenure (p=0.007)					
Own outright (ref)	5184	1	-	-	-
Mortgage/loan	1703	0.94	0.08	0.79	1.11
Renting	1472	0.75	0.07	0.63	0.90
Social class (p=0.039)					
Managerial & professional (ref)	2934	1	-	-	-
Intermediate	658	1.38	0.21	1.02	1.86
Small employers & own-account workers	1039	0.92	0.11	0.74	1.15
Lower supervisory & technical	1096	1.08	0.12	0.86	1.35
Semi-routine	2282	0.90	0.09	0.75	1.09
Other	350	0.77	0.13	0.55	1.07
Self-assessed health (p=0.001)					
Excellent (ref)	1048	1	-	-	-
Very good	2347	0.94	0.11	0.74	1.19
Good	2699	0.77	0.09	0.61	0.98
Fair	1683	0.66	0.09	0.51	0.85
Poor	582	0.59	0.10	0.43	0.82

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Urban/rural indicator (p=0.056)					
Urban >= 10k (sparse) (ref)	6215	1	-	-	-
Town & Fringe (sparse)	1018	1.16	0.13	0.93	1.43
Village – (sparse)	1126	1.28	0.14	1.03	1.59
Number in household (p<0.001)					
1 (ref)	2142	1	-	-	-
2	4839	0.61	0.05	0.51	0.72
3	940	0.62	0.08	0.49	0.79
4+	438	0.80	0.14	0.57	1.11
Highest educational qualification (p<0.001)					
Degree or equivalent (ref)	1023	1	-	-	-
A level/higher education below degree	1550	0.76	0.11	0.57	1.01
O level or other	1413	0.65	0.10	0.48	0.87
CSE or other	1112	0.56	0.09	0.42	0.77
No qualifications	3261	0.44	0.06	0.33	0.58
Long-standing illness (p<0.001)					
Yes (ref)	4748	1	-	-	-
No	3611	0.76	0.06	0.65	0.88

Notes:

1. The response variable for the logistic regression was 1 = core member responding to the main interview in wave 3, 0 = non-response. Only those 8,359 Cohort 1 core members who had taken part in waves 1 and 2 *and* considered eligible for wave 3 were included in the model.
2. Only variables that were significant at the 0.10 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 0.0424.
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 was significant (p<0.10 in this case) then the categorical variable was considered to be 'significantly associated' with the response variable and therefore included in the model.
6. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicated higher odds, and odds ratios less than 1 indicated lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval did not include 1, this category was significantly different from the reference category (at the 5% significance level).

Table B-2 gives summary information on the wave 3 longitudinal weight.

Table B-2 Summary statistics for wave 3 longitudinal weight

Wave 3 longitudinal weight (w3Lwgt)					
N	7168				
Mean	1.000	**Standard deviation**	.262		
Minimum	.557				
Maximum	4.180				
Percentile					
10	.740	**20**	.801	**30**	.850
40	.897	**50**	.946	**60**	1.001
70	1.068	**80**	1.158	**90**	1.318
Percentage variance inflation due to weights				6.86	

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 NON-ATTRITION NON-RESPONSE

As described in Section 6-3, it is often speculated that individuals with non-attrition non-response (who return to a longitudinal study in the current wave after missing one or more of the preceding waves) are likely to have characteristics that differ from those who have taken part in all waves (Lynn et al., 1994). To examine this, a group membership indicator variable (0 = having taken part in all waves, 1 = returning to the study after missing wave 2) for Cohort 1 core members interviewed in a private residential address in wave 3 was modelled on a full range of household and individual-level information collected from HSE and wave 1. These two groups are shown as XXX and XOX in Figure 6-1 respectively. Not all the variables examined were retained for the final model: variables not strongly related to group membership were dropped from the analysis.

The variables found to be related to group membership were: (1) tenure, (2) marital status, (3) ethnicity, (4) whether interviewed in HSE and (5) educational status. The full model is given in Table C-1 below. As a result of fitting this model, the marginal distributions for the combined sample of Cohort 1 core member respondents in wave 3 (XXX + XOX), for each of the five selected variables, was forced to equal the corresponding distributions for XXX respondents (prior to the calibration to age-by-sex household population totals). See Section 6.3 for full details.

Table C-1 Factors associated with non-attrition non-response

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Ethnicity (p<0.001)					
White (ref)	7323	1	-	-	-
Non-white	159	2.50	0.67	1.48	4.22
Tenure (p<0.001)					
Owners (ref)	6187	1	-	-	-
Renters	1187	1.86	0.26	1.41	2.45
Other	108	2.11	0.80	1.00	4.44
Educational status (p<0.001)					
Degree or equivalent (ref)	967	1	-	-	-
A level/higher education below degree	1428	1.04	0.26	0.63	1.71
O level or other	1281	1.15	0.30	0.70	1.91
CSE or other	981	0.97	0.27	0.56	1.67
No qualifications	2825	1.99	0.45	1.28	3.10
Marital status (p=0.098)					
Married, first and only marriage (ref)	4197	1	-	-	-
Single, never married	388	0.78	0.23	0.44	1.38
Remarried	845	1.29	0.24	0.90	1.85
Separated/divorced	843	1.24	0.22	0.88	1.75
Widowed	1209	0.76	0.14	0.53	1.08
Interviewed in HSE (p<0.001)					
Yes (ref)	7397	1	-	-	-
No	85	3.86	1.32	1.98	7.54

Notes:

1. The response variable for the logistic regression was 1 = Cohort 1 core member having had a non-attrition pattern of non-response (XOX), 0 = total response (XXX). Only those 7,482 Cohort 1 core members interviewed in a private residential address in wave 3 (2006-07) were included in the model. Six core members interviewed in a private residential address in wave 3 but ineligible in wave 2 through being institutionalised or having moved out of Britain were excluded from the analysis.
2. Only variables that were significant at the 0.10 level were included in the model.
3. The data was weighted by the wave 1 main interview weight prior to running the model.
4. The model R^2 was 0.0355.
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 was significant (p<0.10 in this case) then the categorical variable was considered to be 'significantly associated' with the response variable and therefore included in the model.
6. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicated higher odds, and odds ratios less than 1 indicated lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval did not include 1, this category was significantly different from the reference category (at the 5% significance level).

Appendix D MODEL OF RESPONSE TO MAIN INTERVIEW (COHORT 3)

For those Cohort 3 age-eligible sample members, response to wave 3 was modelled using logistic regression. A partial or proxy interview was considered a response. Cases in the missing year of birth (1 March 1952 and 28 February 1953) were excluded from the model: 80 Cohort 1 young partners correctly issued as age-eligible sample members were included. Sample members known to have died or moved out of England since HSE interviewing were not included in the modelling.

A number of variables collected from the 2001-2004 HSE years 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) year sampled for HSE, (2) long-standing illness, (3) ethnicity, (4) educational status, (5) whether already part of ELSA study, and (6) household type. 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 top two per cent of the weight was trimmed before the weight was scaled to the achieved sample size (resulting in the weight for Cohort 3 core members being standardised around an average of one).

Table D-1 Model of response to main interview (Cohort 3)

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Year of HSE selection (p=0.006)					
2001 (ref)	679	1	-	-	-
2002	329	1.08	0.15	0.82	1.42
2003	644	1.28	0.15	1.02	1.62
2004	285	1.66	0.26	1.23	2.25
Long-standing illness in HSE (p=0.002)					
Limiting long-standing illness (ref)	476	1	-	-	-
Non-limiting long-standing illness	382	0.75	0.11	0.56	1.01
No limiting long-standing illness	1079	0.66	0.08	0.52	0.83
Ethnicity (p=0.025)					
White (ref)	1796	1	-	-	-
Non-white	141	0.66	0.12	0.46	0.95
Highest educational qualification (p<0.001)					
Degree or equivalent (ref)	390	1	-	-	-
A level/higher education below degree	480	0.84	0.12	0.63	1.11
O level or other	453	0.80	0.12	0.60	1.07
CSE or other	138	0.57	0.12	0.38	0.85
No qualifications	476	0.57	0.08	0.43	0.76
Whether already in ELSA study (p=0.002)					
No (ref)	1857	1	-	-	-
Yes	80	2.30	0.62	1.35	3.91
Household type (p=0.028)					
1 adult aged 16-59, no children (ref)	246	1	-	-	-
2 adults, both 16-59, no children	479	0.73	0.12	0.53	1.01
Small family	364	0.91	0.16	0.64	1.28
Large family	134	1.02	0.23	0.66	1.58
Large adult household	714	1.08	0.17	0.80	1.47

Notes:

1. The response was 1 = age-eligible sample member responding to the main interview, 0 = non-response. Only those 1,937 potential age-eligible sample members were included in the model.
2. Only variables that were significant at the 0.10 level were included in the model.
3. The model R^2 was 0.0243.
4. 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 was significant (<0.05) then the categorical variable was considered to be 'significantly associated' with the response variable and therefore included in the model.
5. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicated higher odds, and odds ratios less than 1 indicated lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval did not include 1, this category was significantly different from the reference category (at the 5% significance level).

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 (from Cohorts 1 and 3) 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 ELSA wave 3 interview were included in the non-response model. A number of variables collected from both HSE and ELSA waves 1-3 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) age-by-sex, (2) marital status, (3) Government Office Region, (4) Financial Unit type, (5) self-assessed health, (6) household size, (7) ethnicity, (8) educational status, (9) equivalised income quintile, (10) current employment status and (11) tenure. 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 (trimmed at the 97.5th percentile) was then multiplied into the wave 3 *cross-sectional* weight to create the final non-response weight to use with the self-completion data. Finally, 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).

Table E-1 Model of response in wave 3 (self-completion)

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Age-by-sex (p<0.001)					
Male 50-54 (ref)	661	1	-	-	-
Male 55-59	757	1.66	0.27	1.21	2.28
Male 60-64	607	1.20	0.21	0.86	1.68
Male 65-69	539	1.24	0.26	0.83	1.87
Male 70-74	510	1.20	0.27	0.77	1.86
Male 75-79	350	1.18	0.30	0.72	1.93
Male 80-84	250	0.72	0.18	0.45	1.17
Male 85 and over	136	0.47	0.13	0.27	0.82
Female 50-54	805	1.18	0.17	0.89	1.57
Female 55-59	921	1.39	0.22	1.03	1.88
Female 60-64	718	1.95	0.39	1.32	2.87
Female 65-69	618	1.91	0.42	1.25	2.94
Female 70-74	577	1.43	0.31	0.93	2.19
Female 75-79	507	1.03	0.22	0.68	1.58
Female 80-84	321	0.85	0.20	0.54	1.34
Female 85 and over	250	0.37	0.09	0.23	0.58
Marital status (p=0.020)					
Single, never married (ref)	503	1	-	-	-
Married, first and only marriage	4559	0.83	0.17	0.56	1.24
Remarried	966	0.97	0.22	0.62	1.51
Separated/Divorced	1007	0.70	0.11	0.52	0.95
Widowed	1492	1.03	0.16	0.75	1.41
Region (p=0.088)					
North East (ref)	554	1	-	-	-
North West	1038	0.69	0.11	0.50	0.96
Yorkshire & The Humber	971	0.96	0.16	0.68	1.34
East Midlands	875	0.74	0.13	0.53	1.04
West Midlands	918	0.83	0.14	0.60	1.16
East of England	1046	1.01	0.17	0.72	1.41
London	784	0.92	0.17	0.65	1.31
South East	1367	0.85	0.14	0.62	1.18
South West	974	0.96	0.17	0.68	1.36
Financial unit type (p<0.001)					
Single (ref)	2780	1	-	-	-
Couple, separate finances	921	1.92	0.41	1.27	2.92
Couple, joint finances	4826	2.44	0.48	1.66	3.59
Self-assessed health (p=0.001)					
Very good (ref)	2114	1	-	-	-
Good	3651	0.87	0.08	0.72	1.04
Fair	2158	0.73	0.08	0.59	0.90
Bad	483	0.60	0.09	0.44	0.82
Very bad	121	0.44	0.12	0.26	0.74

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Household size (p=0.006)					
1 (ref)	2246	1	-	-	-
2	4609	0.85	0.11	0.66	1.10
3	1036	0.77	0.12	0.56	1.04
4+	636	0.56	0.10	0.40	0.79
Ethnicity (p<0.001)					
White (ref)	8306	1	-	-	-
Non-white	221	0.26	0.04	0.19	0.36
Highest educational qualification (p<0.001)					
Degree or equivalent (ref)	1414	1	-	-	-
A level/higher education below degree	1244	0.96	0.13	0.73	1.27
O level	646	0.65	0.10	0.48	0.88
CSE	1520	0.75	0.10	0.58	0.97
Other	396	0.77	0.15	0.53	1.13
No qualification	675	0.91	0.17	0.63	1.29
Equivalised income quintile (p=0.002)					
1 (ref)	1747	1	-	-	-
2	1739	1.12	0.12	0.91	1.38
3	1674	1.33	0.15	1.06	1.66
4	1607	1.19	0.15	0.93	1.51
5	1564	1.08	0.14	0.84	1.39
Missing	196	0.57	0.12	0.37	0.87
Activity status (p<0.001)					
Retired/semi-retired (ref)	4423	1	-	-	-
Employed	2395	0.52	0.07	0.41	0.67
Self-employed	505	0.46	0.08	0.33	0.64
Unemployed/permanently sick/disabled	501	0.65	0.11	0.47	0.90
Looking after home or family	703	0.94	0.14	0.70	1.26
Tenure (p=0.004)					
Own outright (ref)	5065	1	-	-	-
Mortgage	1954	0.77	0.07	0.64	0.92
Renting	1508	0.79	0.07	0.66	0.95

Notes:

1. The response was 1 = core member having returned the self-completion questionnaire, 0 = non-response. Only those 8,527 core members (Cohorts 1 and 3) completing a full main interview in 2006-07 were included in the model.
2. Only variables that were significant at the 0.10 level were included in the model.
3. The data was weighted by the wave 3 cross-sectional weight prior to running the model.
4. The model R^2 was 0.0906.
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 was significant (p<0.10 in this case) then the categorical variable was considered to be 'significantly associated' with the response variable and therefore included in the model.
6. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicated higher odds, and odds ratios less than 1 indicated lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval did not include 1, this category was significantly different from the reference category.

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

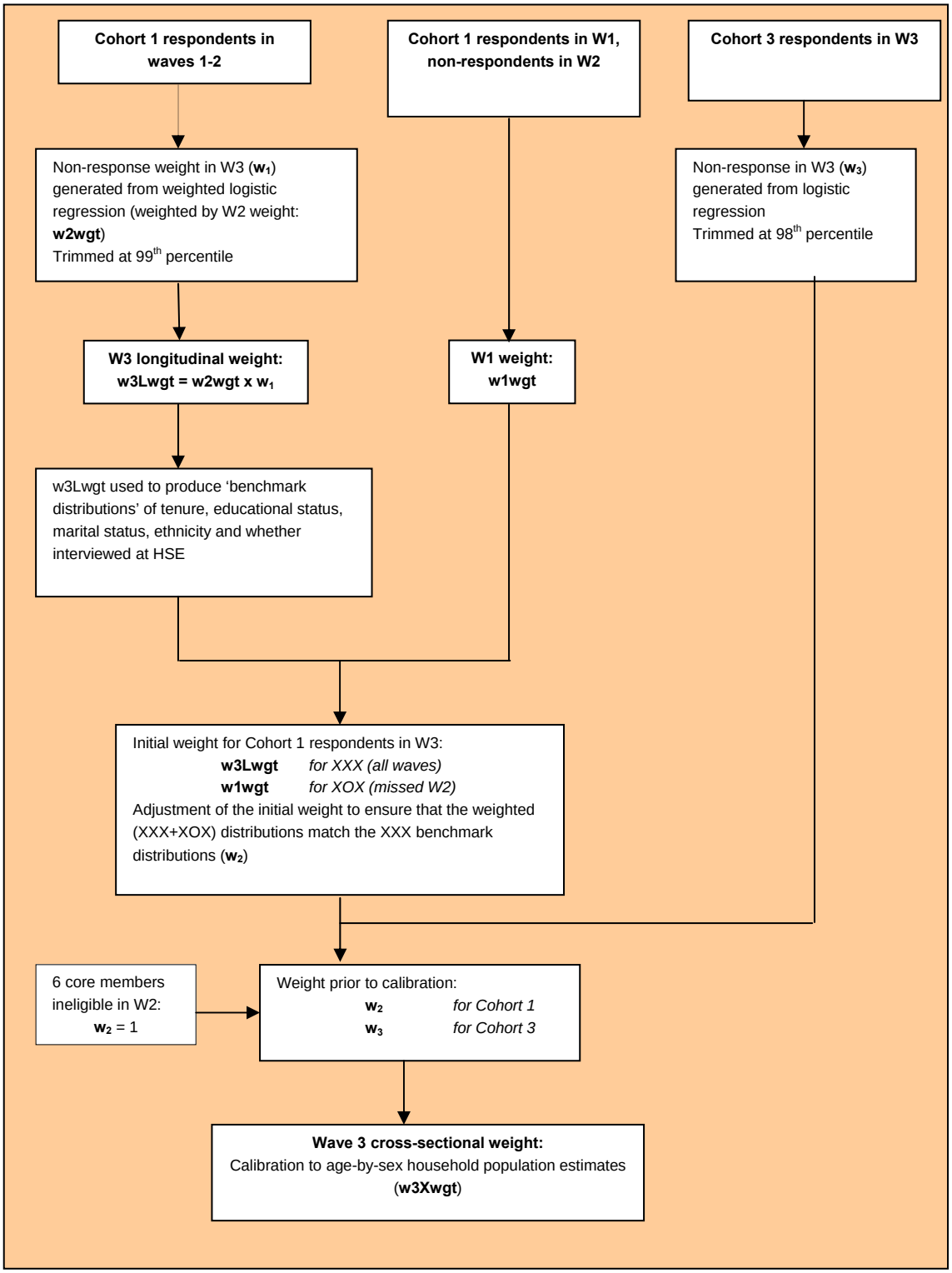
Wave 3 self-completion weight (scw3wgt)					
N	7406				
Mean	1.000	**Standard deviation**	.286		
Minimum	.528				
Maximum	5.440				
Percentile					
10	.725	**20**	.786	**30**	.838
40	.887	**50**	.941	**60**	1.001
70	1.071	**80**	1.169	**90**	1.328
Percentage variance inflation due to weights				8.16	

Appendix F SUMMARY STATISTICS (WAVE 3 CROSS-SECTIONAL WEIGHT)

Table F-1 gives summary information on the wave 3 cross-sectional weight.

Wave 3 cross-sectional weight (w3Xwgt)					
N	8661				
Mean	1.000	**Standard deviation**	.244		
Minimum	.56				
Maximum	3.96				
Percentile					
10	.756	**20**	.813	**30**	.859
40	.906	**50**	.953	**60**	1.005
70	1.067	**80**	1.156	**90**	1.293
Percentage variance inflation due to weights				5.93	

Appendix G DERIVATION OF THE WAVE 3 CROSS-SECTIONAL WEIGHT



Appendix H MODEL OF RESPONSE TO LIFE-HISTORY INTERVIEW

Data available for both respondents and non-respondents was used to model the response behaviour of core members (from Cohorts 1 and 3) eligible for the life-history interview and the results were used to generate a non-response weight specifically for the variables collected in this interview. This non-response weight was created in an analogous fashion to the self-completion questionnaire and was intended to reduce bias in the achieved life-history interview data resulting from differential non-response.

Response to the life-history interview was modelled using logistic regression, with the dependent variable indicating whether or not the eligible core member responded. Only those core members completing a full (i.e. non-proxy) main ELSA wave 3 interview were included in the non-response model. A number of variables collected from both HSE and ELSA waves 1-3 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 to the life-history interview were dropped from the analysis.

The variables found to be related to response were: (1) age-by-sex, (2) Government Office Region, (3) self-assessed health, (4) household size, (5) ethnicity, (6) educational status, (7) equivalised income quintile, (8) tenure and (9) Index of Multiple Deprivation quintiles (IMD 2004). The full model is given in Table H-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 (trimmed at the 97.5th percentile) was then multiplied into the wave 3 *cross-sectional* weight to create the final non-response weight to use with the life-history data. Finally, the weight was scaled to the achieved sample size (resulting in the weight for core members responding to the life-history interview being standardised around an average of one).

Table H-1 Model of response to life-history interview

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Age-by-sex (p<0.001)					
Male 50-54 (ref)	627	1	-	-	-
Male 55-59	741	1.49	0.23	1.10	2.02
Male 60-64	597	1.35	0.23	0.98	1.88
Male 65-69	525	1.49	0.27	1.04	2.12
Male 70-74	497	1.85	0.36	1.27	2.70
Male 75-79	341	1.57	0.32	1.05	2.35
Male 80-84	236	1.51	0.36	0.95	2.39
Male 85 and over	127	0.70	0.18	0.43	1.16
Female 50-54	772	1.26	0.19	0.94	1.68
Female 55-59	904	1.57	0.24	1.16	2.12
Female 60-64	708	1.62	0.27	1.16	2.25
Female 65-69	598	1.81	0.33	1.26	2.60
Female 70-74	561	1.96	0.37	1.35	2.85
Female 75-79	493	1.62	0.30	1.12	2.33
Female 80-84	313	1.17	0.24	0.79	1.75
Female 85 and over	233	0.82	0.19	0.53	1.28
Government Office Region (p=0.006)					
North East (ref)	540	1	-	-	-
North West	999	0.85	0.13	0.64	1.15
Yorkshire & The Humber	949	0.92	0.14	0.69	1.24
East Midlands	858	1.33	0.22	0.97	1.84
West Midlands	887	1.09	0.17	0.80	1.49
East of England	1025	1.31	0.21	0.95	1.80
London	751	0.97	0.16	0.70	1.34
South East	1333	0.93	0.14	0.69	1.24
South West	931	0.86	0.14	0.63	1.17
Self-reported health (p=0.024)					
Very good (ref)	2057	1	-	-	-
Good	3556	0.90	0.08	0.76	1.07
Fair	2090	0.89	0.09	0.74	1.08
Bad	456	0.76	0.11	0.57	1.02
Very bad	114	0.47	0.11	0.29	0.76
Household size (p=0.053)					
1 (ref)	2164	1	-	-	-
2	4494	0.78	0.07	0.65	0.94
3	1002	0.79	0.10	0.62	1.01
4	613	0.88	0.13	0.66	1.18
Ethnicity (p<0.001)					
White (ref)	8060	1	-	-	-
Non-white	213	0.50	0.09	0.35	0.70
Highest educational qualification (p<0.001)					
Degree or equivalent (ref)	1385	1	-	-	-
Higher education below degree	1210	0.84	0.11	0.65	1.08
A level	621	0.76	0.12	0.56	1.02
O level or other	1499	0.90	0.11	0.70	1.15
CSE or other	381	0.84	0.16	0.58	1.20
Foreign qualifications or other	652	0.68	0.11	0.50	0.92
No qualifications	2525	0.61	0.08	0.48	0.77

…continued

Term	N	Odds ratio	Standard error	95% confidence interval	
				Lower	Upper
Equivalised income quintile (p<0.001)					
1 (ref)	1676	1	-	-	-
2	1674	1.03	0.10	0.85	1.26
3	1630	1.15	0.12	0.94	1.41
4	1574	1.13	0.12	0.91	1.40
5	1537	1.08	0.13	0.85	1.37
Missing	182	0.48	0.09	0.33	0.70
Tenure (p=0.002)					
Own outright (ref)	4931	1	-	-	-
Mortgage	1903	0.81	0.07	0.68	0.96
Renting	1439	0.74	0.07	0.62	0.89
Index of Multiple Deprivation 2004 (p=0.001)					
Least deprived (ref)	2048	1	-	-	-
2nd quintile	2000	1.11	0.11	0.91	1.35
3rd quintile	1675	0.90	0.09	0.73	1.10
4th quintile	1451	0.76	0.08	0.62	0.94
Most deprived	1099	0.75	0.09	0.59	0.95

Notes:

1. The response was 1 = core member having responded to the life-history interview, 0 = non-response. Only those 8,273 core members (Cohorts 1 and 3) completing a full main interview in 2006-07 (before April 19 2007) were included in the model.
2. Only variables that were significant at the 0.075 level were included in the model.
3. The data was weighted by the wave 3 cross-sectional weight prior to running the model (with an adjustment to ensure the data was balanced across the four quarters defined by the wave 3 main interview date).
4. The model R^2 was 0.0354.
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 was significant (p<0.075 in this case) then the categorical variable was considered to be 'significantly associated' with the response variable and therefore included in the model.
6. Odds are expressed relative to a reference category (denoted by 'ref'), which has a given value of 1. Odds ratios greater than 1 indicated higher odds, and odds ratios less than 1 indicated lower odds. Also shown are the 95% confidence intervals for the odds ratios. Where the interval did not include 1, this category was significantly different from the reference category.

Table H-2 gives summary information on the life-history main interview weight.

Life history main interview weight (retrowgt)					
N	7049				
Mean	1.000	**Standard deviation**	.277		
Minimum	.51				
Maximum	4.17				
Percentile					
10	.719	**20**	.785	**30**	.840
40	.889	**50**	.943	**60**	1.004
70	1.079	**80**	1.177	**90**	1.339
Percentage variance inflation due to weights				7.70	

Appendix I KEY ELSA ESTIMATES

Effects 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 3 study have been identified to illustrate the effects of the weighting.

The effect of weighting on key estimates is illustrated in Tables I-1 to I-3 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: focusing on core member respondents in wave 3 (disregarding their outcome status in wave 2). Estimates using variables collected in the main interview were calculated on data weighted by the wave 3 cross-sectional weight. Estimates using variables collected in the self-completion questionnaire were calculated on data weighted by the self-completion weight.

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.[48] The HSE 1998, 1999 and 2001-04 samples that provided the sampling frame for ELSA Cohorts 1 and 3 (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 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

[48] 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 Viera (2007).

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 I-1 to I-3 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 3 interview address. In total, 2,372 postcode sectors were covered by the achieved wave 3 sample (Cohort 1 and 3 core members) (average number of respondents 3.65, 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.

Table I-1 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**							
	50-52	3878	4057	13.8	13.6	0.6	12.3-14.8	1.12
	54-59	3878	4057	23.2	26.1	0.8	24.7-27.6	1.07
	60-64	3878	4057	15.8	16.8	0.6	15.5-18.1	1.08
	65-69	3878	4057	14.2	13.6	0.6	12.6-14.7	1.01
	70-74	3878	4057	13.3	11.5	0.5	10.5-12.4	0.95
	75-79	3878	4057	9.3	8.9	0.5	8.0-9.8	0.99
	80 and over	3878	4057	10.4	9.5	0.5	8.6-10.4	0.99
	Legal marital status							
	Single, never married	3871	4049	6.6	7.0	0.5	6.1-7.9	1.12
	Married (first and only)	3871	4049	61.1	61.2	0.8	59.5-62.8	1.08
	Remarried	3871	4049	13.0	13.0	0.6	11.9-14.1	1.03
	Separated/Divorced	3871	4049	9.9	10.0	0.5	9.0-11.0	1.03
	Widowed	3871	4049	9.4	8.8	0.5	7.9-9.7	1.01
	Ethnicity							
	White	3876	4054	97.1	96.2	0.4	95.4-96.9	1.26
	Non-white	3876	4054	2.9	3.8	0.4	3.1-4.6	1.26
	Highest educational qualification (HSE)							
	Degree or equivalent	3812	3967	18.3	16.5	0.6	15.3-17.7	1.03
	A level/Higher education below degree	3812	3967	23.6	22.2	0.7	20.9-23.5	0.99
	O level or other	3812	3967	16.3	16.1	0.6	15.0-17.3	1.00
	CSE or other	3812	3967	11.3	11.6	0.5	10.6-12.7	1.04
	No qualifications	3812	3967	30.5	33.5	0.9	31.9-35.2	1.12
Women	**Age-group**							
	50-52	4783	4604	13.3	12.3	0.5	11.2-13.3	1.09
	54-59	4783	4604	23.0	23.7	0.6	22.4-24.9	1.03
	60-64	4783	4604	15.1	15.4	0.5	14.4-16.5	1.03
	65-69	4783	4604	13.0	12.9	0.5	12.0-13.9	1.03
	70-74	4783	4604	12.3	11.5	0.5	10.6-12.4	1.00
	75-79	4783	4604	10.8	10.1	0.4	9.2-10.9	0.99
	80 and over	4783	4604	12.6	14.1	0.6	13.0-15.3	1.15
	Legal marital status							
	Single, never married	4778	4600	5.4	5.2	0.3	4.5-5.8	1.05
	Married (first and only)	4778	4600	47.3	48.6	0.8	47.1-50.1	1.04
	Remarried	4778	4600	9.9	9.9	0.4	9.1-10.8	1.00
	Separated/Divorced	4778	4600	13.2	12.3	0.5	11.4-13.3	1.01
	Widowed	4778	4600	24.2	24.0	0.7	22.7-25.2	1.06
	Ethnicity							
	White	4782	4603	97.5	96.9	0.3	96.3-97.5	1.22
	Non-white	4782	4603	2.5	3.1	0.3	2.5-3.7	1.22
	Highest educational qualification (HSE)							
	Degree or equivalent	4751	4564	10.4	9.0	0.4	8.1-9.8	1.05
	A level/Higher education below degree	4751	4564	16.5	15.0	0.5	14.0-16.1	1.02
	O level or other	4751	4564	19.4	18.4	0.6	17.3-19.5	1.00
	CSE or other	4751	4564	12.1	12.1	0.5	11.2-13.1	1.02
	No qualifications	4751	4564	41.5	45.5	0.8	43.9-47.1	1.12

…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	3861	4038	58.8	56.5	0.9	54.8-58.2	1.08
	Buy with mortgage	3861	4038	25.3	26.2	0.7	24.8-27.6	1.04
	Rent	3861	4038	14.4	15.8	0.7	14.5-17.1	1.15
	Other	3861	4038	1.5	1.5	0.2	1.1-1.9	1.08
	Employment status							
	Retired/Semi-retired	3872	4050	53.1	50.2	0.8	48.5-51.8	1.03
	Employed	3872	4050	38.8	40.8	0.8	39.2-42.5	1.06
	Looking after home	3872	4050	1.3	1.4	0.2	1.0-1.8	1.07
	Permanently sick/disabled	3872	4050	5.6	6.3	0.4	5.4-7.1	1.11
	Unemployed	3872	4050	1.2	1.3	0.2	0.9-1.7	1.09
	Region							
	North East	3872	4051	6.3	6.0	0.5	5.0-6.9	1.23
	North West	3872	4051	12.4	13.2	0.7	11.9-14.5	1.21
	Yorkshire & The Humber	3872	4051	11.5	10.9	0.6	9.7-12.0	1.18
	East Midlands	3872	4051	10.6	10.1	0.6	9.0-11.3	1.23
	West Midlands	3872	4051	10.8	11.1	0.7	9.8-12.4	1.31
	East of England	3872	4051	12.5	12.3	0.6	11.1-13.6	1.22
	London	3872	4051	8.6	9.4	0.6	8.3-10.5	1.20
	South East	3872	4051	15.6	15.3	0.7	14.0-16.6	1.16
	South West	3872	4051	11.7	11.6	0.7	10.4-12.9	1.26
Women	**Tenure**							
	Own outright	4743	4561	59.3	58.4	0.8	56.9-60.0	1.10
	Buy with mortgage	4743	4561	21.0	20.7	0.6	19.5-21.9	1.04
	Rent	4743	4561	18.2	19.4	0.7	18.1-20.6	1.13
	Other	4743	4561	1.4	1.5	0.2	1.1-1.9	1.07
	Employment status							
	Retired/Semi-retired	4771	4593	50.9	50.7	0.8	49.2-52.2	1.07
	Employed	4771	4593	29.6	29.3	0.7	28.0-30.7	1.06
	Looking after home	4771	4593	13.9	14.3	0.5	13.2-15.3	1.06
	Permanently sick/disabled	4771	4593	5.0	5.1	0.3	4.4-5.7	1.04
	Unemployed	4771	4593	0.6	0.6	0.1	0.4-0.8	1.06
	Region							
	North East	4779	4600	6.6	6.2	0.4	5.4-7.0	1.22
	North West	4779	4600	12.0	13.1	0.6	11.9-14.3	1.22
	Yorkshire & The Humber	4779	4600	11.4	10.7	0.5	9.6-11.8	1.22
	East Midlands	4779	4600	10.0	9.3	0.5	8.3-10.3	1.21
	West Midlands	4779	4600	10.8	11.2	0.6	10.0-12.4	1.33
	East of England	4779	4600	12.1	11.8	0.6	10.6-13.0	1.30
	London	4779	4600	9.7	10.5	0.6	9.4-11.7	1.38
	South East	4779	4600	16.4	16.2	0.6	15.0-17.4	1.14
	South West	4779	4600	11.1	11.0	0.6	9.9-12.1	1.26

Table I-2 True standard errors (SE) and 95% confidence intervals for self-reported health and memory status, and number of falls

	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	3808	3980	25.3	25.1	0.7	23.7-26.5	1.03
	Very good	3808	3980	42.7	42.3	0.8	40.6-43.9	1.04
	Good	3808	3980	24.9	25.0	0.7	23.5-26.5	1.06
	Fair	3808	3980	5.5	6.1	0.4	5.2-6.9	1.11
	Poor	3808	3980	1.5	1.6	0.2	1.1-2.0	1.07
	Self-reported memory status							
	Excellent	3793	3962	3.4	3.5	0.3	2.8-4.1	1.06
	Very good	3793	3962	16.0	15.9	0.6	14.7-17.1	1.01
	Good	3793	3962	41.4	40.9	0.8	39.3-42.6	1.04
	Fair	3793	3962	30.5	30.9	0.8	29.4-32.4	1.05
	Poor	3793	3962	8.7	8.8	0.5	7.9-9.8	1.05
	Number of falls (aged 60+)							
	0	2484	2482	74.3	74.3	0.9	72.6-76.1	1.01
	1	2484	2482	14.0	13.9	0.7	12.5-15.3	1.01
	2	2484	2482	5.4	5.3	0.4	4.4-6.1	0.98
	3+	2484	2482	6.2	6.5	0.5	5.5-7.5	1.06
Women	**Self-assessed health**							
	Excellent	4715	4528	24.4	23.9	0.6	22.7-25.2	1.03
	Very good	4715	4528	42.9	42.5	0.8	41.0-44.0	1.05
	Good	4715	4528	25.7	26.4	0.7	25.0-27.8	1.09
	Fair	4715	4528	5.8	5.7	0.4	5.1-6.4	1.04
	Poor	4715	4528	1.3	1.5	0.2	1.1-1.8	1.09
	Self-reported memory status							
	Excellent	4691	4503	2.4	2.4	0.2	1.9-2.9	1.05
	Very good	4691	4503	16.7	16.6	0.6	15.4-17.7	1.07
	Good	4691	4503	43.4	42.8	0.7	41.4-44.3	1.04
	Fair	4691	4503	30.1	30.5	0.7	29.1-31.9	1.05
	Poor	4691	4503	7.4	7.7	0.4	6.9-8.5	1.04
	Number of falls (aged 60+)							
	0	3095	2976	65.8	65.9	0.9	64.2-67.6	1.02
	1	3095	2976	19.0	19.0	0.7	17.6-20.4	1.03
	2	3095	2976	7.5	7.3	0.5	6.4-8.3	1.05
	3+	3095	2976	7.8	7.7	0.5	6.8-8.7	1.02

Table I-3 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	2856	2957	71.1	70.6	0.9	68.8-72.4	1.07
	Has hobby or pastime	2856	2957	79.0	77.2	0.8	75.5-78.8	1.06
	Taken a holiday in UK in last 12 months	2856	2957	58.0	55.5	1.0	53.6-57.4	1.05
	Taken a holiday abroad in last 12 months	2856	2957	49.6	47.8	1.0	45.9-49.6	1.03
	Gone on a daytrip or outing in last 12 months	2856	2957	64.3	62.8	1.0	60.9-64.7	1.06
	Uses the internet/email	2856	2957	48.2	46.2	1.0	44.3-48.2	1.09
	Owns a mobile phone	2856	2957	73.2	72.8	0.9	71.0-74.5	1.05
Women	Reads daily newspaper	2856	2957	64.6	64.1	0.9	62.4-65.9	1.12
	Has hobby or pastime	3573	3443	77.2	74.7	0.8	73.1-76.3	1.12
	Taken a holiday in UK in last 12 months	3573	3443	57.7	54.7	0.9	53.0-56.4	1.05
	Taken a holiday abroad in last 12 months	3573	3443	47.2	44.4	0.9	42.6-46.1	1.07
	Gone on a daytrip or outing in last 12 months	3573	3443	68.3	65.8	0.9	64.1-67.5	1.10
	Uses the internet/email	3573	3443	36.2	33.7	0.8	32.0-35.3	1.06
	Owns a mobile phone	3573	3443	73.1	70.1	0.9	68.4-71.8	1.13

Appendix J ELIGIBLE SAMPLE MEMBERS IN HSE NON CO-OPERATING HOUSEHOLDS IN WAVE 0

This section outlines the calculations used to estimate the number of age-eligible sample members in HSE non co-operating households in wave 0 (group C in Figure 7-1); beginning with the 'set' sample calculations presented each year in the HSE Technical Reports.

Set sample calculations (number of adults in non co-operating households)
In each HSE year a number of assumptions are made to estimate the total number of adults in the sampled households. There are three groups of households to consider: co-operating households, non co-operating households where information on the number of adults is known and non co-operating households about which nothing is known. The most reasonable assumption is to impute to the last group the same average number of adults as for all households where the number is known (the sum of the first two groups). This assumption gives us an estimated total of the number of adults in HSE sampled households (the 'set' sample).[49]

A further assumption is needed to provide separate 'set' samples for men and women. In non co-operating households where the number of adults was known, the numbers of men and women are usually not obtained. However, it can be assumed that the proportion of men and women in the estimated total sample is the same as for the adults in co-operating households. Applying these proportions to the estimated total of adults gives 'set' samples of men and women (Table J-1).

Table J-1 Estimated number of adults in HSE sampled households

	1998	1999	2001
Number of households	**12446**	**5975**	**12630**
Co-operating	9208	4561	9373
Non co-operating	3238	1414	3257
Total number of adults	**23059**	**11095**	**23314**
Total number of adults (non co-op HH)	**5819**	**2626**	**5805**
Men	2747	1243	2728
Women	3073	1382	3077

[49] Evidence suggests that unproductive households tend to be smaller on average than productive households, so this estimate of the total number of eligible adults is likely to be too large.

Initial estimate of number of age-eligible sample members in non co-operating households

The next step involved producing an initial estimate of the number of age-eligible sample members in non co-operating households by generating expected counts in each age-by-sex cell. The expected counts were calculated by multiplying the estimated total number of men/women in non co-operating households (set out in Table J-1) by the age-by-sex distribution within the co-operating households (Table J-2). Table J-3 shows the expected counts in the age-eligible groups. (Age-eligibility for ELSA wave 1 is shown by grey shading).

Table J-2 Age-sex distribution within HSE co-operating households

Age in HSE	1998		1999		2001	
	Men %	Women %	Men %	Women %	Men %	Women %
16-24	0.130	0.124	0.124	0.129	0.130	0.126
25-34	0.192	0.188	0.179	0.174	0.172	0.167
35-45	0.203	0.196	0.224	0.222	0.262	0.257
46-49 (1998)	0.071	0.065	-	-	-	-
47-49 (1999)	-	-	0.055	0.049	-	-
49-50 (2001)	-	-	-	-	0.014	0.016
50-54	0.090	0.086	0.090	0.100	0.093	0.089
55-59	0.067	0.065	0.080	0.059	0.078	0.072
60-64	0.067	0.066	0.066	0.061	0.067	0.060
65-69	0.060	0.059	0.061	0.056	0.060	0.060
70-74	0.047	0.051	0.052	0.053	0.053	0.055
75-79	0.037	0.050	0.040	0.044	0.037	0.044
80-84	0.022	0.030	0.017	0.033	0.022	0.034
85 and over	0.013	0.022	0.013	0.019	0.011	0.021
Total	*1*	*1*	*1*	*1*	*1*	*1*

Table J-3 Expected counts in HSE non co-operating households

Age in HSE	1998		1999		2001	
	Men	Women	Men	Women	Men	Women
16-24	358	381	155	179	356	387
25-34	529	578	222	241	470	514
35-45	559	601	278	307	716	789
46-49 (1998)	196	198	-	-	-	-
47-49 (1999)	-	-	68	68	-	-
49-50 (2001)	-	-	-	-	39	49
50-54	246	265	112	138	254	274
55-59	184	201	100	81	212	220
60-64	185	202	82	85	184	185
65-69	164	181	75	78	163	184
70-74	130	155	64	73	144	168
75-79	101	153	50	61	101	134
80-84	61	91	22	45	61	105
85 and over	35	67	16	27	29	66
Totals						
All	*2747*	*3073*	*1243*	*1382*	*2728*	*3077*
Age-eligible	*1302*	*1512*	*588*	*655*	*1187*	*1386*

Summing the known and estimated numbers in co-operating and non co-operating households respectively gives us an estimate of the total number of age-eligible men and women in the HSE sampled households (Table J-4).

Table J-4 Estimated number in HSE sampled households

	1998	1999	2001
Co-operating households (age-eligible)			
Men	3861	1898	3536
Women	4491	2114	4096
Non co-operating households (age-eligible)			
Men	1302	588	1187
Women	1512	655	1386
All households (age-eligible)			
Men	5163	2486	4723
Women	6003	2769	5482

Applying the totals for age-eligible men/women in all HSE sampled households (Table J-4) to the relevant Office for National Statistics (ONS) population estimates (Table J-5) gives us final estimates of the numbers for each age-by-sex cell within HSE sampled households (Table J-6).

Table J-5 ONS population estimates

	1998		1999		2001	
	Men %	Women %	Men %	Women %	Men %	Women %
46-49 (1998)	0.148	0.128	-	-	-	-
47-49 (1999)	-	-	0.113	0.098	-	-
49-50 (2001)	-	-	-	-	0.040	0.034
50-54	0.191	0.166	0.200	0.173	0.212	0.184
55-59	0.148	0.129	0.157	0.136	0.179	0.155
60-64	0.136	0.120	0.142	0.125	0.150	0.133
65-69	0.122	0.115	0.124	0.117	0.132	0.122
70-74	0.103	0.108	0.106	0.110	0.113	0.116
75-79	0.081	0.100	0.085	0.105	0.088	0.104
80-84	0.042	0.066	0.043	0.065	0.053	0.077
85 and over	0.028	0.067	0.031	0.070	0.034	0.075
Total	*1*	*1*	*1*	*1*	*1*	*1*

Table J-6 Estimated number of age-eligible adults in HSE sampled households

	1998		1999		2001	
	Men	Women	Men	Women	Men	Women
46-49 (1998)	764	768	-	-	-	-
47-49 (1999)	-	-	281	271	-	-
49-50 (2001)	-	-	-	-	189	186
50-54	986	997	497	479	1001	1009
55-59	764	774	390	377	845	850
60-64	702	720	353	346	708	729
65-69	630	690	308	324	623	669
70-74	532	648	264	305	534	636
75-79	418	600	211	291	416	570
80-84	217	396	107	180	250	422
85 and over	150	402	77	194	161	411
Total	*5163*	*5997*	*2489*	*2767*	*4727*	*5482*

Subtracting the known numbers from the HSE co-operating households (Table J-7) from each cell gives us the estimated numbers in each cell for the HSE non co-operating households (Table J-8). Summing across the HSE years gave us an estimate of 6,630 age-eligible sample members within HSE non co-operating households (Group C in Figure 7-1).

Table J-7 Known number of age-eligible sample members in HSE co-operating households

	1998		1999		2001	
	Men	Women	Men	Women	Men	Women
46-49 (1998)	580	589	-	-	-	-
47-49 (1999)	-	-	219	218	-	-
49-50 (2001)	-	-	-	-	118	154
50-54	730	786	361	444	781	805
55-59	546	596	322	262	606	655
60-64	548	599	264	273	560	561
65-69	486	537	243	251	489	539
70-74	385	461	207	237	422	494
75-79	299	453	160	197	308	409
80-84	182	271	70	146	166	299
85 and over	105	199	52	86	86	180
Total	*3861*	*4491*	*1898*	*2114*	*3536*	*4096*

Table J-8 Estimated number of age-eligible sample members within HSE non co-operating households

	1998		1999		2001		Total		
	Men	Women	Men	Women	Men	Women	Men	Women	All
46-49 (1998)	184	179	-	-	-	-	184	179	364
47-49 (1999)	-	-	62	53	-	-	62	53	115
49-50 (2001)	-	-	-	-	71	32	71	32	103
50-54	256	211	136	35	220	204	613	449	1062
55-59	218	178	68	115	239	195	526	488	1014
60-64	154	121	89	73	148	168	392	363	754
65-69	144	153	65	73	134	130	344	356	700
70-74	147	187	57	68	112	142	315	397	712
75-79	119	147	51	94	108	161	278	402	680
80-84	35	125	37	34	84	123	156	282	438
85 and over	45	203	25	108	75	231	144	542	687
Total	*1302*	*1506*	*591*	*653*	*1191*	*1386*	*3084*	*3546*	*6630*

Appendix K ELIGIBLE SAMPLE MEMBERS IN HSE NON CO-OPERATING HOUSEHOLDS IN WAVE 1

Adjusting for deaths

Appendix I sets out the calculations used to estimate the number of age-eligible sample members in HSE non co-operating households in wave 0 (Group C in Figure 7-1). This section takes the process one step further by removing those age-eligible sample members hypothesised to have become ineligible by the time of the ELSA wave 1 interview (2002-03) through deaths or institutional moves (Group K in Figure 7-1). (Estimates of the number of deaths and institutional moves were produced in an analogous fashion for other groups of sample members).

Table K-1 again sets out the estimated number of age-eligible sample members in HSE non co-operating households in wave 0.

Table K-1 Estimated number of age-eligible sample members within HSE non co-operating households

Age in HSE	1998		1999		2001	
	Men	Women	Men	Women	Men	Women
46-49 (1998)	184	179	-	-	-	-
47-49 (1999)	-	-	62	53	-	-
49-50 (2001)	-	-	-	-	71	32
50-54	256	211	136	35	220	204
55-59	218	178	68	115	239	195
60-64	154	121	89	73	148	168
65-69	144	153	65	73	134	130
70-74	147	187	57	68	112	142
75-79	119	147	51	94	108	161
80-84	35	125	37	34	84	123
85 and over	45	203	25	108	75	231
Total	*1302*	*1506*	*591*	*653*	*1191*	*1386*

Table K-2 shows the annual mortality rates (expressed per thousand) for England provided by the ONS for 1998 to 2001 (the time period between HSE and ELSA wave 1).

Table K-2 Annual mortality rates (per thousand) 1998-2001

	1998		1999		2000		2001	
	Men	Women	Men	Women	Men	Women	Men	Women
45-49	3	2	3	2	3	2	3	1.9
50-54	4.8	3.2	4.8	3.1	4.6	3.2	4.6	3.1
55-59	8.5	5.2	8.2	5	7.7	4.9	7.6	4.8
60-64	14.2	8.4	13.7	8.4	13.2	7.9	12.7	7.8
65-69	24.2	14.4	23.7	14	22.3	13.4	20.9	12.6
70-74	41.5	25.3	40.3	24.7	38.1	23	35.9	22.2
75-79	66.5	41.3	66	41.6	63	39.8	61.2	38.7
80-84	108.8	72.4	107.4	71.9	99	66.7	94.9	65.3
85 and over	187.3	151.4	187.6	154.4	181.3	147.3	186.5	155

For each HSE year the estimated number of deaths by ELSA wave 1 was calculated by applying the ONS mortality rates (Table K-2) to the estimated number of age-eligible sample members within HSE non co-operating households (ageing the numbers each year).

As an example, for the estimated number of age-eligible sample members in HSE 1998 non co-operating households, the expected number remaining alive in 1999 was found by applying the 1998 mortality rates to the numbers in each cell in 1998 and ageing the age-by-sex distribution by one year. These calculations are set out in Table K-3.

Table K-3 Applying mortality rates to the age-sex distribution in 1998 and ageing the age-sex distribution by a year to estimate number remaining alive in 1999

Estimated age-eligible sample members in HSE 1998 non co-operating households

Age in HSE	Men 1998	Women 1998	Mortality rate Men 1998 (per person)	Mortality rate Women 1998 (per person)	Expected deaths Men	Expected deaths Women	Alive Men 1999	Alive Women 1999
46-49	184	179	0.0030	0.0020	0.6	0.4	138[a]	134[a]
50-54	256	211	0.0048	0.0032	1.2	0.7	250[b]	213[b]
55-59	218	178	0.0085	0.0052	1.9	0.9	224[c]	184[c]
60-64	154	121	0.0142	0.0084	2.2	1.0	165[c]	131[c]
65-69	144	153	0.0242	0.0144	3.5	2.2	143[c]	145[c]
70-74	147	187	0.0415	0.0253	6.1	4.7	141[c]	176[c]
75-79	119	147	0.0665	0.0413	7.9	6.1	117[c]	149[c]
80-84	35	125	0.1088	0.0724	3.8	9.1	47[c]	121[c]
85 and over	45	203	0.1873	0.1514	8.4	30.7	43[d]	195[d]
Total	*1302*	*1504*			*35.6*	*55.8*	*1266*	*1448*

Technical notes:

[a] *Ageing the 46-49 age-band by a year meant that three-quarters of the band (46, 47 and 48 in 1998) remained in the 46-49 age-band in 1999 and the remaining one-quarter (aged 49 in 1998) entered the 50-54 age-band in 1999. Hence the estimated number of men/women aged 46-49 remaining alive in 1999 equalled the 1998 total minus the expected number of deaths multiplied by the proportion who remain (0.75 in this case).*

[b] *As described above, one quarter of the 46-49 age-band in 1998 (those aged 49) entered the 50-54 age-band in 1999. Ageing the 50-54 band by a year meant that four-fifths (aged 50, 51, 52 and 53 in 1998) remained in the 50-54 age-band in 1999 whilst one-fifth (aged 54 in 1998) entered the 55-59 age-band in 1999. Hence the estimated number of men/women aged 50-54 alive in 1999 equalled the sum of:*

- *the 1998 total for 46-49 year olds minus the expected number of deaths multiplied by the proportion who entered the 50-54 age-band (0.25) in 1999; and*
- *the 1998 total for 50-54 year olds minus the expected number of deaths multiplied by the proportion who remained in the 50-54 age-band (0.8) in 1999.*

[c] *For other age-bands, apart from those aged 85 and over, one-fifth of the preceding age-band entered the group and four-fifths remained. As an example, the estimated number of men/women aged 55-59 alive in 1999 equalled the sum of:*

- *the 1998 total for 50-54 year olds minus the expected number of deaths multiplied by the proportion who entered the 55-59 age-band (0.2) in 1999; and*
- *the 1998 total for 55-59 year olds minus the expected number of deaths multiplied by the proportion who remained in the 55-59 age-band (0.8) in 1999.*

[d] *For the last open ended age-band one fifth of the preceding age-band entered the group. Hence, the estimated number of men/women aged 85 and over alive in 1999 equalled the sum of:*

- *the 1998 total for 80-84 year olds minus the expected number of deaths multiplied by the proportion who entered the 85 and over age-band (0.2) in 1999; and*
- *the 1998 total for 85 and over minus the expected number of deaths.*

These calculations were carried forward in an analogous fashion for 2000, 2001 and 2002 (the latter being taken as ELSA wave 1). These calculations are set out in Tables K4-K6 (for estimated age-eligible sample members in HSE 1998 non co-operating households).

Table K-4 **Applying mortality rates to the age-sex distribution in 1999 and ageing the age-sex distribution by a year to estimate number remaining alive in 2000**

Estimated age-eligible sample members in HSE 1998 non co-operating households

Age in HSE	Men 1999	Women 1999	Mortality rate Men 1999 (per person)	Mortality rate Women 1999 (per person)	Expected deaths Men	Expected deaths Women	Alive Men 2000	Alive Women 2000
46-49	138	134	0.0030	0.0020	0.4	0.3	92	90
50-54	250	213	0.0048	0.0031	1.2	0.7	244	214
55-59	224	184	0.0082	0.0050	1.8	0.9	227	189
60-64	165	131	0.0137	0.0084	2.3	1.1	174	141
65-69	143	145	0.0237	0.0140	3.4	2.0	144	140
70-74	141	176	0.0403	0.0247	5.7	4.3	136	166
75-79	117	149	0.0660	0.0416	7.7	6.2	114	149
80-84	47	121	0.1074	0.0719	5.1	8.7	56	118
85 and over	43	195	0.1876	0.1544	8.0	30.2	43	188
Total	*1266*	*1448*			*35.6*	*54.4*	*1231*	*1394*

Table K-5 **Applying mortality rates to the age-sex distribution in 2000 and ageing the age-sex distribution by a year to estimate number remaining alive in 2001**

Estimated age-eligible sample members in HSE 1998 non co-operating households

Age in HSE	Men 2000	Women 2000	Mortality rate Men 2000 (per person)	Mortality rate Women 2000 (per person)	Expected deaths Men	Expected deaths Women	Alive Men 2001	Alive Women 2001
46-49	92	90	0.0030	0.0020	0.3	0.2	46	45
50-54	244	214	0.0046	0.0032	1.1	0.7	240	215
55-59	227	189	0.0077	0.0049	1.8	0.9	229	193
60-64	174	141	0.0132	0.0079	2.3	1.1	183	149
65-69	144	140	0.0223	0.0134	3.2	1.9	147	139
70-74	136	166	0.0381	0.0230	5.2	3.8	133	157
75-79	114	149	0.0630	0.0398	7.2	5.9	112	147
80-84	56	118	0.0990	0.0667	5.5	7.9	61	117
85 and over	43	188	0.1813	0.1473	7.8	27.7	45	182
Total	*1231*	*1394*			*34.3*	*50.1*	*1196*	*1344*

Apx.Table K-6 Applying mortality rates to the age-sex distribution at year 2001 and ageing the age-sex distribution by a year to estimate number remaining alive in ELSA wave 1 (2002)

Estimated age-eligible sample members in HSE 1998 non co-operating households

Age in HSE	Men 2001	Women 2001	Mortality rate Men 2001 (per person)	Mortality rate Women 2001 (per person)	Expected deaths Men	Expected deaths Women	Alive Men 2002	Alive Women 2002
46-49	46	45	0.0030	0.0019	0.1	0.1	0	0
50-54	240	215	0.0046	0.0031	1.1	0.7	237	216
55-59	229	193	0.0076	0.0048	1.7	0.9	230	196
60-64	183	149	0.0127	0.0078	2.3	1.2	190	157
65-69	147	139	0.0209	0.0126	3.1	1.7	151	139
70-74	133	157	0.0359	0.0222	4.8	3.5	131	150
75-79	112	147	0.0612	0.0387	6.9	5.7	110	144
80-84	61	117	0.0949	0.0653	5.8	7.6	66	116
85 and over	45	182	0.1865	0.1550	8.5	28.2	48	176
Total	*1196*	*1344*			*34.3*	*49.6*	*1162*	*1294*

Table K-7 Estimated age-eligible sample members within HSE non co-operating households (HSE 1998, 1999 and 2001)

	1998		1999		2001		Total		
	Men	Women	Men	Women	Men	Women	Men	Women	All
Deaths by W1	140	210	54	76	40	58	234	344	578
Alive	1162	1294	536	577	1151	1328	2849	3199	6048
Total	*1302*	*1504*	*590*	*653*	*1191*	*1386*	*3083*	*3543*	*6626*

Institutional moves

Adjustments for institutional moves were made by applying the estimated[50] annual rates of moves into an institution to the estimated number of age-eligible sample members remaining alive in the time period from HSE (wave 0) to ELSA wave 1 (taken as 2002) across the relevant HSE years. Note that we have made the assumption that deaths and institutional moves are independent events: this is not likely to hold in practice but it is not likely to have a sizeable impact on the estimates. The annual rates of moves into an institution are set out in Table K-8.

Table K-8 Annual rates of moves into an institution

Age	Men	Women
	%	%
65-69	0	0.1
70-74	0.4	0.4
75-79	0.5	0.7
80+	2.1	3.5

[50] Estimated using data from the British Household Panel Survey (see Evandrou et al., 2001).