Office for National Statistics

Wealth and Assets Survey Review Report

Contents

1 Executive Summary

1.1 Terms of Reference for the review of the Wealth and Assets Survey

1.1.1 Background

The Wealth and Assets Survey (WAS) is a longitudinal sample survey of private households in Great Britain. The first wave of data collection (wave 1) commenced in July 2006 and was completed in June 2008. The **achieved sample in wave 1** was **30,595** responding households.

Wave 2 of the survey commenced in July 2008 and covered the period up to June 2010. Wave 2 returned to consenting respondents from wave 1, approximately two years after their initial interview. The **achieved sample in wave 2** was **20,170** responding households.

Wave 3 of the survey commenced in July 2010 and covered the period up to June 2012. Wave 3 returned to consenting responding Wave 2, plus non-contacts from wave 1. This would have yielded an expected 16,000 households interviews. In order to maintain and improve the sample size a new cohort was introduced; with the aim of taking the overall sample size up to 24,000 households. However recent spending cuts across the funding consortium has meant that the size of the new cohort was reduced in the second year of **wave 3** so the **expected sample size** is now around **21,500** households.

Wave 4 of the survey commenced in July 2012 and should cover the period to June 2014. At present the basic survey would only follow-up consenting responding households from wave 3 (inc. new cohort) - expected sample size of around 16,000 households. A small additional sample has also been included (limited by the level of funding available) resulting in the expected sample size for wave 4 being around **18,000** households.

WAS aims to fill identified gaps in the data about the economic wellbeing of households and individuals by gathering information on, among other things, levels of savings and debt, saving for retirement, how wealth is distributed across households and individuals, attitudes and factors that affect financial planning.

WAS is the **only source** of information available to ONS, Government and other external stakeholders that provides comparable estimates of different types of wealth held by households. It is used extensively by policymakers, and as a new survey will have many more uses in the future as it develops over time. In particular, WAS contributes significantly to policy proposals on pensions and is used to inform policy makers about the many aspects relating to wealth in Great Britain.

WAS is funded by a consortium of departments. ONS is one member of the consortium which also currently includes the Department for Work and Pensions, HM Revenue and

Customs, the Financial Conduct Authority and Scottish Government. Previous members have also included Business Innovation and Skills, Communities and Local Government and Cabinet Office. Departmental contributions and level of use are not connected in any way. The two major funders are DWP and ONS.

1.1.2 Purpose of Review

The main purpose of this review is to provide evidence for decisions on the future of the WAS; specifically, that the use of WAS will lead to the specific benefits and that the challenges which have been and are being faced in the production of this survey are being dealt with effectively and will allow for the future sustainability of the survey.

At the time of the review, data from the first two waves of the survey were available for analysis. Some improvements had already been made for wave 3 of the survey and more being implemented with wave 4. These are detailed within this report.

There is a clear demand and need for the data being produced by WAS. However, in the current economic climate those responsible for carrying out the survey and those funding the survey need to be able to demonstrate that it is providing data that meets their needs and therefore that the expense of the survey can be justified. ONS are considering their post wave four funding position with regard to this survey and senior managers have requested such a review be undertaken in order for them to make a considered judgement on future funding requirements. It will however, provide evidence for other funding departments to justify their contributions.

1.1.3 This report

The structure of the review, and of this report, follows the production processes, considering the efficiency and quality aspects of each area.

Each area of the production process has been detailed, both in terms of what has been done in waves to date, improvements being implemented at the time of the review and consideration of any future improvements required.

This report provides a record of the assessments made and forms a comprehensive technical document of WAS procedures.

1.2 Summary of conclusions

The following provides a summary of the results of the review. These are ordered through the generic statistical business process model (this covers all stages of the survey - from survey design through to analysis and dissemination of data). These conclusions have been approved by the WAS Steering Group – the cross-governmental governance group for the survey.

Stage of Generic Statistical Business Process Model	Review Outcome
Survey design	1) A new cohort should be introduced at every wave of WAS. 2) The overall sample size should be increased as far as possible towards the original target size of 32,000 responding households. 3) Oversampling of the wealthiest households for the new cohort should continue – at a rate of three, based on existing methodology. 4) Data collection should continue to incorporate a two-yearly follow up.
	1) Further work is required analysing later waves of data before a decision can be made on whether the perceived advantages of keeping sampled households in the sample indefinitely can be proved, or whether a rotating panel design might prove to be a better design for WAS. 2) Continue with current face-to-face interviewing for mainstage and current mode of telephone interviewing for the keep in touch exercise (KITE). 3) Combine the KITE interview with the delivery of a newsletter, four months prior to the HAS interview.
Questionnaire content	1) Current procedures for determining questionnaire content are sufficient and have worked well, particularly with regard to the wave four questionnaire. Suitable wave 5 questions for cognitive testing will be identified in early 2013, before testing takes place in the summer of that year. 2) The use of Blaise (the software used to program the computer assisted personal interviewing) will continue. The testing of the questionnaire is now thought to be sufficient.
	1) Continue to train new WAS interviewers using the existing processes.

Fieldwork procedures	1) KITE processes will continue and be accompanied by a newsletter, rather than no panel contact between waves.
	1) Implement a more stringent approach to fieldwork deadlines and the timely return of interviews. 2) Investigate why the response rate of new cohort 'boost' cases is relatively low and what can be done to improve new cohort response.
	1) Continue to use the existing imputation methodology, accompanied by a well developed imputation specification. 2) Continue with the existing weighting methodology.
Data processing	1) Refine and automate the procedures for linking longitudinal cases. 2) Automate outlier detection methods based on variable variance and streamline investigation methods by running cross-sectional and longitudinal edits simultaneously.
	1) Conduct base checks as soon as possible following each field period.
	1) ONS Methodology to review and test production of standard errors for WAS data. 2) Review the mechanisms for informing ONS of staff changes that require an update to the Data Access Agreement. 3) Consider how best to elicit feedback from external users of WAS data; particularly with the view to informing analysis plans.
Analysis and dissemination	1) ONS to provide an End User License WAS dataset to the UK Data Service. 2) ONS to review, and improve for wave two, the guidance provided to users of WAS data. 3) Consider how the WAS consortium can promote the wider use of WAS data. 4) Explore and implement an approach that reduces the lag between data collection and dissemination.
	1) Take steps to understand more about user requirements in order to improve the service offered to WAS data users.
Uses of data	1) ONS should continue to provide consortium progress updates between Technical Group meetings, as appropriate. 2) Continue to govern the survey with the existing structure and

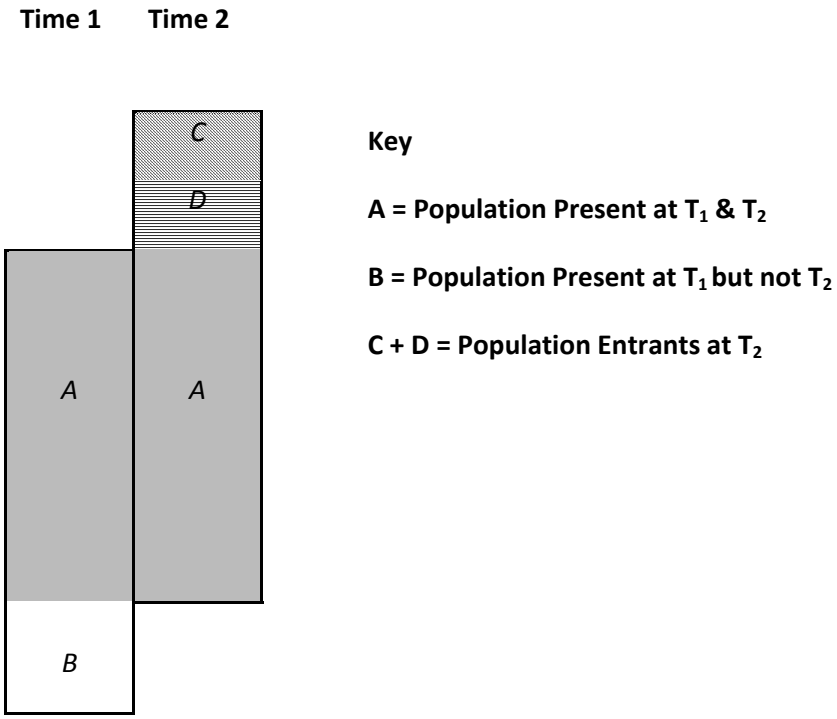
post publication	Technical/Steering group roles -the decision making forums are generally working as intended and ensure appropriate governance of the survey.
Administration and governance	1) There is some duplication in survey documentation. This should be reviewed to ensure appropriate progress updates are provided to the consortium but this should not be overly burdensome.
	1) The timing of confirming consortium contributions should be reviewed in order to ensure the smooth running of the survey. This will also be considered during the review of the Service Level Agreement (SLA).

2 Survey Design

2.1 Target Populations

The wave one sample was chosen to be representative of the population of Britain at the time it was selected (excluding mainland Scotland north of the Caledonian Canal, the Scottish islands and the Isles of Scilly). The cross-sectional population at this time forms the basis of the population of inference for the longitudinal sample throughout the development of the WAS study. However, by wave two the cross-sectional population has evolved from that of wave one as is illustrated hypothetically in Figure 2.1.

Figure 2.1: Illustrative Changes in the Population over Two Time Periods



(Note this chart and commentary relates to the target GB population; not the WAS sample).

Figure 2.1 illustrates the cross-sectional population at time 1 (XP_1) as *A* + *B* and at time 2 (XP_2) as *A+C+D*. The population component common to times 1 and 2 is labelled *A,* whereas *B* covers people who have left the population since time 1 through death, emigration or institutionalisation. At time 2, incomers to the population (births, immigrants and people leaving institutions) are represented by *C* and *D*. *D* represents the sub-sample of the population inflow who (at the time of the wave two interview) live with people who were eligible for selection in the wave one sample. Population entrants who live alone, or with only other population entrants (*C*), cannot be sampled in WAS wave two because the follow up rules give them a zero probability of selection, and there is no boost to capture this part of the population.

Nevertheless, we know the size of the cross-sectional population for wave two from the population estimates, and can produce *pseudo-cross-sectional* estimates by weighting the sample (which covers A+D) to the known population totals (which cover A+C+D). This implicitly assumes that the characteristics of people in C are similar to those people in the sample. Over the two year period between waves it is anticipated that in most cases this potential source of bias will be negligible because C is likely to be only a small part of the population.

Refreshment samples drawn from the current cross-sectional population will ensure that the survey accounts better for population change. Sample refreshment can be done on an ad-hoc basis as is currently the case or more regularly through incorporation explicitly into the design as a rotating panel[1].

A more general notation uses OUT_t to represent people who left the target population between waves $t-1$ and t, and IN_t represents people who joined the target population between these waves. Therefore $OUT_2 = B$ and $IN_2 = C + D$ in Fig. 1. Following Verma *et al*. (2007), the cross-sectional population at wave 2 (XP_2) can be viewed as a function of outflows between waves one and two (OUT_2) and the corresponding inflows (IN_2), i.e.

$$XP_2 = XP_1 + IN_2 - OUT_2$$

There are various ways in which the longitudinal population (LP) can be defined. At one extreme is an all-inclusive definition where anyone ever in the target population between wave one and the current or final wave, wave *T*, is included ($LP^{\max} = \bigcup_{t=1}^{T} XP_t$). At the other extreme, is the population definition restricted to those people in the target population at wave one who survive until wave *T*, ($LP^{\min} = \bigcap_{t=1}^{T} XP_t$). Similarly, we can conceive longitudinal populations which are different combinations of cross-sectional populations.

[1] A rotating panel replaces a fixed percentage of currently interviewed cases at each wave of the survey with a newly drawn sample of cases.

2.2 Achieved and Projected Future Sample Sizes for each wave

It's important to ensure a sample size sufficiently large to enable reliable estimates of wealth both nationally and within demographic groups such as regions and ten-year age bands. Preliminary analysis of the British Household Panel Survey (BHPS) produced estimates of precision which showed the 95% confidence intervals based on a sample size of 32,000 (See Table 2.2). Precision was considered both for estimates of the level of savings and wealth and also for the net change in savings. The sample size and corresponding levels of precision were agreed with the various clients in the planning phase of the survey and were discussed at the 10th National Statistics Methodology Advisory Committee (MAC), see Lound and Beerten (2006)[2].

Table 2.2: Confidence intervals for cross-sectional survey and minimum significant changes between first and second wave

	CI% two-year cross-section	Minimum significant change
Great Britain	3.8%	3.1%
Male	4.1%	3.7%
Female	6.2%	5.4%
16 to 29	7.0%	7.1%
30 to 39	8.0%	6.7%
40 to 49	8.2%	6.5%
50 to 59	11.9%	10.7%
60 to 69	6.6%	6.5%
70 and above	5.2%	5.5%
Average all age groups	*7.8%*	*7.2%*
North East	18.6%	17.6%
North West	8.9%	6.6%
Yorks & Humb.	12.6%	10.7%
East Midlands	14.8%	11.1%
West Midlands	12.0%	8.9%
Eastern	8.9%	6.8%
London	7.5%	5.9%
South East	8.3%	6.7%
South West	6.7%	9.7%
Wales	30.1%	23.0%
Scotland	13.8%	8.3%
Average across all regions	*12.9%*	*10.5%*

Calculated from the BHPS Waves 5 and 10 and presented to the 10th NS Methodology Advisory Committee (2006)

[2] Lound, C and Beerten, R (2006) *Sampling and Estimation Strategies for the Wealth and Assets Survey*, Paper presented to the 10th National Statistics Methodology Advisory Committee.

Table 2.3 provides a summary of the sample sizes, both issued and achieved, for each of the first three waves of the Wealth and Assets Survey.

Table 2.3: Wealth and Assets Survey sample sizes

Wave	Issued addresses	Achieved households	Achieved adults*
One	62000	30600	53,300
Two	32200	20000	34,500
Three (longitudinal)**	25200	15000	-
Three (new cohort)**	12000	6000	-
Four (longitudinal)**	21000	-	-
Four (new cohort)**	8000	-	-

*Respondents aged 16 and over.
**Anticipated figures.

Loss to follow-up (LTFU) through natural population change (e.g. death, moving to an institution or abroad) and sample attrition are threats to all longitudinal studies and WAS is no exception. A diminishing sample size reduces precision and attrition may increase the potential for bias through a systematically disproportionate loss of respondents with particular characteristics. At wave two, a total of 32,200 addresses were issued, with around 20,000 achieved. These addresses comprised the achieved wave one respondent sample and some of the non-contacts and 'soft' refusals from wave one.

This decrease in sample size from 32,000 at wave 1 to 20,000 at wave 2 will not enable estimation to achieve the levels of precision discussed above[3]. Consequently, it was decided after wave two to draw a fresh sample to 'boost' the overall sample size for wave three, and subsequent waves, to stem the decline in the sample size of the survey. A new panel of 12,000 addresses was drawn for wave three: 8,000 for the first year and 4,000 for the second year of fieldwork. The original intention was to have a total new sample of 16,000 addresses for wave three. However, financial constraints meant that the new cohort sample was reduced from 8,000 to 4,000 for the second half of wave three.

A new panel is also planned for wave four. For the first year of wave four, a new panel of 4,000 addresses will be issued. It is anticipated (at the time of writing) that the second year of wave four will also include a new panel of 4,000 addresses, creating a combined new wave 4 panel of 8,000 addresses.

The new sample addresses for waves three and four have been selected using exactly the same methodology as previously described; i.e. oversampling wealthy addresses using an over-sampling rate of 3.0 for the wealthiest addresses.

[3] Where estimates based on people are required, rather than households, levels of precision at wave 2 and net change between waves 1 and 2 will still be similar to those given to the MAC, providing the underlying assumptions used in that paper were accurate.

Introducing a new cohort to the WAS sample is essential in order to maintain the precision of cross-sectional estimates. Importantly, it also helps to combat the reducing sample size over time as a result of attrition; this will improve the precision of longitudinal analysis in future waves. As noted, ideally the new cohort would return the sample to 32,000 achieved household interviews; however, the cost of achieving this is prohibitive given the current financial climate. Increasing the issued sample by 8,000 addresses (38 per cent increase in issued sample) for wave four will however improve the precision of estimates compared to having no new cohort at all.

Table 2.4 illustrates the impact of introducing a new cohort sample on the precision of WAS estimates. The gain in precision is relative to having no new cohort. The scale of the proposed new cohort for wave four (8000 addresses) will lead to an improvement in precision of around 11 per cent. This assumes wave three response rates of 73 and 51 per cent for the old and new cohorts respectively are achieved for wave four. A higher response rate for the new cohort in wave four would increase the impact of the new cohort on precision. Note that increasing the new cohort to a level that achieves 32,000 household interviews (the level intended for wave one of the survey) would improve the precision of WAS estimates by 30 per cent; relative to having no new cohort.

Conclusion

It was agreed that a new cohort should be introduced at every wave of WAS, and that the overall sample size be increased as far as possible towards the original target size of 32,000 achieved households.

Table 2.4

New cohort	Issued sample	Achieved sample size	Standard error	Precision gain
0	21000	15330	0.0040	-
1000	22000	15840	0.0040	1.62%
2000	23000	16350	0.0039	3.17%
3000	24000	16860	0.0039	4.65%
4000	25000	17370	0.0038	6.06%
5000	26000	17880	0.0037	7.41%
6000	27000	18390	0.0037	8.70%
7000	28000	18900	0.0036	9.94%
8000	**29000**	**19410**	**0.0036**	**11.13%**
9000	30000	19920	0.0035	12.27%
10000	31000	20430	0.0035	13.38%
11000	32000	20940	0.0035	14.44%
12000	33000	21450	0.0034	15.46%
13000	34000	21960	0.0034	16.45%
14000	35000	22470	0.0033	17.40%
15000	36000	22980	0.0033	18.32%
16000	37000	23490	0.0033	19.22%
17000	38000	24000	0.0032	20.08%
18000	39000	24510	0.0032	20.91%
19000	40000	25020	0.0032	21.72%
20000	41000	25530	0.0031	22.51%
21000	42000	26040	0.0031	23.27%
22000	43000	26550	0.0031	24.01%
23000	44000	27060	0.0030	24.73%
24000	45000	27570	0.0030	25.43%
25000	46000	28080	0.0030	26.11%
26000	47000	28590	0.0030	26.77%
27000	48000	29100	0.0029	27.42%
28000	49000	29610	0.0029	28.05%
29000	50000	30120	0.0029	28.66%
30000	51000	30630	0.0029	29.25%
31000	52000	31140	0.0028	29.84%
32000	53000	31650	0.0028	30.40%
33000	54000	32160	0.0028	30.96%

Notes:

Assume p = 50% (0.5); although the above applied for any value of p

p(1-p) = 0.25

SE_p = sqrt [p(1 - p) / n]

Assume old cohort response of 73%.

Assume new cohort response of 51%.

2.3 Sampling Strategy

The sampling frame for the survey uses the Royal Mail's postcode address file (PAF), which was adjusted to exclude postcodes associated with high numbers of daily mail items to remove, as far as possible, business and institutional addresses from the frame. The ONS copy of the PAF is updated twice a year to ensure that recently built addresses are included and demolished or derelict properties are removed quickly.

A stratified multi-stage sampling design first selected 2,400[4] primary sampling units (PSUs), which are comprised of post-code sectors. PSUs were selected with probability proportional to size, without replacement, where size was the number of addresses[5] on the sampling frame. A fixed number of addresses (26) was then randomly chosen from each PSU. Within each PSU there was an extra step of oversampling relatively wealthy addresses where matched HMRC data was used to identify addresses into one stratum likely to have high wealth and a second stratum where householders were expected to have lower wealth levels.

'High' wealth addresses are identified after the postcode sectors have been established. A limited amount of information is available about the type of household resident at a particular address on the PAF and what is generally available relates to the area around the address, rather than being specific to an address. However, HMRC collects data on income and certain components of wealth in order to administer the tax system and the Self-Assessment regime. Data from HMRC on tax returns at an address level, in conjunction with average FTSE350 dividend yields from the previous calendar year are used to estimate the value of share holdings at a household level. Those addresses estimated to be in the 90th percentile of shareholding value were then oversampled at a rate of 2.5 (first year of wave one) or 3.0 (second year of wave one and waves three and four) relative to other addresses within a given postcode sector. It should be noted that financial wealth is used as a proxy for total wealth under this approach.

Interviews were allocated to a month over the 24 month fieldwork period using systematic sampling with a random start point in such a way that addresses were balanced proportionately over time and across geography.

2.3.1 Rationale for Oversampling Wealthier Households

There were two reasons to increase the achieved sample number of households falling in the top decile:

- To allow for more precise, separate analysis of this group so we could look in more detail at more complex arrangements for those with greater assets. An enhanced sample size also helps counteract the possibly worse response from this group. The ability to do this detailed analysis was a key requirement for some of the survey customers.

[4] 1,200 PSUs per year.
[5] In Scotland addresses refers to the count of multi-occupancy addresses, whereas in England and Wales it is the straightforward count of addresses.

- To improve the precision of total and average wealth estimates from the survey. Since the distribution of wealth is highly skewed, the variation in wealth between wealthy individuals is much larger than between less wealthy individuals. This population variation in the level of wealth influences the sampling error of our survey estimates and if we can sample relatively more of those showing the greatest variation then this sampling error will be reduced[6].

The oversampling procedure was intended to meet the HMRC target of achieving 4,500 households, or 14.1 per cent of the total sample of 32,000 households, located in the top wealth decile group. However, other stakeholders were concerned to ensure that meeting the oversampling target was not achieved at the particular expense of any other decile group, especially of those people in the bottom wealth decile group.

Section 2.3.2 establishes the distribution of the sample size classified into each wealth decile group. Initial analysis is on savings wealth because the original sample size estimates were derived from the analysis of savings data taken the British Household Panel Study (see Lound & Beerten 2006). Subsequent analysis is on total wealth to establish whether the aim of oversampling wealthier households has been achieved.

2.3.2 The Impact of Oversampling on the Distribution of Savings Wealth

The wave 1 data set has 30,595 responding households. Provisional financial assets variables were created through summing over the relevant collection of component variables. The WAS variable most similar to that used in BHPS is named 'Total savings'. This variable consists of current accounts (excluding overdrafts), savings accounts, ISA's, national saving products and UK shares. Using this variable, the following decile groups were produced based on weighted analysis of financial assets (Table 2.5).

The main finding is that 13.9 per cent of households fall into the top decile of the savings wealth distribution. This is just 0.2 percentage points below the target of 14.1 per cent. Inevitably, oversampling the top decile has an impact on the remaining deciles. The 8th and 9th deciles are slightly larger than the remaining deciles however none of the decile groups appears to be more seriously adversely affected than any other. In particular, the lowest wealth decile group has not been affected through oversampling the wealthier households.

[6] The increase in precision is a balance between the better estimation of the level of wealth amongst the wealthy and the need to introduce compensatory weights.

Table 2.5: Decile groups of total savings

Decile	Breakpoint	N	Per cent
low	64	3,007	9.8
2	500	2,741	9.0
3	1,400	2,949	9.6
4	3,341	2,818	9.2
5	7,200	2,721	8.9
6	14,300	2,905	9.5
7	27,600	2,865	9.4
8	50,900	3,051	10.0
9	107,100	3,275	10.7
high	5,637,511	4,263	13.9
Total		30,595	100.0

Breakpoint based on weighted data

The same analysis was undertaken using the total wealth variable (Table 2.6). The distribution of total wealth is similar to the corresponding distribution of net savings.

Table 2.6: Decile groups of total wealth

Decile	Breakpoint	N	Per cent
low	8,817	1,574	9.1
2	28,526	1,571	9.1
3	73,295	1,552	9.0
4	135,904	1,575	9.1
5	204,607	1,617	9.3
6	285,727	1,661	9.6
7	388,867	1,699	9.8
8	542,230	1,782	10.3
9	851,544	1,939	11.2
high	26,644,185	2,346	13.6
Total		17,316	100.00

Breakpoint based on weighted data

Results based on the random half sample that had physical wealth measured.

The top decile of estimated wealth is 13.6 per cent, which is only 0.5 percentage points lower than the target of 14.1 per cent. The percentage of households selected in each decile gradually becomes less for the less wealthy households; however there are still 9.1 per cent of households contained in the lowest decile.

Comparisons of the distribution of total savings and total wealth show that the method of oversampling has been effective. A savings variable was used to flag wealthier households and the total savings results show that these households were oversampled without having an adverse impact on the remaining decile groups.

Increasing the sampling fraction from 2.5 to three between Years 1 and 2 of Wave 1, as expected increased the numbers captured in the high wealth stratum. The higher oversampling rate (Year 2) captured 0.4 percentage points more people in the higher wealth stratum than the lower oversampling sampling rate (Year 1).

Table 2.7: Decile groups of total wealth by year of Wave 1

Decile	Year 1	Year 2	Total
low	9.1	9.0	9.1
2	9.2	9.0	9.1
3	9.1	8.9	9.0
4	9.3	8.9	9.1
5	9.4	9.3	9.3
6	9.7	9.5	9.6
7	9.8	9.9	9.8
8	10.3	10.3	10.3
9	10.8	11.6	11.2
high	13.3	13.7	13.6

Results based on the random half sample that had physical wealth measured.

Conclusion

Oversampling of wealthy households has been mostly successful in that it has only undershot the required 14.1 per cent target by 0.5 percentage points. Additionally, there is no serious adverse impact on the numbers of households in other wealth group deciles. It was therefore agreed that the same method of oversampling would be used in the future.

2.4 Wave Structure

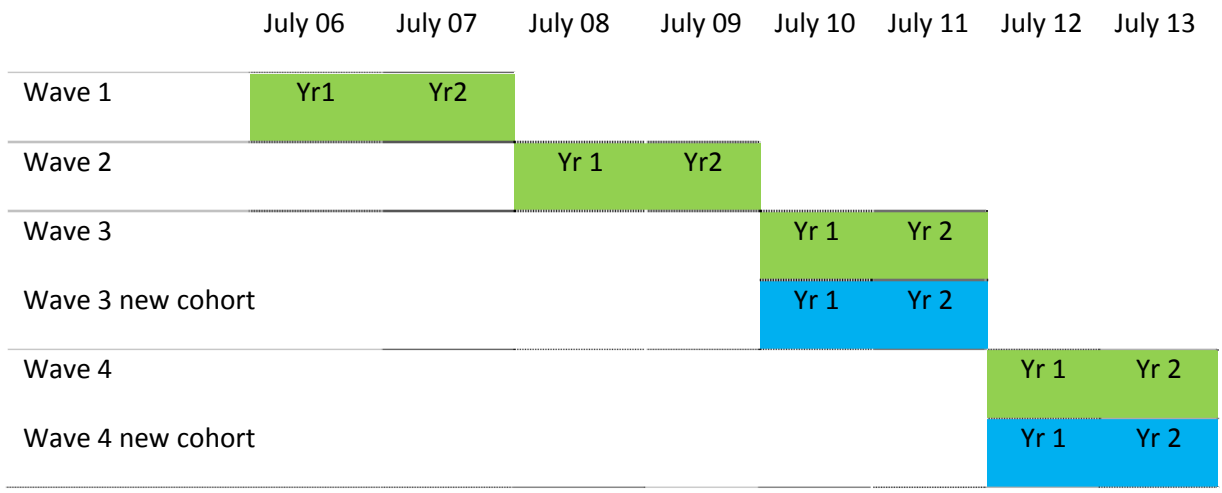
Figure 2.8 illustrates the longitudinal design of the Wealth and Assets Survey. Wave one started in July 2006 with fieldwork being spread over a two year period. The survey was due to start in April 2006; in line with the start of the financial year, but implementation was delayed by three months.

Wave two, a follow up to wave one, was conducted between July 2008 and June 2010. For wave three, the achieved sample for wave two was issued for a follow up interview over a two year period.

All interviews have a two yearly interval between consecutive waves, therefore providing individual/household estimates of change that are based on a constant seasonal time point. For example wave one interviews conducted during July 2006 would be repeated for wave two in July 2008. It is important that this gap remains constant so that estimates of change are comparable wave on wave and not confounded by potential seasonal effects on wealth holdings.

In addition, a new panel of addresses (shown in blue) was selected to increase the wave three sample size. The same approach is being taken for wave four, with the wave three achieved sample being issued for a follow up interview, and an additional new sample issued to 'top-up' the achieved wave four sample.

Figure 2.8: The longitudinal design of the Wealth and Assets Survey



The purpose of the sample replenishment is twofold. First, it increases sample size with the aim of increasing the precision of estimates. Second, replenishment helps to update the sample with respect to any changes in the population arising from inflows subsequent to the start of the panel's first interview waves. Both of these gains are helpful for estimation purposes. In particular, updating the sample each wave is particularly beneficial when using WAS to make cross-sectional estimates from WAS because over time the original panel is likely to become less representative of the evolving extant population as the panel ages. It is straightforward to recommend the continuation of regular sample replenishments because of these benefits, assuming the availability of resource.

What is more debatable is the extent to which gains can be made from continuing to retain sample members in the survey. After three years we have lost nearly three quarters of the sample that was originally selected, with just under half at Wave 1 (45% non-response). It is difficult to be sure what level of attrition to expect in the future but we know the sample size of the members selected into the original panel will continue to decline. Consequently, it is appropriate to ask at what point estimation solely from the remaining members of the panel becomes untenable. In part, this is a question of attrition driven bias, i.e. to what extent are surviving panel members different from those sample members who have left the survey. In part, it is also a question of precision, which is largely a function of sample size.

2.4.1 A Rotating Panel Design

A rotating panel fixes the length of time any one panel can be retained in the survey and as one panel is rotated out another, newly selected panel, is rotated in to the survey. For example, the Labour Force Survey uses a rotating panel design with a three month interval between interview waves and a five wave maximum duration for any one panel. Figure 2.9 illustrates the LFS design. In any one quarter there are five panels that go to make up the cross-sectional sample. At one extreme ('wave 5') one panel of respondents is on their fifth and final interview and will be rotated out after this quarter. At the other extreme, ('wave 1') a new panel of respondents is on their first interview. As we progress from one quarter to the next (traversing from left to right along the columns in Figure 1), the wave number of the panel increments to show the interview number associated with the panel for a given quarter. Each panel has an interview period of 5 waves, which is the maximum amount of time (duration) which a person-based longitudinal analysis can cover.

Figure 2.9: Illustration of the Panel Design of the Labour Force Survey

	y1q1	y1q2	y1q3	y1q4	y2q1	y2q2	y2q3
Panel 1	wave 5						
Panel 2	wave 4	wave 5					
Panel 3	wave 3	wave 4	wave 5				
Panel 4	wave 2	wave 3	wave 4	wave 5			
Panel 5	wave 1	wave 2	wave 3	wave 4	wave 5		
Panel 6		wave 1	wave 2	wave 3	wave 4	wave 5	
Panel 7			wave 1	wave 2	wave 3	wave 4	wave 5
Panel 8				wave 1	wave 2	wave 3	wave 4
Panel 9					wave 1	wave 2	wave 3
Panel 10						wave 1	wave 2
Panel 11							wave 1

2.4.2 Population Dynamics and Estimation

Populations are dynamic: elements move in and out of a population over time through natural processes, e.g. births, deaths, institutional moves and migration. A longitudinal panel is selected at a particular point in time and, on its own, can only ever represent an incomplete section of population change. For example, people who enter the population after selection for the panel can not be represented in the sample. WAS sample follow-up rules allows for secondary sample members (SSMs) to enter the study. However, SSMs have to be linked to an original sample member and population entrants who live on their own (or solely with other population entrants) can have no such link to a member of the original sample. For this reason, the panel can never truly represent a cross-section at a point in time after it was selected. The extent to which the panel becomes unrepresentative of the population increases over time. After one wave, bias arising from population change is likely to be negligible but we cannot say with certainty where the bias becomes non-negligible. Combining panels selected anew at each point in time overcomes this population dynamic bias, e.g. Figure 2.9.

The attrition process associated with longitudinal surveys is of particular concern if there are systematic differences in attrition. This will lead to larger weights for certain population subgroups, who have dropped out at a faster rate, to adjust for bias. Additionally, the overall general sample size reductions will result in much larger standard errors and decreased precision. Eventually, there may become a point at which estimates are based on such a small proportion of people selected from the original sample that it is debatable to what extent the surviving sample can compensate for the lost sample through weighting. If the sample should reach this point, the financial costs of re-interviews may arguably be better spent elsewhere.

2.4.3 A Rotating Panel for WAS: For and Against

Regular inclusion of a new panel into the study confers the following advantages:

- Helps reduce potential bias through updating the sample with new population entrants.
- Increases sample size, hence precision, for certain analyses.

Reduction of bias offers most advantage when making cross-sectional estimates because it is more difficult to define the population of interest beyond that of the time of selection for a longitudinal panel. Consequently bias is more of a concern for longitudinal analysis when it arises from attrition. In particular if certain subgroups have left the study completely, weighting cannot adjust for them because weighting requires some remaining subgroup members to act as a proxy for those who have left the study.

Combining panels, from a cross-sectional perspective, increases sample size, hence precision, as shown in Figure 2.9. However, from a longitudinal perspective the situation is more complex. Combining panels that have started at different time points reduces the maximum duration that the combined sets of waves cover to that of the latest wave selected. Consequently, sample size is increased but at the expense of duration, which can be problematic for some analyses

Clearly, bias adjustment and improved precision are two valid reasons for regularly adding a new panel to the survey. However, these benefits have already largely been achieved with the current WAS design which has introduced a new panel for both Waves 3 and 4. What are the potential benefits of rotating out a panel?

The primary reasons for out-rotation are (i) to reduce respondent burden; and (ii) to ameliorate the presumed increase in bias associated with a declining response rate. In addition, limiting the maximum duration of a panel's participation in the study can be beneficial in terms of data quality, especially if there is a strong correlation between duration in the panel and changes in respondent behaviour. However, in practice, it is difficult to establish the existence of such a correlation.

Regular out-rotation can help to control costs in controlling for sample size. Continual ad hoc panel supplements will result in a build-up of the sample in a relatively uncontrolled way.

Conclusion

Advantages of the fixed rotation design are that it limits respondent burden and helps to control sample size and, hence costs. It also improves statistical precision when measuring net change between waves. Conversely, a key disadvantage is that a rotating panel limits the maximum duration for which a person is followed. Thus, analysis of long-term changes in wealth accumulation and disposal is not possible. However, such analysis may eventually become less valuable as the validity of the results becomes more questionable.

It was agreed that WAS will continue to collect data on a two-yearly wave cycle and that, for the time being at least, future waves will introduce a new cohort in the same way as has been done for waves 3 and 4. At present little analysis has been carried out on a longitudinal basis, and further work is required analysing later waves of data before a decision can be made on whether the perceived advantages of keeping sampled households in the sample indefinitely can be proved, or whether a rotating panel design might prove to be a better design for WAS.

2.5 Mode of data collection

The Wealth and Assets Survey has two interview stages at each wave in the longitudinal panel design. The primary interview is where the WAS questionnaire is administered; this is referred to as the 'mainstage' interview. The second stage is the Keeping in Touch Interview (KITE) which is used to maintain respondent's contact details between waves. At wave 3 an experiment was conducted to explore the efficacy of the KITE relative to a newsletter.

2.5.1 Mainstage interview

The mainstage interview is conducted using Computer Assisted Personal Interviewing (CAPI). Face to face interviewing is the preferred choice for the WAS due to the complex subject matter of the survey and the need for the interviewer to support the respondent in answering the questions. The interviewer-respondent interaction is much greater on a face to face survey compared with other modes such as paper and telephone. Another reason for face to face interviewing is the need to interview everyone aged 16 and over in the household. This is more challenging with some alternative modes of data collection.

The interview length of the WAS questionnaire also means that CAPI is a good approach. Face to face contact with respondents allows interviewers to identify when respondents are becoming fatigued during the interviews. This allows interviewers to suggest a break from the interview, or perhaps for them to continue the interview at another time in some cases. Identifying respondent fatigue, picking up on body language, is best done when the interview is face to face.

CAPI was also considered the best approach to maximise cooperation with the survey. Response rates to face to face surveys always tend to be higher than telephone, paper and web alternatives. Therefore it is recommended that for the majority of sampled cases face to face interviewing continues for WAS interviewing. Collecting WAS data using other modes of data collection (i.e. telephone or web) could be considered for more 'straight forward' follow up interviews; i.e. one person households known to have a narrow portfolio of assets and liabilities.

2.5.1.1 Consideration of alternative modes of data collection

CAPI interviewing is a more expensive mode of interviewing when compared with alternative modes such as telephone or internet data collection. Therefore, there is potential to deliver cost savings as a result of using alternatives to CAPI. However, whilst cost savings might be possible, it is of the upmost importance to consider implications for data quality. This section details the case for and against using either telephone or internet data collection methods as an alternative to CAPI.

This approach makes sense intuitively. However, sometimes the composition of households change between waves – and sometimes in the four month period between the Keep in Touch Exercise (KITE) and the interview. The household may have additional household members by the time of the interview, or a change in circumstances with regards to their financial circumstances. These changes could mean that an alternative mode of data collection wouldn't have been deemed appropriate; however, by the time the change in circumstances was identified, it would be too late to switch modes.

2.5.1.2 Telephone interviewing

Telephone interviewing or Computer Aided Telephone Interviewing (CATI) is one alternative mode of interviewing to CAPI. CATI is already used on the WAS for the KITE, to interview households four months prior to their next interview to ensure that our contact and household composition details are accurate.

The most significant benefit from CATI over CAPI is that significant financial savings are realised through not having to pay for travel expenses to visit sampled addresses. Based on estimates provided for the Survey of Living Conditions, the *issued* sample for CATI costs approximately a third

of the cost of CAPI. There is however other non-financial costs associated with CATI when compared with CAPI data collection. These can be broadly disaggregated into three main categories:

1) Lower response rates
2) Mode effects
3) Reduced data quality

Lower response rates

The Labour Force Survey interviews some wave one cases by telephone (where a telephone number can be attained for a sampled address). The experience from LFS indicates that response rates are about 75 per cent of what would be expected from a face to face interview. This implies that for WAS the issued sample size would need to be increased by one third in order to realise the same achieved sample size. This increase in set sample would eliminate approximately half of the financial savings realised by switching from CAPI to CATI.

In addition to there being a lower household response rate, it is likely that telephone interviewing will lead to a higher proportion of proxy responses or non-responding adults within responding households.

ONS CATI best practice is that a telephone interview should not exceed around 40 minutes in duration. In fact, the length of the interview is highly correlated with response rates. That is, the longer the interview the lower the response. The mean average WAS interview is approximately double the recommended maximum CATI telephone interview length. Due to the questionnaire routing, WAS interview lengths have a significant variance, with 75 per cent of interviews taking over 100 minutes. Based on results from the wave four pilot, the mean average household interview for a one person household was 60 minutes. This is 1.5 times the recommended maximum interview length; thus the potential to exploit telephone interviewing whilst exercising best practice is significantly limited on WAS.

Mode effects

Again, the Labour Force Survey offers some evidence on potential mode effects of using CATI rather than CATI. Annex A provides a comparison of CATI and CAPI derived estimates for LFS waves 2-5. Note that the overall estimates in these tables reflect the larger proportion of telephone interviewing conducted between waves 2-5. However, for this paper, it is the difference between the CATI and CAPI estimates that are of relevance. Tables 2.10 to 2.12 provide evidence that telephone only interviewing would under-represent the following groups of the population: manual and routine workers, one person households, cohabiting couples and lone parents, younger age groups (20-34 years). In contrast, managerial and professional workers, married couples and older age groups (40 an over) would be over-represented. It's important to note that the mode effects can be controlled for where respondents are given the choice of which mode to respond to; as is the case with the LFS. The bias is introduced where households with specific characteristics are selected for a given mode; as is being considered for WAS.

Table 2.10: LFS: Percentage of respondents within Socio-Economic Grouping by Interview type and overall

NS-SEC - individual level			
	Type of Interview		
NS-SEC (3 level grouping)	Telephone	Face-to-face	Overall
managerial / professionals	27	21	26
intermediate	14	13	14
manual / routine	25	30	26
non-workers	34	36	35

Table 2.11: LFS: Percentage of households within household composition group by Interview type and overall

Type of household level data			
	Type of Interview		
Type of household	Telephone	Face-to-face	Overall
1 person	28	35	30
2 or more persons, all diff families	2	4	2
Married couple, no chld, no others	28	15	24
Cohab couple, no chld, no others	3	6	4
Married couple, all dep chld, no others	14	11	13
Cohab couple, all dep chld, no others	3	5	3
Marr couple, dep & non-dep chld,no oth	3	2	2
Marr couple,all non-dep chld, no oth	7	3	6
Lone parent, all dep chld, no others	4	10	6

Table 2.12: LFS: Percentage of respondents within age band by Interview type and overall

Age bands - individual level			
	Type of Interview		
Age Bands	Telephone	Face-to-face	Overall
16-17	3	2	3
18-19	2	3	2
20-24	3	8	4
25-29	3	9	5
30-34	4	8	5
35-39	6	7	6
40-44	8	7	7
45-49	8	6	7
50-54	7	5	6
55-59	7	4	7
60-64	8	5	7
65-99	23	14	20

Table 2.13 provides the proportion of Household Debtor Survey cases (a sub-sample of the most in-debt households in the WAS sample) which had no working telephone number. Over a year period, on average 27 per cent of the HAD sample did not have a working telephone number. Therefore, introducing CATI to WAS could increase the likelihood of the survey under-reporting on the most indebt households, which would clearly be hugely detrimental to the accuracy of key WAS estimates.

Another factor that should be considered is accessibility. Respondents with impairments such as deafness or manual dexterity are less likely to be able to respond via CATI compared to CAPI; the latter of which is the most accessible mode of interview. The WAS results to date indicate that there is an association between 'disability' and wealth; therefore it is important that respondents with impairments are not excluded from taking part in the survey.

Table 2.13: Percentage of HAD sample that has no working telephone number.

	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Mar-09	Apr-09	May-09	Jun-09
selected sample	112	127	105	136	115	139	133	154	116	160	134
no working telephone number	33	34	31	35	31	30	39	45	24	45	36
percentage	**29**	**27**	**30**	**26**	**27**	**22**	**29**	**29**	**21**	**28**	**27**

The mode effect is a serious enough consideration for cross-sectional results, but even more so for a longitudinal survey. If the mode of interviewing was changed for a sub-sample of WAS respondents, there is a substantial risk that a discontinuity would be introduced into the time series.

Reduced data quality

Aside from biases introduced as a result of mode effects there are other data quality issues that need to be taken into account when considering CATI.

Respondent fatigue is a concern. In a CAPI interview, the interviewer is more likely to be able to pick up on a respondent tiring or losing interest in the survey. The interviewer would offer a break, or to come back at another time to complete the interview. This is important given the length of some WAS interviews. The danger of respondent fatigue is that through not being able to concentrate or losing interest the propensity for item non-response increases; that is the prevalence of 'don't know' responses. Worst still, there is the increased risk that respondents guess or estimate answers rather than spending the time to formulate their answer.

It is also less likely that respondents would consult relevant documentation such as pay slips, or council tax or pension statements with CATI. This is again likely to lead to more estimation of responses, rather than consulting documents to record exact amounts. This measurement error could lead to both inaccurate cross-sectional estimates, but also a discontinuity in WAS time series data.

A further consideration with CATI is that show cards are harder to deploy on telephone interviews. Showcards can alter some response effects, and they can be used to improve recall and recognition

of a variety of subjects'[7]. The exclusion of showcards with telephone interviewing is therefore likely to lead to responses being missed, when compared to CAPI interviewing with the use of showcards.

The final and perhaps most relevant concern over the data quality of CATI relates to the role of the interviewer. With CAPI an interviewer is better able to develop a rapport with the respondent, compared with CATI. This leads to respondents being more open about their circumstances, as a result of the trust built between respondent and interviewer. The face to face interaction is also more amenable to the interviewer supporting the respondent in answering questions that they find cognitively difficult to answer. This is a really important factor in more complex or technical surveys where respondents are more likely to rely on interviewer support to understand the questions. WAS definitely fits into this category; particularly with its detailed questions on pensions. This point is further underlined by the fact that none of the EU member states collecting EU-SILC (Statistics on Income and Living Conditions) use CATI as a means of data collection. Eurostat and the EU National Statistics Institutions (NSIs) deem the income information to be too detailed and complex to collect over the telephone; instead CAPI is preferred by all EU-SILC data collectors. WAS collects data at least, probably more, detailed and complex data than EU-SILC.

2.5.1.3 Internet data collection

Internet data collection has the same benefit of CATI; cost reductions. It also has many of the same disadvantages; lower response, poorer data quality etc. In addition to the limitations with CATI there are other concerns specific to internet data collection.

Question comprehension

As reported under the limitations of CATI interviewing, respondents may not understand questions as well as CAPI; with an interviewer providing more support than is possible with a telephone interview. This problem is even greater with internet data collection; i.e. where there is no interviewer interaction at all. Although in theory in an internet mode the role of the interviewer could be replicated by providing detailed guidance for each question (either on the same screen as the question or in a separate screen), in practice it is the respondent's decision whether to access, consult and use such guidance. A report on a pilot of internet data collection report on the Labour Force Survey (LFS) explained that:

"Evidence of 'satisficing' was apparent at some questions, whereby questions and/or completion instructions/guidance were read quickly or incompletely; provided answers adequate to fulfil the question's requirements but not necessarily fully accurate; and provided deliberately inaccurate answers to get past questions that had caused difficulty and frustration."

The report concluded that substantial design work was required to develop the LFS internet survey instrument in order to ensure that questions, answers and instructions are well understood by respondents, thus minimising the risk of measurement errors. This would certainly apply to WAS, where the questions are even more complex and detailed than the LFS.

The finding on the LFS is consistent with other studies that have identified respondents taking short cuts to speed up the interview. A technique referred to as 'straight-lining' involved respondents

[7] R. Groves et al, Survey Methodology (2nd Edition), 2009

clicking vertically down a list of radio buttons in order to complete the questionnaire as quickly as possible; without considering the question or answer categories. This clearly has a hugely detrimental effect on the data quality.

Coding frames

The testing of internet data collection on the LFS found that the most problematic questions both in terms of the cognitive response process and the questionnaire's usability appear to be those which make use of coding frames. Significant difficulties have been reported, in particular, at questions using the Standard Industrial Classification (SIC) and Standard Occupational Classification (SOC) coding frames. Pilot results are inconclusive in recommending whether an online questionnaire should include occupational and coding frames for self-completion; or only collect occupation and industry details for in-house coding after data has been collected. Results from the quantitative and qualitative analysis show issues with both approaches:

Self-coding

Analysis of results of a self-coding experiment carried out on the face-to-face Opinions survey show that more than 10 per cent of respondents did not complete the SIC and SOC coding frames, mostly because they refused to do so. Among the respondents who did complete the coding frame task, 53 and 60 per cent of respondents reported at least some problems in using, respectively, the SIC and the SOC frames. Finally, when comparing the SIC and SOC codes self-coded by respondents with those coded by the interviewer, discrepancies emerge for around one third of respondents. Around 18 per cent of SIC codes and 21 per cent of SOC codes differ at the very first level of the hierarchical classifications.

In-house coding

As an alternative to the use of self-completion coding frames, the use of office-based coding was also tested. LFS respondents were asked to record details of their occupation and industry in a set of open-ended questions. Experienced coders then tried to code the occupation details to the SOC coding frame, while automatic coding text recognition was used to code industry details. Coded responses were then compared with SIC and SOC codes assigned by interviewers at the time of the previous LFS interview for those respondents who were still in the same job. Discrepancies in SIC and SOC coding were observed for over 50 and 60 per cent of respondents, respectively. Around 23 per cent of SIC codes and 27 per cent of SOC codes were different at the very first level of the hierarchical classifications. Coders' feedback highlighted that respondents often did not provide sufficient details or provided irrelevant information (often in large quantities) which made it difficult for the coders to accurately code the occupation. The DCM cognitive interviewing report (Betts et al, June 2011) also observed how "there was variation in the adequacy of respondents' descriptions of their employment to enable accurate coding of Standard Industrial Classification and Standard Occupation Classification".

LFS are continuing to test approaches to collecting data using coding frames. Needless to say that the use of coding frames poses particular issues for internet data collection. WAS currently uses both the SOC and SIC coding frames, and plans to utilise these further to assist with the classification of

financial institutions as part of the new Financial Conduct Authority (FCA) questions to be implemented in January 2013.

Infrastructure

Methodological issues aside, ONS is still developing and testing internet data collection as a feasible mode for social and business survey data collection. The infrastructure required to deliver these solutions, with the appropriate security level is currently under-development. A particularly relevant consideration with regards to security is the ability to upload previous waves' responses to an online system that could be used to route the questionnaire. Not being able to load previous responses would increase the interview length, as selective routing would be less efficient.

Given the current stage of development of internet data collection, even if it was deemed appropriate to use internet as a mode of data collection for WAS, it is not currently a feasible option due to infrastructure restrictions.

2.5.2 Keep in Touch Exercise interview

Unlike the mainstage survey, the KITE interview aims to collect much less information, and only from one person in each household. The questionnaire is set up to establish whether the household circumstances (contact details only) have changed and if so, how. In the vast majority of cases there isn't change in the household composition so the interview is only about five to ten minutes. The requirements of KITE are much simpler than the mainstage interview, therefore in order to reduce costs and maximise value for money, the interviews are conducted using Computer Assisted Telephone Interviewing (CATI).

Conclusion

There are potential savings to be made as a result of replacing some CAPI data collection with other modes; namely telephone and internet data collection. At this stage the latter is not possible due to the lack of infrastructure; regardless of whether it was deemed an appropriate decision based on methodology considerations. There is the functional ability to conduct CATI data collection; however the implications for response and data quality are not in-significant. If maintaining an achieved sample size is important (which it definitely is for WAS), then the cost savings will be compromised as a result of having to issue a larger set sample.

Given the marginal likely cost savings that CATI could offer; the difficulty of identifying changes in household's circumstances; and, the significant concerns over the quality of the data (given the complex content of the WAS questionnaire) it is not advised that CATI is employed on the survey. Furthermore, it is vitally important that the time series of WAS data is not compromised – evidence from the LFS suggests that there could be a mode effect on some key estimates, and that some groups would be under-represented. This would be hugely detrimental to the potential for analysis on WAS; both cross-sectional and across waves.

Continue with current mode of telephone interviewing for KITE.

2.6 Administrative Data Linkage

Since its inception the Wealth and Assets Survey has collected consent to link respondent's data with administrative sources using their National Insurance Number (NINO). The intention was that combining survey responses with administrative sources from HMRC and DWP would help to enhance and validate the survey data. To date, no linkage has been performed using WAS data. The case for asking consent to data linkage has been questioned in the lead up to wave four and as a result it was decided to remove the question for the first three months of wave four; pending assurances from DWP that they are able to link 'Real Time Information' RTI to WAS data accurately and timely.

The future potential of data linkage focuses on the ability to link RTI from HMRC. RTI contains data collated from employers who pay staff using BACS. The data is submitted to HMRC on a monthly basis and will contain information on contributions to occupational pensions. With auto-enrolment coming into effect from October 2012, this linkage could potentially add a lot of value to WAS data; particularly for data validation. The effectiveness of this link will depend upon the ability to link the RTI and WAS data accurately and timely; so as to allow the link to feed into data validation in real time.

If the RTI linking works effectively, this information could be used in future to replace some pensions and income questions (for respondents where an RTI link is permissible); thus reducing the interview length and potentially improving data quality.

The consortium will progress this development separate to this review.

3 Questionnaire Content

3.1 Overview

The Wealth and Assets Survey (WAS) collects data on a wide range of assets and liabilities that private individuals and households in Great Britain have. The primary aim of the survey is to derive overall estimates of wealth and monitor how these change over time. WAS broadly splits wealth into four categories:

1) Financial wealth
2) Pensions wealth
3) Physical wealth
4) Property wealth

The questionnaire is designed to collect relevant information across these four domains of wealth, to provide aggregated measures of wealth, but also to afford significant potential for analysis within these four domains. The questionnaire is therefore both broad and detailed in coverage, with a wide range of stakeholders interested in the data WAS provides.

The wave one questionnaire content was determined by the requirements of the WAS consortium of government departments; namely the Department for Business Innovation and Skills (BIS); Department for Work and Pensions (DWP); HM Revenues and Customs (HMRC); HM Treasury (HMT); the Office for National Statistics (ONS); the Department for Communities and Local Government (DCLG) and the Cabinet Office (CO). The primary focus of the questionnaire is to provide four estimates of wealth; however some additional information is collected on non-wealth topics such as socio-demographic characteristics and financial acuity. This allows for aggregate and component analysis of wealth with other factors.

3.2 Questionnaire changes

WAS is a longitudinal survey and therefore in order to measure change over time the questionnaire needs to be as stable as possible; so as to reduce discontinuities in the outputs. However, there is scope to make changes to the questionnaire between waves in order to adopt harmonised question standards and/or emerging information requirements.

Changes between waves are made with consortium agreement. Sponsoring departments provide their information requirements and specify any requested changes. These changes are discussed by the WAS Technical Group (TG), with recommendations for questionnaire changes being submitted to the WAS Steering Group (SG). The WAS SG is formed from senior representatives of the consortium departments. Recommended questionnaire changes have previously been subject to cognitive question testing and quantitative piloting. The cognitive question testing has the following objectives:

- ascertain whether the proposed questioning will address the information needs identified by key users and stakeholders, from the respondents' perspective
- establish what respondents understand the questions to mean and the terminology used

- understand how respondents formulate their answers and by so doing ensure that the questions are interpreted as key users and stakeholders intended
- ensure that response options are comprehensive
- ensure that respondents are willing to provide answers
- ensure that respondents are able to provide answers
- ensure that the order in which the questions are asked does not affect the answers given
- address issues relating to the collection of proxy data (if proxy information can be collected)

It is suspected that some of the questions introduced for wave three were not sufficiently tested and may be problematic for respondents to answer. For example, some of the pensions questions suffer from very high item not response (don't know responses). A review of questions suitable for cognitive testing is due this year, ahead of wave five interviewing.

The quantitative piloting aims to provide a test run of the new questionnaire, and to identify any issues with the questionnaire before the next wave's data collection starts. An interviewer de-brief is held following the pilot to seek feedback on the questionnaire and any areas for improvement. The pilot also provides the opportunity to produce survey metrics such as interview length (broken down by topic area) and indicative response and data linkage consent rates.

Conclusion

Current procedures for determining questionnaire content are sufficient and have worked well, particularly with the wave four questionnaire.

With respect to the wave 5 questionnaire, a review of suitable questions for cognitive testing has been conducted in early 2013, with cognitive testing to be carried out in the summer of 2013.

3.3 Modularisation of WAS questionnaire to reduce overall interview length

This section considers the possible approach of reducing overall WAS interview length through the modularisation of the current WAS questionnaire, identifying a number of questionnaire blocks as appropriate for modularisation due to them not being used in the creation of WAS wealth DVs or estimates. The modularisation of WAS questionnaire blocks offers an opportunity to exclude new cohort households from completing these sections of the questionnaire, while maintaining the potential for time series and longitudinal analysis for the follow up sample. In addition, it may not be essential to ask some of these non-core question blocks to all households, at every wave going forward. If this is the case there may be the possibility for some of these questions to be asked to a subset or half sample of households within a given wave or even at alternate waves instead. There is also the option of only asking certain module blocks at the wave one interview going forward. The possibility of employing a combination of these approaches has the potential to maximise reductions in questionnaire length for future WAS waves.

3.3.1 Possible forms of modularisation

There are a variety of ways modularisation could be employed on the current WAS questionnaire. However, the five forms of modularisation considered are:

new cohort households are not asked all/some of the identified question blocks;

all/some of the questions identified will be asked to all households at alternate waves;

all/some of the questions identified will be asked to half of the sampled households per wave;

all/some of the questions identified are asked only once at the first wave;

a combination of the above approaches to maximise reductions in questionnaire length for future WAS waves.

A variety of questionnaire blocks have been identified as possible candidates for modularisation as they are not used in the creation of household wealth derived variables and estimates. Many of the blocks identified have been discussed during previous WAS questionnaire reviews although in the context of the potential for removal rather than for modularisation. Modularisation offers a less severe method of reducing survey interview lengths while still collecting data that is potentially useful for analysis purposes, albeit for fewer respondents and/or at wider time intervals.

The blocks identified here for potential modularisation are: Financial Acuity (7.7 minutes), Saving Attitudes and Behaviour (4.1 minutes), Wellbeing (2.2 minutes), Attitudes to Risk (1.7 minutes), Reasons for not Contributing to a Pension (1.7 minutes), Retirement Status (1.3 minutes), Attitudes for Saving for Retirement (1.3 minutes), Status of Parents (1.6 minutes), Financial Expectations (1.5 minutes), Financial Management and Awareness (1.1 minutes), Health/Longstanding Illness (1.3 minutes), Business Assets/Sale of Business/Other Business interests (1.1 minutes), Debt Burden (0.6 minutes), Equity Release (0.2 minutes).

3.3.2 Discussion

The length of the WAS questionnaire has been an ongoing concern since the survey's inception. It was agreed the interview length would need to be reduced prior to the start of wave four, and as a result around 80 variables were removed from the questionnaire. A key question to consider looking forward is whether all new cohort cases (assuming a new cohort is funded) need be asked all of the same questions as those in the old cohort (i.e. does cross-sectional and future longitudinal analysis require all of the existing questions to be asked of the new cohort). In addition, some questions may not necessarily need to be asked at every wave and could be asked at alternate waves instead. In some instances this could be taken a step further by only asking certain questions to half of the full/new cohort sample within a given wave. There is also the option expanding the existing use only routing certain module blocks to wave one/new cohort interviewees (currently used on the Status of Parents block). The possibility of employing a combination of these approaches has the potential to maximise reductions in questionnaire length for future WAS waves, while still maintaining data that will be of use to analysts. Table 3.11 below illustrates the individual questionnaire blocks identified as candidates for modularisation. The identified blocks currently add around 27 minutes to an average WAS household interview and are discussed individually below.

At 7.7 minutes in length, the Financial Acuity block remains the longest section of the WAS questionnaire outside of those used to produce wealth DV's and estimates. Interviewers have previously reported that they find this section time-consuming at the end of a long interview and consortium members were asked during the consultation for wave four to consider reducing the number of respondents asked these questions. A case was then made to retain them in their current form in order to be able to obtain individual's Financial Acuity score. The February TG recommended the questions should be cognitively tested in 2013, and since then, the FCA have expressed a willingness to be involved in reviewing this section. The proposed new FCA questions on Financial Advice are currently planned to sit towards the end of this block.

Table 3.11: Summary of wave four timings by questionnaire block (minutes per household)

		Households starting this section			All responding households (notional)	
Block Name	**Description**	Base	Mean	Median	Mean	Median
QTMaths	Financial Acuity	179	7.70	7.08	7.70	7.08
QTSavBe	Saving Attitudes and Behaviour	179	4.14	3.33	4.14	3.33
QT Wellbeing	Social Wellbeing	179	2.16	1.82	2.16	1.82
QTRisk	Attitudes to risk	179	1.70	1.53	1.70	1.53
QTNoPens	Reasons for not-contributing to a pension	119	2.51	2.22	1.67	1.43
QTRetire	Retirement Status	179	1.31	0.63	1.31	0.63
QTSavRet	Attitudes to saving for retirement	119	1.93	1.53	1.28	1.12
QTSupPar	Status of parents	87	3.34	2.88	1.63	0.00
QTFinExp	Financial Expectations	179	1.46	1.08	1.46	1.08
QTFinMan	Financial Management and awareness	179	1.05	0.88	1.05	0.88
QTHealth	Health	179	0.32	0.23	0.32	0.23
QTIllness	Long-standing illness	179	0.94	0.60	0.94	0.60
QTBasset	Business assets	96	1.40	0.14	0.75	0.03
QTBusInc	Sale of business	179	0.19	0.15	0.19	0.15
QTOthbus	Other business interests	179	0.14	0.10	0.14	0.10
QTNonMp	Non-mortgage debt burden	147	0.68	0.43	0.56	0.38
QEquity	Equity Release	177	0.22	0.13	0.22	0.13
Total					**27.20**	

1. Timings based on wave four pilot interview audit trails.

There is the potential for significant time savings to be made here (over 5 minutes per average household interview) if the existing Financial Acuity questions (excluding the new proposed questions on Financial Advice) were only asked to new cohort/wave one cases going forward on the basis that there may be little added value in recording individual's financial acuity score more than once. If this was not desirable, a possible alternative to this approach could be that these questions were only asked at alternate waves for follow up interviews only (i.e. excluding new cohort cases from them altogether). This may have the potential to reduce average interview times by around 4 minutes.

Saving Attitudes and Behaviour is another long section of the questionnaire adding 4.1 minutes to an average WAS interview. This section was reviewed prior to the start of wave four and three questions were removed as a result. These questions have previously been identified as a high priority for DWP colleagues who have specifically requested retaining OSavExt and OSavExtO in relation to assessing the forthcoming workplace pension reforms (OSavExt: *'Thinking back over the last 12 months, has anything in the wider world, or outside your household, influenced your decisions on pensions, savings or investments?'*, OSavExtO: '*What is the main event or change in policy that you are thinking of?'*). We propose that new cohort households are not asked this block from wave five onwards and that for follow up households the questions are either only asked at alternate waves or to a half sample of households per wave. This approach may have the potential to reduce average interview times by around two minutes.

ONS introduced Well-being questions on WAS from the start of the second year of wave three (July 2009). This block is asked of all respondents with the effect of increasing average interview times by over 2 minutes per household. These questions might be considered a candidate for modularisation and would offer a time saving of over one minute per average household interview.

The current Attitudes to Risk question block adds around 1.7 minutes to an average WAS interview, but has previously been identified as of interest to DWP analysts. The modularisation of these questions for new cohort cases and also for follow up households at alternate waves could realise some significant time savings going forwards, while still providing data of interest to DWP analysts.

The Retirement, Attitudes to Saving for Retirement and Reasons for not Contributing to a Pension blocks have been discussed as being of high interest to DWP analysts in the past. However, with a combined average length of 4.3 minutes overall, their modularisation for both new and follow up interviews at alternate years presents a significant opportunity to further reduce the WAS questionnaire.

The current Status of Parents block is only asked at the wave one interview. Discussions around the uses of this data have included the potential for assessing social mobility, however there are no clear analysis plans for this work. Adding over 1.6 minutes per household interview, we recommend that these questions are only asked to half of the new cohort sample going forwards.

The Financial Expectation and Financial Management and Awareness blocks combined add an average of 2.5 minutes per interview. Their modularisation for both new and follow up interviews in terms of only being asked at alternate years presents a significant opportunity to further reduce the WAS questionnaire in the future.

The Health and Longstanding Illness blocks add around 1.3 minutes to an average WAS interview and might also only be asked at alternate waves going forwards.

The three Business Assets blocks (Business Assets, Sale of Business and Other Business Interests) have recently been reviewed and retained due to their potential for future analysis. With an average total time over one minute per household, only asking these questions at alternate waves would still allow their potential for analysis to be investigated while offering an additional method for reducing respondent burden. There would also be the potential to exclude new cohort cases from being

routed to these as well should an exploration of the potential for analysis of these variables show their value to be lacking.

The Debt Burden section of the questionnaire adds around 0.6 minutes to an average household interview but has previously been reported as of interest to analysts. We propose that this section is only asked to a half a sample of follow up households in future.

Of the fifty questions within the Equity release block, thirty seven of these are not used in the creation of wealth DVs or for analysis. HMRC/HMT have expressed some interest in analysing these questions although there have historically been low levels of response to these questions and DWP requested that they were looked at again as part of the wave five review. We recommend that in future these questions are not asked of new cohort cases and are only asked to follow up addresses at alternate waves.

3.3.3 Implementation

Precise details on the implementation of the proposed changes are not discussed in detail here, though there are a number of approaches that could be taken. Questions routed to wave one cases only (such as has been recommended for the Financial Acuity block) would be relatively simple to implement as they could be routed in a similar way to the current Status of Parents questions. For individuals only to be routed to particular questions on alternate years, a simple approach could be that households in the first year of the wave would be asked certain question blocks while those in the second year could be excluded from these questions but perhaps routed to other question blocks instead. Other questions could also potentially be routed to a half of the survey sample on a month by month basis by routing the related questionnaire blocks on the randomly allocated sample file address number (odd numbered sample file addresses receiving certain question modules and even numbered households excluded from these or potentially routed to other questionnaire modules instead).

Asking questions to half of a sample or at alternate years would raise the possibility of imputing data for those respondents not routed to certain questions by using data from those who did respond to them (either within the same year or wave of interviewing). At present WAS only imputes data for variables contributing to total wealth estimates, though expanding this approach to other non-wealth variables could be considered if thought to be desirable going forwards. ONS methodology would need to be able to confirm the suitability of the questions to be imputed for as well as the availability of resource to carry out the work before questionnaire changes were made on the basis that this would occur. These and other decisions concerning the implementation of the proposed changes will need to be discussed in detail, although after the difficult though necessary decisions in terms of the areas of the questionnaire that will be suitable for modularisation have first been made.

3.4 Proxy questions

Where possible WAS will collect information from each respondent in person. However, in some circumstances this is not possible and a proxy interview with another household member will be accepted. Proxy interviews are not routed to all of the questions, for example more subjective questions such as attitudes to finances or well-being are not asked by proxy.

Some analysis has been conducted in the past to assess the quality of proxy data. This analysis showed that item non-response (don't know) values was higher for proxy interviews than personal; a predictable result. However, what was more interesting is that proxy responses were found to have under-estimated the value of wealth; although this analysis did not control for the characteristics of proxy responses compared with those respondents who provide a personal interview. Therefore it is difficult to conclude from this analysis whether proxy interviews genuinely under-estimate wealth.

This analysis and the resulting report concluded that proxy interviews should continue on WAS, because the alternative would be a much greater reliance on imputation. Proxy interviews can be considered as a method of 'informed imputation'.

3.5 Programming and testing

The Wealth and Assets Survey data is collected using Computer Aided Personal Interviewing (CAPI). The software, loaded into interviewer's laptops is called Blaise. All face to face ONS social surveys use Blaise for interviewing as ONS feel that it has the flexibility and technical capability to cope best with the complexity of social research surveys. Blaise's powerful programming language offers numerous features and its data entry program supports a variety of survey processing needs (http://www.blaise.com/capabilities).

A number of features of Blaise are particularly advantageous for this survey:

- Blaise CAPI scripts have an in-built hierarchical block structure that effectively makes all questionnaires modular. The ability to handle the associated routing of a modular questionnaire is core to Blaise's architecture. In addition to its hierarchical block structure, Blaise also allows the creation of 'blocks' which can be accessed in parallel, allowing interviewers to switch out of one set of hierarchical blocks to another set. This provides valuable flexibility as it, for instance, allows an interviewer to pause an interview with one household member, initiate an interview with another household member (e.g. a household reference person), and then resume the interview with the original household member at a convenient time in the future.

- Blaise meets the requirement of being able to split the sample geographically or by sample identifiers. Separate questions can be allocated to these different sections of the sample or to randomly selected sub-samples of different sizes.

- Handling complex routing (including loops and repeated events), applying automatic logic and consistency checks in real time during the interview, and using text fills where required, are all core to Blaise's architecture. They are functions that we make extensive use of on the Wealth and Assets Survey.

- Blaise allows interviewers to exit and restart interviews at any point which allows interviews to be suspended and resumed.

The Wealth and Assets Survey questionnaire records the length of time spent on different questions during interviews, by placing 'time stamps' at the start and end of different questions. We can use the session log file (called the audit trail in Blaise) to time individual questions. This method affords

us the ability to monitor how different questions contribute to the overall length of the questionnaire, which is essential when conducting questionnaire content reviews.

Other features of Blaise which make it excellent for undertaking the Wealth and Assets Survey include:

- the ability for interviewers to back track in instances where later sections of an interview highlight an error made earlier
- flexibility over styles, fonts, font sizes and colours. Blaise allows these to be specified for all text or for individual words/questions etc. This helps ensure the screen seen by the interviewer is as well designed as possible, with effective interviewer prompts. This in turn helps promote interviewer-respondent rapport, thereby contributing to better data quality
- the ability to interact with a 'question by question' (QbyQ) help facility. This provides interviewers with real-time access to guidance on specific questions during the interview. This is an electronic programme that operates in conjunction with Blaise

The Wealth and Assets Survey questionnaire is tested extensively prior to being scattered to field interviewers. Currently, staff in the research team independently test the questionnaire; along with staff in ONS Survey Operations team. Questionnaire testing is done every month prior to the questionnaire scatter for the next fieldwork period. Monthly testing of the questionnaire is required, as, although there are not normally question changes, often improvements to the questionnaire routing are added within a wave. It is important that these changes are tested to ensure that the questionnaire actually operates as intended.

Conclusion

The use of Blaise will continue. The testing of the questionnaire is considered to be sufficient.

4 Fieldwork procedures

The following provides a summary of interviewer training prior to starting a HAS quota of interviewing; how progress is monitored and performance benchmarked during data collection; and, how contact is maintained with HAS respondents between waves.

4.1 Interviewer training

Interviewers working on the Wealth and Assets Survey have received both generic field interviewer and survey specific training.

4.1.1 Generic interviewer training

New interviewers to ONS are placed on a six week training programme – the Interviewer Learning Programme (ILP) - where they are equipped with the skills required for social survey interviewing. The programme coordinates the activities of managers, trainers and interviewers into a structured programme that ensures all interviewers can meet the high standards expected of an ONS interviewer. The training is a partnership between HQ training and the interviewer's line manager (Field manager (FM)) and adopts a blended learning approach. Methods used include: classroom training; instructional and activity based workbooks; instructional and activity based e-learning applications and; activity based applications that test the interviewer's skills and knowledge base. At the end of the six weeks, interviewers continue to be supported in their personal development. This is done with the assistance of their field manager. They are also assigned a mentor who is an experienced interviewer. New interviewers shadow mentors as well as having their FM or mentor accompany them when they begin working on a survey.

Interviewers also participate in specific training events such as Achieving Cooperation Training (known as ACT) and Achieving Contact Efficiently (ACE). Both of these training packages have been reviewed and rolled out to the entire face to face field force. This is managed through training events and interviewer support group meetings. Regular meetings of field managers and their teams are held throughout the year where training issues and refresher training are addressed.

Telephone interviewers and ONS help desk operatives receive equivalent training and can very often convert refusals; following the receipt of an advance letter.

4.1.2 Survey specific training

Face-to-face interviewers

Interviewers working on the WAS undergo training in two stages prior to starting any WAS interviews. Firstly they are provided with a home-study pack to work through which provides detailed information on the purpose and design of the survey as well as the questionnaire content. Following completion of the home study, interviewers complete an 'electronic learning questionnaire' or ELQ. This Blaise supported questionnaire is designed to test interviewer's knowledge of the survey and identify areas where interviewers require further support. The results of the ELQ are submitted to the HQ field team for review ahead of a face to face briefing of up to 12

interviewers. This briefing reviews the content of the home study pack in more detail and offers the opportunity for interviewers to ask questions. It also highlights any areas of concern identified by results from the ELQ. The briefing is led by one or two field managers, sometimes with support from research and field team HQ staff. For WAS wave three the briefings were led solely by field managers. Given the minimal changes between the wave three and wave four questionnaire, combined with having an experienced fieldforce of WAS interviewers, a paper briefing will be issued to interviewers working on WAS wave four.

Interviewers will not start WAS work until their field manager is assured that they are fully briefed and ready to undertake the survey.

All interviewers working on the survey are briefed on the importance of collecting and recording accurate data. For example, the requirement for accurate National Insurance Number (NINO) details to be recorded was made explicitly clear to interviewers in order to maximise the accuracy of linking based on NINO.

Telephone interviewers

ONS telephone interviewers working on WAS receive an annual briefing on how to administer the Keep in Touch Exercise (KITE) questionnaire. This briefing, delivered by research staff, covers the importance of the KITE interview; and, the importance of collecting contact details and ensuring these are reported correctly. KITE interviewers are trained to try and turn around refusals, should panel respondents express concerns over future involvement in the survey.

Conclusion

Continue to train new WAS interviewers using the existing processes.

4.2 Respondent contact

Once the sample has been selected, either from the small users Postcode Address File (new cohort), or by maintaining panel address details (old cohort), advance letters are issued to sampled households/respondents. Advance letters are issued approximately ten days prior to the start of the monthly fieldwork period. The advance letters are intended to inform eligible respondents that they have been selected for an interview; provide information on the purpose of the interview; explain the importance of respondent's participation; and, to provide contact details in case eligible respondents want to find out more.

New cohort households are issued one advance letter addressed 'Dear resident' which assumes no prior knowledge or involvement in the survey. For the old cohort, each eligible respondent is sent an advance letter, addressed specifically to them, thanking for their help in the previous interview and inviting them to take part again. The exception to this is where the respondent was a proxy interview in the previous wave – these respondents are sent a named advance letter, but the letter assumes no prior knowledge or participation in the survey.

ONS recognises that some sectors of the community can be difficult to contact. These include but are not limited to metropolitan areas, flats, London, ethnic minorities and gated estates. ONS recently reviewed and updated the interviewer guidance on calling patterns designed to maximise contact.

This strategy is known as Achieving Contact Efficiently and is underpinned by a Calling Checklist. The checklist is intended as guidance for interviewers and their managers to use as a basis for identifying whether alternative strategies can be adopted to make more effective calls. It is not a prescriptive list as it is recognised that there will be some differences in different areas.

In summary, however, the calling strategy is aimed at achieving the highest contact rate at the lowest cost by varying calling times. Many households will be easily contacted within the first couple of calls, but for those which are not it is important to make sure that successive visits are at different times of the day (including evenings) and on different days of the week.

ONS Methodology conducted a review of interviewer calling patterns and the success of these as the time of day, and day of week varied. This report recommended a set of calling patterns for interviewers to follow in order to maximise the likelihood of establishing contact with respondents[8]. Best practice procedures whereby interviewers varied their calling times and days in the area were employed in an attempt to maximise response to the WAS.

4.3 Field sampling procedures

Where an interviewer discovered a multi-household address in England and Wales or a Scottish address with an multi-occupancy (MO) count less than two, up to a maximum of three randomly sampled households from the address were included in the sample. For Scottish addresses sampled with an MO count of three or more, a single household was sampled if the MO count equalled the actual number of households present. If the number found differed from the MO count, the number of households sampled was adjusted but again to a maximum of three. The number of additional households that could be sampled was subject to a maximum of four per PSU. Some occupied dwellings are not listed on the PAF. This may be because a house has been split into separate flats, only some of which are listed. If the missing dwelling could be uniquely associated with a listed address, a divided address procedure was applied to compensate for the under-coverage. In these cases, the interviewer included the unlisted part in the sample only if the associated listed address had been sampled. Any sampled addresses identified by the interviewer as non-private or non-residential were excluded as ineligible.

4.4 Monitoring progress

Reports on progress, response rates, calling patterns and contact rates at the interviewer, Field Manager, Regional Manager and survey levels are produced on a daily basis. These are easily accessible to both the operations department and the survey research team.

[8] Hopper, N.: "An analysis of optimal calling pattern by Output Area Classification", ONS Working Paper, Methodology Division, 2008

The Wealth and Assets Survey operates using a monthly fieldwork period; that is the sample is scattered to allow interviewing to start at the beginning of the month; with the expectation that all work is attempted by the conclusion of the calendar month. Following this field period some addresses that were either non-contacts or 'soft' refusals are re-issued to interviewers in order to try and secure an interview at the second attempt. The re-issue period generally runs from two weeks after the close of the field period, for four weeks, i.e. it concludes six weeks after the standard field period close. Re-issuing allows a different interviewer to attempt a previously unproductive case; this allows for a different interviewer-respondent interaction which can sometimes improve the likelihood of securing an interview.

4.4.1 Impact on re-issues

A new timetable was implemented for the return of fieldwork, effective from the beginning of April 2012. This timetable did not change the monthly data collection periods; its intention was to help ensure the timely return of all cases so that they could be considered for re-issues.

The deadline for completion of fieldwork is on or close to the 10th of the following month. All cases are expected to be returned by this date so as to ensure they can be considered for re-issue for a second attempt at securing an interview. The re-issue period is for approximately four weeks.

At the time of writing, the impact of re-issues could only be assessed for April, May and June 2012. Table 4.1 compares the impact of re-issues for the new and old cohorts for the three months prior to, and post April 2012.

Table 4.1: Impact of Re-issues

Response[9] 2012	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
New cohort response	50.0	56.9	43.0	49.4	51.1	48.6	48.9	49.3
New cohort response after re-issues	50.3	57.1	44.5	50.5	51.4	52.5	51.0	50.2
Impact of re-issues	0.3	0.2	1.5	1.1	0.3	3.9	2.1	0.9
New Cohort average impact			0.67					1.66
Old cohort response	65.5	67.1	64.9	70.8	67.5	64.4	66.9	63.8
Old cohort response after re-issues	67.4	67.7	66.3	71.9	69.0	66.4	68.2	65.0
Impact of re-issues	1.9	0.6	1.4	1.1	1.5	2.0	1.3	1.2
Old cohort average impact			1.30					1.42

The table shows that the average impact of re-issues on new cohort response has increased from 0.67 per cent to 1.66 per cent since the introduction of the more stringent timetable for return of cases to HQ. This is an observed increase of 1.0 per cent.

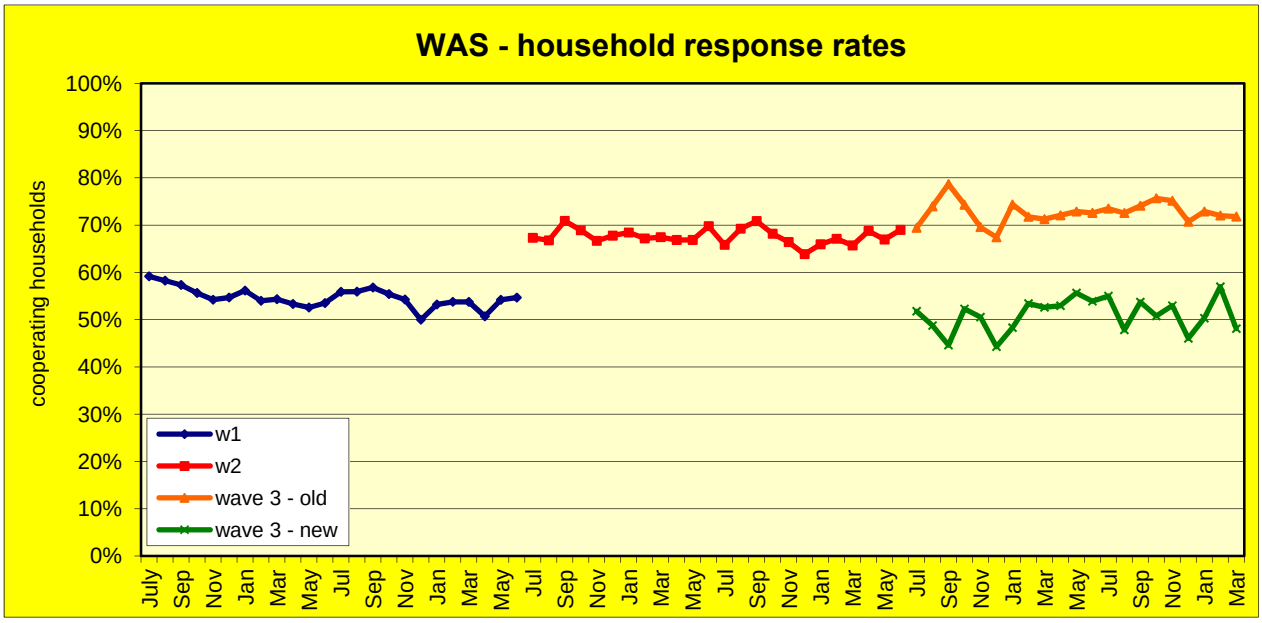
The impact is less profound for the old cohort, where the impact of re-issues has increased from 1.3 per cent to 1.42 per cent; an improvement of 0.12 per cent.

These results are based on a very short period of time and caution should be applied in making inferences from these observations. Indicatively it would appear that the new timetable has led to an improvement in the productivity of re-issues. However, further analysis with appropriate statistical tests should be conducted from April 2013, when a year's worth of data is available to evaluate.

[9] Response rates quoted are 'middle response rates' and make an adjustment for unknown eligibility – i.e. only a proportion of unknown eligibility cases are assumed to be ineligible.

4.5 Response rates

The following graph provides household response for waves one to three; separating out the new and old cohorts for the latter.



This graph illustrates the differential response rates across waves and between the cohorts within wave three. WAS achieved an average response rate of 55 per cent for wave one, with fieldwork being conducted between July 2006 and June 2008. The achieved sample for wave one was issued for re-interview between July 2008 and June 2010, yielding an improved response of 68 per cent. For wave three, the achieved wave two sample was issued for re-interview and to date an average response rate of 73 per cent has been achieved.

In addition to the 'old cohort', a 'new cohort' of 'boost' cases was drawn to increase the wave three sample size; and that of subsequent waves. The new cohort response is currently averaging 51 per cent for wave three. This is significantly less than the old cohort, but this is expected as the old cohort sample has already experienced some attrition in the sample; with the remaining respondents more likely to take part in WAS interviews. A better comparison is to look at the new cohort response of 51 per cent against the wave one response of 55 per cent. This four per cent decline most likely reflects a general decline in response rates across all social surveys. It is also possible that WAS has been particularly vulnerable given the saliency of the subject and respondent's sensitivities to talking about their financial circumstances – particularly given the economic climate in Great Britain in 2010-2012 relative to 2006-2008 when WAS started.

Overall, WAS wave three is meeting the response targets set by the consortium. WAS over-achieved on the response for the old cohort (72 per cent achieved compared with a target of 67 per cent). The wave three old cohort is currently achieving 51 per cent compared with a target of 55 per cent. It is important to understand why the old cohort response is relatively low compared with the achieved

response for wave one. Understanding the causes of relatively low response will help to improve sample recruitment in future boosts, with the view to maximising cooperation.

Whilst the above commentary is accurate, one should note that given the relatively small monthly sample size of the new cohort, a small number of extra refusals within a month can have a profound impact on the achieved response rate. With that in mind, one should take care when inferring variance in response for the new cohort across months within the wave. Nonetheless, response across the wave is lower for the new cohort and should be investigated further with the view to maximising cooperation rates of future WAS boosts.

4.6 Improving WAS New Cohort response

The new cohort response rate for wave three was 51 per cent; four per cent below target. A number of initiatives have been identified to help improve the new cohort response rate. It is likely that a combination of these will help to improve the response rate; i.e. no single initiative will account for a four per cent increase in response. It is important to remember that declining response rates is an issue facing all social surveys; it is not an issue specific to the WAS.

Key initiatives to help improve new cohort response are considered below, some of which have already started and some that are scheduled for implementation over the coming months. It's worth noting that although these initiatives have been identified to increase the new cohort response rate, it is very likely that some of these will help to improve the old cohort response rate as well.

4.6.1 Focus groups with interviewers

The WAS research team have worked closely with the Family Resources Survey (FRS) team in ONS to hold a focus group with interviewers to try and learn more about how interviewers sell financial surveys to respondents; how we can learn from best practice; and, whether there is anything HQ can do to help interviewers sell FRS and WAS.

To date, one focus group has been held and there are plans for a second. The initial focus group identified that for WAS the interview length was a factor in respondent's decision on whether to take part (particularly for old cohort). The focus group also highlighted the potential benefit of a WAS 'factsheet' in order to illustrate WAS results to respondents. The factsheet would provide the key results from WAS waves one and two, as well as any media coverage. The factsheet would help to assure respondents that published results are aggregated and anonymous.

4.6.2 Advance letter cognitive testing

ONS Survey Operations branch are currently reviewing the advance letters for all social surveys. This review includes conducting cognitive testing of advance letters in order to better understand the interpretation and inferences made by respondents reading the letter.

4.6.3 Survey materials

As a result of the focus group referred to previously, and from interviewer feedback through other means, it is proposed that a WAS 'factsheet' be prepared for interviewers to use. This factsheet will provide key results from the first two waves of the survey. Interviewers will be able to use this factsheet to show respondents on the doorstep how their responses are used, and, importantly to illustrate that published results are aggregated and anonymous.

In addition to the factsheet, the WAS research team are currently updating the WAS purpose leaflet to include the latest results from WAS wave two. The research team are consulting with interviewers to identify which results they think will have the most relevance and appeal to respondents.

The WAS Technical Group will be consulted on all new or revised WAS survey materials.

4.7 Keeping in Touch

WAS is a longitudinal survey that follows all adults interviewed in wave one (original sample members, or OSMs). The survey is biennial, i.e. two years in-between each interview. WAS, like other longitudinal surveys, experiences attrition, which may occur for inevitable reasons such as death, or for reasons that can be minimised such as failure of tracing, failure of contact, or refusal.[10]

The longitudinal design of WAS requires following OSMs over time in order to be able to measure changes of wealth. It is evident that tracing and following sample members becomes difficult when circumstances of sample members, in particular their location, change over time.[11] To minimise attrition caused by the loss of sample members due to the failure of tracking, WAS has a number of measures implemented in the survey design to maximise the likelihood of contact being made with the sample member at the next wave.

Firstly, the WAS questionnaire asks respondents at the interview to confirm their address details as well as further contact details such as phone numbers, email address, and contact details of two nominated persons (not resident at the same address) that are authorised to provide ONS with the respondent's new address in case the respondent has moved and cannot be traced. Secondly, a few weeks after the interview all respondents receive a 'Change of Address' card together with the posted incentive (alternatively this will be sent by email), which aims to encourage respondents to inform the ONS if their contact details change. Thirdly, a brief telephone interview is conducted prior to the next wave's interview. This telephone interview is referred to as the 'Keep in Touch Exercise',

[10] Portanti, M.: "Attrition on Longitudinal Survey – Literature Review", ONS Working Paper, Social Survey Division, November 2009, pg. 2
Plewis, I., 2007. Non-Response in a Birth Cohort Study: The Case of the Millenium Cohort Study. *International Journal of Social Research Methodology*, 10(5), p. 325

[11] Laurie, H., Smith, R. & Scott, L., 1999. Strategies for Reducing Nonresponse in a Longitudinal Panel Survey. Journal of Official Statistics, 15, p. 269

or KITE. During this interview information about household members as well as their address and contact details are confirmed or updated. It provides the opportunity to identify movers from the household, and their new contact details; as well to identify joiners to the household.

The KITE telephone interviews have been conducted since April 2008. During the first year of KITE, the interviews were conducted three months before the next wave's interview. Due to the lack of time between KITE and HAS required for sampling and allocation of interview quotas, with the start of August 2009 KITE changed to being conducted from three to four months prior to HAS. This meant that during the period of change, sample members of HAS in November 2009 were not approached prior to the next wave to up-date their contact details. Despite this change the observed response rate (74% cooperating households out of those in scope for November 2009) at mainstage did not differ considerably from the wave two average response rates. The effectiveness of KITE in terms of the impact it had on the next wave's response, and therefore the case for its continuation was questioned as a result.

Between November 2010 and October 2011 the ONS conducted an experiment on the effectiveness of the KITE relative to a newsletter issued to respondents between waves, and relative to no contact at all. The initial results tend to indicate that the KITE does improve response in the next wave of interviewing. Further analysis is required on the full 12 months of data before any firm conclusions can be inferred.

4.8 The KITE-Experiment

The Wealth and Assets Survey (WAS) Keep In Touch Exercise (KITE) was subject to an experiment over a period of 12 months between November 2010 and October 2011. During this time two different types of KITE were used as treatments on sample members. One was a five minute long Computer Aided Telephone Interview (CATI) (also referred to as Household Assets KITE or HAK) conducted four months prior to the next wave's interview. The aim of this interview is to up-date contact details of original sample members for the sample files. The second treatment was a newly developed and cognitively tested newsletter aiming to up-date responders to previous waves about the use of collected data to date.

Respondents, who would have usually been eligible for HAK according to the developed survey flow, were randomly allocated at address level to one out of four of the following experiment groups:

(1) control group (no treatment);

(2) treatment group: newsletter;

(3) treatment group: HAK interview;

(4) treatment group: HAK interview and newsletter.

In addition to the 12 monthly HAK samples, three monthly HAS samples (November 2011 to January 2012) were included in the experiment. These respondents could only be allocated to experiment groups three and four, since the HAK interview stage had already passed when the experiment started.

The objective for this experiment was to establish the effectiveness and impact of both treatments separately and combined on the response rates of the next wave. The experiment also aimed to identify the right timing for issuing the survey newsletter to respondents. Furthermore, the experiment should provide information on how well the treatments support the tracing process of original sample members, as both treatments allow respondents to inform ONS if their address details change. The results of this experiment will inform the survey management and contribute to decisions regarding the continuation of the KITE currently in place for WAS.

The analysis based on the 12 months sample of this experiment has highlighted a small but statistically significant difference in the response rates of the combined treatment of the newsletter and HAK interview in comparison to the individual treatments and the control group. Focusing on those treatment groups that received a newsletter, the analysis suggests that the length of time between the issue of the newsletter and the mainstage interview has no statistically significant impact on response rates. The response rates vary from month to month and do not show any significant pattern (e.g. declining response rates) and therefore do not allow drawing conclusions about a trend. Finally, the analysis looked into the proportions of non-movers, eligible movers, ineligible movers, and movers where the eligibility status is unknown. The results highlighted that those two treatment groups that included a HAK interview achieved higher proportions of eligible movers compared to the newsletter and the control group. This suggests that HAK has a positive impact on the identification of movers and the tracing process of their new location.

The report (given as annex 2 to this chapter) concludes that this experiment successfully established that some aspects of the treatments show significant impact on response rates and the eligibility status at the mainstage interview. It is therefore recommended to continue HAK interviews four months prior to the mainstage interviews to ensure that as many movers as possible can be identified and traced. Further more, the introduction of periodical newsletters should be considered to maintain respondents' interest in participating in the survey.

Chapter 4 Annex 2: Report on the WAS KITE Experiment

1. Background

WAS is a longitudinal household survey conducted in Great Britain. The survey collects comprehensive data on household and individual assets and liabilities. The first wave started in July 2006 with the fieldwork evenly spread over two years. Waves run sequentially, with no gap between the end of one wave and the start of the next wave. The length of time between contacting sample members at each wave is two years.

WAS, like other longitudinal surveys, experiences attrition, which may occur for inevitable reasons such as death, or for reasons that can be minimised such as failure of tracing, failure of contact, or refusal.[12] Between November 2010 and October 2011 the ONS conducted an experiment on WAS using two Keep In Touch Exercises (KITE). Existing literature suggests that these treatments have the potential to minimise attrition caused by panel fatigue[13] and by the failure to track respondents.

The longitudinal component of WAS requires following Original Sample Members (OSM) over time in order to be able to measure changes of wealth. It is evident that tracing and following sample members becomes difficult when circumstances of sample members, in particular their location, change over time.[14] To minimise attrition caused by the loss of sample members due to the failure of tracking, WAS has a number of measures implemented in the survey design to maximise the likelihood of contact being made with the sample member at the next wave.

Firstly, the WAS questionnaire asks respondents at the interview to confirm their address details as well as further contact details such as phone numbers, email address, and contact details of two nominated persons that are authorised to provide ONS with the respondent's new address in case the respondent has moved and cannot be traced with the collected contact details. Secondly, a few weeks after the interview all respondents receive either a 'Change of Address' card together with the posted incentive (alternatively this will be sent by email), which aims to encourage respondents to inform the ONS in case their circumstances change and they would like to be contacted at a different address. Thirdly, and most relevant for the purpose of this report, a brief telephone interview is conducted as a KITE prior to the next wave's interview. During this interview information about household members as well as their address and contact details are confirmed or up-dated. The KITE telephone interviews (also referred to as HAK) have been conducted since April 2008. During the first year of HAK, the interviews were conducted three months before the next wave's interview. Due to the lack of time between HAK and HAS required for sampling and allocation of

[12] Portanti, M.: "Attrition on Longitudinal Survey – Literature Review", ONS Working Paper, Social Survey Division, November 2009, pg. 2
Plewis, I., 2007. Non-Response in a Birth Cohort Study: The Case of the Millenium Cohort Study. *International Journal of Social Research Methodology*, 10(5), p. 325

13 Panel fatigue is a phenomenon that can be observed on longitudinal surveys. Respondents may 'become bored or uninterested in taking part' in any further waves (see Laurie, H., Smith, R. & Scott, L., 1999. Strategies for Reducing Nonresponse in a Longitudinal Panel Survey. Journal of Official Statistics, 15, p. 270).

[14] Laurie, H., Smith, R. & Scott, L., 1999. Strategies for Reducing Nonresponse in a Longitudinal Panel Survey. Journal of Official Statistics, 15, p. 269

mainstage interview quotas, with the start of August 2009 HAK changed to being conducted from three to four months prior to HAS. This meant that during the period of change, sample members of HAS in November 2009 were not approached prior to the next wave to up-date their contact details. Despite this change the observed response rate (74% cooperating households out of those in scope for November 2009) at mainstage did not differ considerably from the wave two average response rates. The effectiveness of HAK and the case for its continuation was questioned as a result.

Up until the start of the experiment, no survey design features were in place that focused on maintaining the respondent's interest in the survey and their willingness to participate in future waves. With the third wave of WAS starting in July 2010, and the start of the development of wave four, the need for such design features became more apparent. Therefore a newsletter was developed containing information about research results and media coverage of the first wave of WAS. The newsletter was designed with the purpose of informing respondents about how useful and important their participation in this survey has been to policy making, as well explaining that their continuing participation is crucial to the success of the survey.

The remainder of this report gives an overview about the aims and the design of the experiment in general, and the treatments in particular. Furthermore the report provides descriptive data that explain the structure of the underlying data for the analysis, as well as results from testing relevant research hypothesis for this experiment. The report concludes with a summary of results and recommendations for further analysis to be carried out when the complete experimental data is available.

2. Experimental Design

2.1 Aims of the Experiment

The experiment conducted on WAS addressed four main objectives: to measure the impact of the KITE telephone interview (HAK) and the newsletter on response rates at the mainstage; to establish the best timing for issuing survey newsletters to respondents; to measure the effectiveness of identifying eligible and ineligible movers; and to support survey management and stakeholders to make an informed decision about the cost-effectiveness of the assessed treatments.

2.2 Sampling and Allocation

The experiment started in November 2010 and was carried out over a period of 12 months up until and including October 2011. The length of the experiment was defined by the desired experiment sample size of 12,000 individuals that is necessary to attain significant test results from the experiment.

Respondents from the previous two waves who would have usually been sampled and contacted for the KITE interview stage before wave three (W3) were included in the experiment. The eligibility of previous respondents for the next wave is dependent on their consent to be interviewed at the next wave. In addition to consenting respondents from the second wave, respondents from the first wave

where attempted contacts were unsuccessful at wave two (W2), as well as soft and circumstantial refusals were sampled for the KITE interview stage (four months prior to the next wave's interview).

The sample members of the experiment were randomly allocated to either the control group, who did not receive a treatment, or one out of three experiment groups: (1) Newsletter; (2) HAK interview; and (3) Newsletter and HAK interview. It should be noted that the randomisation exercise was not done on an individual level, but on address level. This was done to avoid interference of different treatments for sample members living at the same address. The element of randomisation, however, was vital for the experiment in order to ensure that sample members of similar characteristics have the same probability of being allocated to either one of the four groups, and subsequently for experiment results to be unbiased. Figure 1 and 2 illustrate the allocation of eligible HAK sample members to one of the four groups.

Figure 1: Usual HAK sample allocation

Figure 2: Experiment sample allocation

As an extension to the experiment sample above, a separate much smaller sample of three months worth of respondents was chosen for random allocation to one out of two experiment groups: (1) HAK interview, and (2) newsletter and HAK interview. The difference to the experimental groups above is that the sample members were allocated to the experiment groups after the HAK interviews had been conducted.

Figure 3 illustrates the timing of treatments, highlighting the difference within the two treatment groups that were sent newsletters. The HAK interview was consistently conducted four months prior to the mainstage interview, whereas the newsletters were sent out in November 2010 for the first nine months of the experiment, and in May 2011 for the last six month. This introduced a difference in the length of time between the newsletter posting and the mainstage interview.

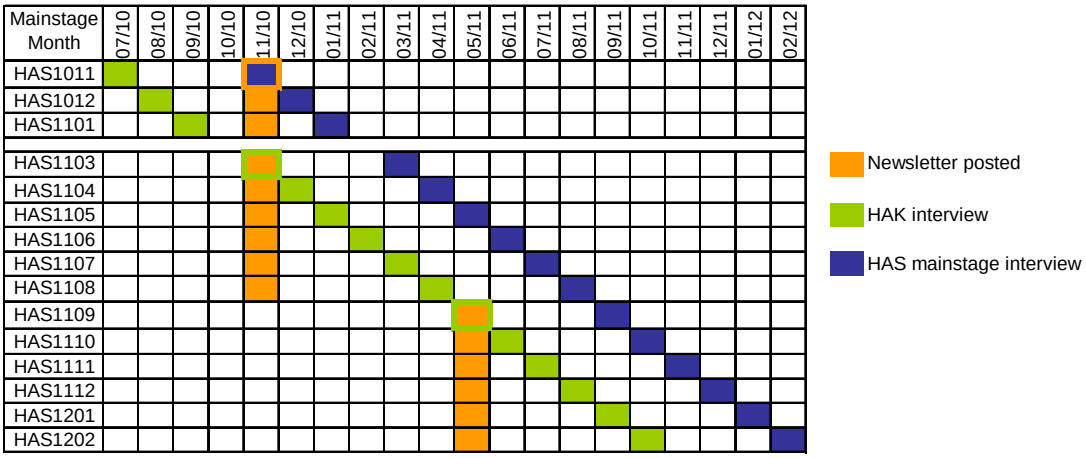


Figure 3: Timing of treatment

2.3 KITE Telephone Interview

The KITE telephone interview (HAK) is a five minute Computer Assisted Telephone Interview (CATI) conducted four months before the interview at the next wave. The telephone interviewer contacts the respondent household on the phone number recorded at the last wave's interview. Ideally the interviewer would like to speak to all eligible adult household members in the household to up-date their details. However, this is not always possible, which is why some information may be collected by proxy.

The telephone interview contains the following elements:

- Household members currently living at the originally sampled address (including new household members)
- Contact details of household members who have moved since the last interview
- Address details of household members who were contacted at the provided phone number
- Consent for follow-up interview for household members who have not previously given consent
- Plans for moving within the next four months and new address details if applicable

All respondents who were randomly allocated to either the control group or the experiment group 'Newsletter' and therefore did not receive a HAK interview were coded out by telephone interviewers with a separate outcome code.

It should be noted that the respondents were allocated to experiment groups with HAK interviews with the intention to interview them. However, response was achieved with approximately 80% of this sample. The experimental design can randomise the allocation of sample members to certain treatments, however it cannot control for the random occurrence of successful and unsuccessful contact.

2.4 KITE Newsletter

The newsletter for this experiment was designed and developed in three stages. In the first stage, information was collected to draft the content and layout. The 'Wealth and Assets Report'[15], which was published in December 2009, media clippings, and feedback from consortium members provided a wealth of information to choose from. The challenge was to present the information in a way that was easy to read and understand by respondents. To ensure this, the drafted newsletter was cognitively tested in the second stage. The newsletter was posted to respondents of the WAS pilot sample that is available for piloting the WAS questionnaire. A week after the newsletter was posted, pilot respondents were contacted by phone to ask for the opportunity to conduct a cognitive interview and to arrange an appropriate date and time. A member of the WAS survey team visited consenting respondents to conduct the interview, for which a cognitive interviewing topic guide was developed. The outcome of the cognitive testing stage was varied. Overall the results indicated that the newsletter had to be further simplified, with fewer statistical or research terms and more relevant to the reader. Stage three saw the newsletter being finalised by incorporating results from the cognitive testing.

Once the newsletter was signed off, it was posted to all those sample members who were randomly allocated to the two experiment groups that include the newsletter as a treatment. For this purpose newsletter address lists had been prepared. In order to assess what the best timing would be for the newsletter to be sent out to respondents, it was decided to issue the newsletter for the first half of the experiment year in November 2010, and for the second half in May 2011. This meant that respondents allocated to the newsletter treatment did not all receive the treatment at exactly the same time before the next interview. This design provides the opportunity to identify whether the length between the posted newsletter and the next interview has an impact on response.

As with the HAK interview, the experimental design can only consider the intention for newsletters to be posted to relevant sample members. However, it cannot account for newsletters being delivered by the Royal Mail to the correct address, or for sample members to open and read the newsletter.

3. Analysis

The results presented in this report are split into two parts. The first part is based on a simple descriptive analysis to explain the structure of the underlying data. The second part contains results from several hypotheses tested to address the objectives of this experiment.

The control group, as well as all three experiment groups have been enumerated as follows and are referred to in all tables by their number:

1 - Control Group
2 - Treatment Group 1: Newsletter
3 - Treatment Group 2: HAK Interview
4 - Treatment Group 3: HAK Interview & Newsletter

[15] http://www.ons.gov.uk/ons/search/index.html?newquery=wealth+in+great+britain

3.1 Descriptive Analysis

Table 1 provides an overview of the sample sizes in each month (referring to the survey field period of the wave three interview) and each experiment group. Experiment group one and two do not apply to the first three months, since all sample members were sampled for HAK interviews. Therefore the groups three and four have a higher total number of sampled cases for the whole 15 month period than the groups one and two. The randomisation element of this experiment aimed to allocate an equal amount of addresses to each experiment group. Table 1 shows results at an individual level. Due to the fact that households are not made up of the same number of eligible household members, it is expected that the proportions of respondents within each experiment group do not exactly equal 25% (or 50% for the first three months).

Table 1: Proportion of Sample Members allocated to Control and Experiment Groups

Experiment Group	Survey Period															Total 12 Months	Total 15 Months
	HAS1011	HAS1012	HAS1101	HAS1103	HAS1104	HAS1105	HAS1106	HAS1107	HAS1108	HAS1109	HAS1110	HAS1111	HAS1112	HAS1201	HAS1202		
1	n/a	n/a	n/a	389	410	384	376	379	412	403	450	392	370	489	491	4945	4945
	n/a	*n/a*	*n/a*	*25.2%*	*25.1%*	*26.0%*	*24.2%*	*26.4%*	*25.5%*	*24.6%*	*27.3%*	*24.2%*	*24.5%*	*33.5%*	*28.3%*	*26.2%*	*21.6%*
2	n/a	n/a	n/a	399	409	361	423	350	411	426	389	413	372	303	366	4622	4622
	n/a	*n/a*	*n/a*	*25.9%*	*25.0%*	*24.4%*	*27.3%*	*24.4%*	*25.5%*	*26.0%*	*23.6%*	*25.5%*	*24.6%*	*20.8%*	*21.1%*	*24.5%*	*20.2%*
3	718	599	710	391	414	355	399	354	406	388	444	396	381	362	511	4801	6828
	50.1%	*50.6%*	*50.6%*	*25.3%*	*25.3%*	*24.0%*	*25.7%*	*24.6%*	*25.2%*	*23.7%*	*26.9%*	*24.5%*	*25.2%*	*24.8%*	*29.5%*	*25.4%*	*29.8%*
4	714	584	693	364	401	378	353	354	384	421	366	416	390	305	367	4499	6490
	49.9%	*49.4%*	*49%*	*23.6%*	*24.5%*	*25.6%*	*22.8%*	*24.6%*	*23.8%*	*25.7%*	*22.2%*	*25.7%*	*25.8%*	*20.9%*	*21.2%*	*23.8%*	*28.4%*
Total	1432	1183	1403	1543	1634	1478	1551	1437	1613	1638	1649	1617	1513	1459	1735	18867	22885
	100.0%	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

The treatments for group two and four include the issuing of newsletters, which were posted in November 2010 and May 2011. Table 2 shows the proportion of sample members receiving their newsletter at a different length of time prior to their mainstage interview within experiment groups two and four (see Table 2).

Table 2: Proportion of Sample Members for NL Experiment Groups

Experiment Group	Number of Months before Mainstage Interview									Total 12 Months	Total 15 Months
	0	1	2	4	5	6	7	8	9		
2	n/a	n/a	n/a	825	798	774	795	653	777	4622	4622
	n/a	*n/a*	*n/a*	*51.3%*	*51.0%*	*49.4%*	*51.7%*	*49.7%*	*50.9%*	*50.7%*	*31.7%*
4	714	584	693	784	767	794	743	660	751	4499	6490
	100.0%	*100.0%*	*100.0%*	*48.7%*	*49.0%*	*50.6%*	*48.3%*	*50.3%*	*49.1%*	*49.3%*	*68.3%*
Total	714	584	693	1609	1565	1568	1538	1313	1528	9121	11112
	100.0%	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

3.2 Hypotheses Testing

This part of the analysis focuses on the main sample (HAS1103 to HAS1202) of the experiment. The first three months (HAS1011 to HAS1101) have been excluded from the inference testing due to the fact that the sample members were exposed to treatments in a different way to the main sample. All cases within these three months underwent a HAK interview. Also, the newsletter was posted either in the same month as the mainstage interview, or very close to the mainstage interview.

The cross-tabulations presented in this report have all been run with the analysis program STATA, which allows to control for the survey design using 'svyset' and subsequently produces results with robust standard errors.

Null Hypothesis 1

One of the questions the experiment aims to answer is whether any of the treatments have an impact on response at the next wave's interview. Table 3 shows a cross-tabulation of the individual interview outcome at mainstage by the experiment group. The individual interview outcome has been split into responding cases, non-contacts and refusal, cases where the interview eligibility was unknown, and ineligible cases. The hypothesis has been tested separately for each treatment in comparison with the control group.

H0 1: The individual's interview outcome at mainstage is independent from the experiment group.

Table 3: W3 Individual Interview Outcome by Experiment Group

Interview Outcome		Experiment Group					
		1	2	1	3	1	4
Response	*N*	3,228	3,027	3,228	3,150	3,228	3,058
	Column %	*65.3*	*65.5*	*65.3*	*65.6*	*65.3*	*68.0*
Non-response (non-contact/ refusal)	*N*	1,162	1,114	1,162	1,127	1,162	1,006
	Column %	*23.5*	*24.1*	*23.5*	*23.5*	*23.5*	*22.4*
Unknown eligibility	*N*	358	317	358	300	358	266
	Column %	*7.2*	*6.9*	*7.2*	*6.3*	*7.2*	*5.9*
Ineligible	*N*	197	164	197	224	197	169
	Column %	*4.0*	*3.6*	*4.0*	*4.7*	*4.0*	*3.8*
Total	*N*	4,945	4,622	4,945	4,801	4,945	4,499
	Column %	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
	Design DF		951		953		954
	Pearson's Chi2		1.963		6.692		10.676
	F-Statistic		0.337		1.190		2.116
	P-value		0.797		0.312		0.097

Table 3 highlights that all treatments show higher proportions of response compared to the response rate of the control group. The Pearson's Chi Square test results highlight that the difference between observed and expected distributions for the cross-tabulation of experiment group one and four are larger compared to the other two cross-tabulations. Treatment group

number four (newsletter and HAK combined) has with a three percent point difference the highest response rate, which is with 90 per cent confidence statistically significant, whereby the difference in response outcomes for the other two treatment groups are not significant. Based on this result the null hypothesis can be rejected.

Null Hypothesis 2

Another question the experiment wanted to address was to establish the right time for posting the newsletter to respondents. As shown in Table 2, only experiment groups two and four received the newsletter treatment. Therefore the overall sample size to assess this question is only half the size as the one including all four groups.

H0 2: The individual's interview outcome is independent from length of time between posting the newsletter to respondents and conducting the mainstage interview.

Table 4: W3 Individual Interview Outcome by Length of Time between Newsletter and W3 Interview

Interview Outcome		No. of months between NL and W3					
		4	**5**	**6**	**7**	**8**	**9**
Response	*N*	1,085	1,028	1,044	1,029	875	1,024
	Column %	*67.4*	*65.7*	*66.6*	*66.9*	*66.6*	*67.0*
Non-response (non-contact/ refusal)	*N*	361	354	341	364	316	384
	Column %	*22.4*	*22.6*	*21.8*	*23.7*	*24.1*	*25.1*
Unknown eligibility	*N*	117	116	123	86	82	59
	Column %	*7.3*	*7.4*	*7.8*	*5.6*	*6.3*	*3.9*
Ineligible	*N*	46	67	60	59	40	61
	Column %	*2.9*	*4.3*	*3.8*	*3.8*	*3.1*	*4.0*
Total	*N*	1,609	1,565	1,568	1,538	1,313	1,528
	Column %	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
	Design DF						936
	Pearson's Chi2						38.418
	F-Statistic						1.278
	P-value						0.209

Table 4 provides and overview of the distribution of the number of months between treatment and next wave's interview cross-tabulated with the individual interview outcome at wave three. Due to the newsletter being posted for the first six months in November 2010 and the second six months in May 2011, the length of time between the newsletter posting and the next interview varies from four to nine months. Based on the proportions of responding individuals, and the Pearson's Chi Square test result (38.418) it can be said that there is a difference of response rates depending on the length of time between newsletter receipt and interview. This result, however, is not statistically significant. The null hypothesis can therefore not be rejected.

Furthermore, it should be noted that the differences in response rates between the different lengths of time are marginal and also do not indicate a clear pattern. The response rate in the months where

the newsletter was posted (HAS1011 and HAS1105) is with 67.4 per cent highest. The results of this particular month need to be interpreted with caution. The newsletter treatment may not necessarily be the cause for the higher response rate, as some respondents might have received the newsletter after the mainstage interview was conducted. The date of when the newsletter was received is an unobserved factor.

Null Hypothesis 3

The third question that the experiment aims to answer is whether any of the treatments have a positive impact on tracing sample members over time and therefore are effective in identifying eligible and ineligible movers. The analysis differentiates between four groups of resident statuses:

(1) Sample members where a contact was made at wave three and it was established at HAK and HAS that they had not moved
→These remain eligible sample members;
(2) Sample members where no contact was made at wave three and no evidence suggested that they had moved
→These remain eligible sample members;
(3) Sample members that reported a move to a new address within the eligible survey sampling area of Great Britain;
→These individuals are categorised as eligible movers;
(4) Previous respondents who died, moved abroad or to a communal establishment, or moved to an unknown address.
→These individuals are categorised as ineligible movers, or movers where the eligibility is unknown.

The assumption for this hypothesis is that all moves and deaths happen at random within the four experiment groups. The analysis focuses on whether the number of identified ineligible individuals and those where the eligibility status is unknown differs between experiment groups, which would indicate that relevant treatments maybe better suited to identify and trace movers. The null hypothesis that needs to be assessed is therefore the following:

H0 3: The resident status at mainstage is independent from the experiment groups.

Table 5: Resident Status by Experiment Group

Type of Mover		Experiment Group					
		1	2	1	3	1	4
Non-mover - contact/ eligible	*N*	4,139	3,928	4,139	3,955	4,139	3,790
	Column %	*83.7*	*85.0*	*83.7*	*82.4*	*83.7*	*84.2*
Non-mover - non-contact/ eligible	*N*	177	130	177	136	177	134
	Column %	*3.6*	*2.8*	*3.6*	*2.8*	*3.6*	*3.0*
Mover - eligible	*N*	74	83	74	186	74	140
	Column %	*1.5*	*1.8*	*1.5*	*3.9*	*1.5*	*3.1*
Mover - ineligible/ unknown	*N*	555	481	555	524	555	435
	Column %	*11.2*	*10.4*	*11.2*	*10.9*	*11.2*	*9.7*
Total	*N*	4,945	4,622	4,945	4,801	4,945	4,499
	Column %	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
	Design DF		951		953		954
	Pearson's Chi2		7.516		56.591		35.722
	F-Statistic		1.430		10.321		6.511
	P-value		0.232		0.000		0.000

Table 5 provides a summary of each treatment group individually compared to the control group cross-tabulated with the resident status at wave 3. The first cross-tabulation, referring to the newsletter treatment in comparison to the control group, shows that the group receiving the newsletter has 1.3 percentage points more eligible non-movers. According to Pearson's Chi Square test result, the difference between observed and expected values is only small and also did not prove to be statistically significant.

The results for the cross-tabulations for the comparison of the HAK treatment and the combined treatment, each compared to the control group, highlight that a considerably higher proportion of eligible movers were identified in both treatment groups; 3.9 per cent for treatment group three and 3.1 per cent for treatment group four. The common feature of both groups is the HAK interview, which tries to identify movers and collects their addresses four months prior to the main interview. The Pearson's Chi Square test results confirm with 56.591 for treatment three and 35.722 for treatment four that there is a considerably large difference between observed and expected cell values, which is in both cases with 99 per cent confidence statistically significant.

4. Conclusion and Recommendations

The analysis for the KITE experiment has indicated that the combination of a newsletter sent to respondents and the HAK interview conducted four months prior to the HAS interview result in a significantly better response rate than the individually applied treatments. Although the response rates at wave three appeared to differ depending on the length of time between the newsletter being issued and the mainstage interview, the results did not prove to be statistically significant and also did not allow a conclusion of a trend due to very small and volatile differences. And finally, the analysis has also indicated that the HAK interview, part of treatment three and four, had a statistically significant and positive impact on the identification of movers and subsequently the tracing of their new location.

4.1 Recommendations for Survey Policy

Firstly, based on these results it is safe to conclude that the experiment was successful in the identification of the effectiveness of the tested treatments. Considering that the newsletter did not have any significant impact on identifying movers/ineligible addresses, but did seem to have an affect on response in combination with HAK interviews, it should be considered whether newsletters should be introduced as a periodical issue to respondents.

However, the results demonstrate that the HAK interviews are an effective way of identifying movers and/or ineligible addresses, which delivers a cost saving to the survey (by not sending interviewers to ineligible addresses). The HAK has also been shown to improve response in the next wave of the survey which will help to maintain the longitudinal panel. Therefore, this report concludes that the HAK should continue as part of the WAS survey processes.

With the introduction of e-vouchers to HAS from wave three there is the opportunity to utilise email addresses as a means of Keeping in Touch in-between waves. It is recommended that those respondents who are not contacted at HAK by telephone (25 per cent of the eligible sample for wave three) are sent an email to confirm that their contact/address details are still the same. Email addresses also provide the opportunity to send a PDF[16] copy of a newsletter, if it were decided that this was appropriate.

4.2 Recommendations for further Analysis

To build on the knowledge gained from this experiment, further analysis should be carried out looking into modelling response versus non-response, as well as eligibility versus ineligibility. The multivariate analysis should be based on household, socio-demographic and interviewer characteristics commonly known in the research field for their effect on interview outcomes. In addition to that, explanatory variables for each of the treatments should be added to the models to establish their contribution towards explaining the interview outcome at the next mainstage.

[16] Portable Document Format

Appendix – Newsletter

Office for National Statistics

Household Assets Survey Newsletter

This newsletter is for all households that take part in the Household Assets Survey (HAS). *Thank you for your help so far and for your continued support.* HAS is the only large-scale official survey that collects information about individual and household wealth and so, when the first results were published in the 'Wealth in Great Britain' report in December 2009, they were eagerly received. There was widespread coverage in the national and regional press, examples include:

First results release

Average Household Wealth (median), by Region, 2006-2008

Average household wealth includes:

- Property;
- Cash, savings and shares;
- Possessions and vehicles,
- Private pensions and debts.

Average household wealth for Great Britain was £204,500, (2006 -2008).

Average household wealth in London was low as there's a higher proportion of:

- Young people and so little wealth is accumulated;
- People who rent their homes, so property wealth is lower,
- People who don't own a vehicle, as they use public transport instead.

5. Data Processing

5.1 Linking longitudinal data: waves 1 and 2

A fundamental requirement of a longitudinal survey is to link data between interview waves; in this instance from the second wave back to the first wave. First, and foremost, this linkage enables the longitudinal analysis that is the primary purpose of the study. In addition, a number of data processing, validation and quality improvement steps are dependent upon the linkage exercise.

(1) Linked responding and non-responding records provided the base for the calculation of the attrition bias that is needed to adjust longitudinal weights accordingly (see further details in weighting below).

(2) Linked responding records provided the base for longitudinal data validation and edit checks.

(3) Linked responding records provided more detailed information for the imputation of item and unit non-response, where a case provided a valid response in only one wave (see further details in Imputation below).

(4) Linked records on individual and household level provide users with the opportunity to analyse the change of individual and household wealth over time.

The linkage exercise was conducted in two stages. Firstly, due to the fact that the survey design specifies that Original Sample Members (OSM) should be followed from wave to wave, all records were linked on individual level. This was done by using a unique person identifier (PID) which remains the same over the survey lifetime for a sample member; even after an individual moves to a new address. In the process of the linkage exercise a number of checks were carried out to verify the accuracy of individual level links:

- Check to verify whether unlinked records in wave two are true entrants to the survey sample. Cases that did not meet the conditions of this check were those where due to technical problems in the field the previous unique identifier was replaced by a new unique identifier which made these individuals appear as new entrants.

- Check to identify duplicates of person level records. Cases that failed this check were for example individuals, who moved to a new address but were non-contacts. In this case, the individuals were sometimes recorded as a non-contact under the old and the new address.

- Check to highlight individuals where the date of birth and gender changed between waves. Although this check highlighted a large number of cases where the change of date of birth and/or gender was caused by a genuine data entry error, it also identified cases that were mis-linked. This was often caused by scenarios where for example an individual had left a

household and the enumeration of remaining household members changed accordingly and records were therefore mis-linked.

Although procedures for linking have been significantly improved for wave three, these linkage checks can involve a lot of manual intervention and therefore take a considerable amount of time to implement.

After the completion of the linkage exercise and relevant corrections on person level, linked records were aggregated to household level to create a linked household level data set. At this point it should be noted that the linked household level data does not contain unique records like the linked person level data. This is due to the fact that individuals, who split from their previous household and were interviewed at their new address together with their new eligible cohabitants, build a new household. This means that a household in the first wave could link to two or more households in the second wave if the household has split. The example below illustrates how the data is structured in these instances:

Wave 1	Wave 2			Linkage status
HH 1	HH 1	HH 2	HH 3	
P 1	P 1			linked in same household
P 2	P 2			linked in same household
P 3		P 3 (now P 1)		linked in new household
P 4	P 4 (now P 3)			linked in same household
P 5			P 5 (now P 1)	linked in new household
n/a		new P 2		new entrant to second household
n/a		new P 3		new entrant to second household
n/a			new P 2	new entrant to third household

ONS acknowledge the importance of ensuring that data users are able to link longitudinal datasets appropriately. Procedures and guidance for linking will be prepared for the revised user guide to accompany the full wave two dataset (available in August 2012).

5.2 Longitudinal Linking: wave 3

Due to the absence of a longitudinal tracking database for WAS, the exercise that aimed to link records between the first and the second wave was resource intense and relatively time consuming.

In order to reduce the administrative effort for linking and validating linked records and to ensure that further survey data processes can be conducted earlier than previously, programs have been put in place for wave three and beyond, that allow the survey team to accumulate information from various sources that help to link and up-date the status of sample members as well as quality assuring the links of all sample members (this includes responding and non-responding sample members).

5.2.1 Data sources

The linkage exercise is carried out on raw SPSS data files, which are a compilation of the number of cases that were contacted for interviews at the most recent mainstage field period. These files include productive as well as unproductive cases.

Prior to the linkage, a number of 'support' files need to be prepared; since the actual data file does not provide all of the sample information (e.g. sample cases history between previous mainstage and latest mainstage field period) that is necessary to verify the linkage status in the next wave.

The following 'support' data is prepared for the linkage exercise:

- Files containing information of follow-up consent from previous wave:
  If a case responded at wave two, household members would have been asked for consent to take part in the next follow-up survey. Therefore, one of the reasons for not sampling for wave three is if consent for to follow-up was not given. In that case the address would be removed from the sample file for the next stage. The consent data has to be extracted from the performance indicator files. These files will help to establish whether the cases agreed or refused to be followed up at the previous wave.

- Sample files for Household Assets Kite (HAK) and Households Assets Survey (HAS):
  Those cases, where consent for the follow-up survey at previous mainstage interview was obtained, are included on the sample file for the keep-in-touch interview (HAK). Where respondents refuse a follow-up interview at this stage, their record would be removed from the HAS sample file. A list of deleted cases has been kept for each month which can be used in the linking process to establish which cases would not be expected on the data file for the most recent mainstage.

- Files from the Sampling Unit (SIU) containing address changes:
  When a whole household or an individual from a previous household moves, a new 'area' and 'address' code is allocated to this case. The address changes files will provide the information of the old and new 'area' and 'address' codes for movers to help verify linked records.

- Non-responders files:
  The linking process between wave one and wave two proved to be more difficult for non-responding cases than for responding cases. This was due to the fact that a large proportion of non-responding cases either had no unique person identifiers (PID) on the data files. This issue has since been addressed in the Blaise Program. However, in the first year of wave three special attention was given to non-responding cases to establish which household members have been coded out as a non-responding case. As a result, a program was written to pre-select non-responding cases from the unedited raw data files and investigate these to establish links to the previous wave. This has improved the efficiency of the linking process.

5.2.2 Linkage Exercise

Step 1:
As a first step of this linkage exercise all relevant data sources are converted into the same format (SPSS) in order to merge them together. Syntax is then run on the file to compute an indicator for the linkage status for each individual case.

Step 2:
The results of step 1 will highlight cases that have not been linked and require further investigation, which is done manually by following the cases history from previous interviews to the most recent contact. Once these cases have been checked, corrections will be run on the data to resolve their linkage status.

Step 3:
To verify the accuracy of linked records, the date of birth and sex collected at the previous and the most recent interview are then compared. Cases with only small discrepancies in the date of birth are accepted as correctly linked cases (the difference of birth dates can in most instances be explained by report errors of the respondents or entry errors by the interviewer). All cases that appear to have large discrepancies of birth dates and/or a change of sex are then investigated manually to check whether this error can be explained by a mis-linkage. Those cases that were linked in error will be corrected accordingly. However, there are also cases, where a change of birth date and sex may still be a correctly linked case. This may be the case for non-responding individuals in a household with an ambiguous name, and/or birth dates being collected by proxies.

Step 4:
Due to the fact that a linkage of person level is only possible if the person level identifier is unique, the last stage looks at identifying and resolving any duplicate person level identifiers.

The process of linking records across waves and verifying their accuracy, is being carried out on quarterly datasets for W3 and beyond, which allows a much quicker turn around of subsequent processes.

5.2.3 Conclusion

The experiences and lessons learnt from the wave one to wave two linking have been taken on board. This has led to further automation of the linkage for wave two to wave three. This has improved the efficiency of the linkage, which will help to ensure the timely and accurate production of linked WAS data in future.

5.3 Data editing and validation

An initial edit of the WAS data is performed by a team of editors based in the Titchfield office. This is a quick sweep of the data before it is delivered to the research team for more detailed validation. This edit ensures that there are no missing values in the dataset and does some preliminary checks on any errors that were flagged up during the interview; where notes have been left by interviewers, the editors may correct the data. The editors also recode responses to 'other' categories; i.e. where an interviewer has recorded a response of 'other' and then specified a value which could have been coded in the existing category frame, these responses are back-coded to what they should have been recorded as.

Before any editing by the research team is performed on WAS data, the routing of the questionnaire output is checked, using a process referred to as 'base checks'. Base checks (on all variables) involve running SPSS programmes to emulate the routing performed in Blaise. This process is used to identify where Blaise has incorrectly routed respondents. This can either be corrected for by recoding data, or, where cases haven't been routed as they should have been; imputation requirements are specified. Where errors in routing are discovered, the Blaise questionnaire is corrected to enhance the quality of future data collection. The sooner base checks are performed; the sooner the Blaise questionnaire can be corrected; thus leading to lower levels of data imputation.

Editing and validation processes for the second wave of WAS were overall similar to those used for wave one. However, due to the longitudinal component of the survey design, part of the achieved sample size in wave two is linkable to wave one data. Therefore it was important to introduce longitudinal edit checks to the existing editing and validation processes.

The edit and validation checks (on all variables) were run in two stages: first cross-sectional checks were carried out on wave two to validate or edit outliers. As opposed to checks for the property and physical wealth data, checks for financial and pension wealth data were exclusively done on individual level because of the way the data had been collected. The investigation of outliers largely focused on the top and bottom ten per cent of the distribution of each wealth component, although for some variables this proportion was reduced if the number of cases highlighted for investigation was particularly high. When outliers were investigated in the pensions or the financial section, various variables within the same wealth component section or even different sections of the questionnaire were included to establish whether particularly large outliers could be explained by the circumstances of respondents. The majority of investigated cases proved to be genuine and only a small number of cases had to be edited, whereby data was only edited if sufficient information was recorded by interviewers to establish the correct response.

The second stage of checks was conducted after the linkage exercise was completed. At this stage the change of wealth components between the two waves was calculated and subsequently outliers of change were highlighted. To investigate these outliers, the circumstances of relevant respondents in both waves had to be considered to decide whether the value in either wave one or wave two was correct. As with the cross-sectional checks only a small number of corrections were made for each wealth component variable where sufficient information was available.

Ideally the cross-sectional and longitudinal outlier cases would be investigated at the same time, in order to ensure that each completed interview was only being accessed once; rather than twice or more. This should streamline the edit process and provide time efficiencies.

5.4 Improvement of base checks and outlier detection

Base checks have been reviewed and for the majority of variables (approx. 75%) there were no errors. Most problematic areas were pensions, current accounts, loans and trusts. The base checks will be streamlined to allow focus on areas of the questionnaire in error, removing checks on stable areas of the questionnaire. This will be tapered in so that wave four begins with full base checks and the general rule will be to remove checks after two quarters of correct data.

Base checks scripts will be re-ordered to reflect sections within the questionnaire.

Base checks will be run on a monthly basis to realise more timely feedback into the questionnaire. Corrections to wave four routing will be made no more than six months following the month of data error.

Cases will now be checked for outliers against the Interquartile Range and lower and upper quartiles.

To reduce repetition in the opening of cases, error reports for outliers will be displayed on a case as opposed to variable basis. When a case is in error, the report will show all errors within that case (split out by errors within pension, property, financial and physical wealth). Cross-sectional and longitudinal edit checks will be flagged at the same time for each case.

In addition to statistical error (outliers), there are checks that have been applied at wave two to validate the credibility of responses. These check responses across and/or within different sections of the dataset and ensure they tie in e.g. Individual outcomes against ages; Household Reference Person (HRP) status against age; expected repayment of credit agreements against date of interview. These have largely been informed by the lessons learned from preparing earlier WAS datasets and are documented to be part of data preparation before sending data to analysts.

Base checks	Outlier identification	Credibility checks
• Review level of error within base checks • Amend timetable and processing plan	• Calculate outlier thresholds for cross-sectional and longitudinal values • Write scripts to report on outliers against the IQR	• Write checks to be run before edit checks • Document checks based on feedback from W2 • Document areas of the dataset that require checking during

5.5 Imputation

5.5.1 General Methodology

In a way similar to all social surveys, data from the Wealth and Assets Survey contained missing values. Referred to as item non-response, missing values occur typically when a respondent does not know or refuses to answer a particular survey question. Item non-response can be problematic in that many standard analytical techniques are not designed to account for missing data. More significantly, missing data can lead to substantial bias and inconsistencies in estimates and publication figures. Imputation is a statistical process that serves to counter these problems by replacing missing values with valid, plausible data. To avoid distorting the data through this process inappropriately the method applied must account for the survey question structure and the distributional properties of the observable data that structure yields. It must also take into account the possibility that unrecorded data is not missing completely at random. It is important to note that as the overarching aim of imputation is to improve the utility of the data, the key analytical aims of the survey should also be factored into the design of the imputation process.

Information about discrete assets or liabilities recorded by the Wealth and Assets Survey was collected through a relatively consistent question structure. Typically, an affirmative response to routing questions designed to determine; *do you have asset/liability x?* was followed by a question to specify the value; *what is the amount/income/expenditure of asset/liability x?* In cases where an exact amount was not known, participants were asked to provide a banded estimate from a range of bound values such as £0 to £100, £101 to £500, and so on.

For imputation, the structure of the survey questions gives rise to several important distributional properties in the data. Data from routing questions are categorical. Data from amount/income/expenditure questions can be highly skewed. Furthermore, distributions are often characterised by discrete steps or clustering. This can emerge through constraints imposed by implicit laws or regulations governing the absolute value of an asset or liability, or through respondents able only to provide a banded estimate. The key analytical aim of the survey was to provide longitudinal estimates of change over time as well as cross-sectional/single year estimates. To meet this aim the imputation must account not only for the distributional properties of the data

associated discretely with each variable, but also the distributional properties of the rate of growth and/or decay over time.

In general, because of the distributional properties of the data elicited by the Wealth and Assets question structure, missing data was best treated using a non-parametric imputation method. To this end, all item non-response was imputed using a Nearest-Neighbour approach (Bankier, Lachance, & Poirier, 1999; Durrent, 2005; Waal, Pannekoek, & Schltus, 2011). In this approach, missing data was replaced with plausible values drawn from other records in the data set referred to as 'donors'. For categorical data and skewed or clustered continuous data, donor-based methods are advantageous in that they use only values actually observed in the data. Significantly, this helps to avoid the distributional assumptions associated with parametric methods such as regression modelling. Importantly, if applied correctly, imputation will estimate the distributional properties of the complete data set accurately (Rubin, 1987; Chen & Shoa, 2000, Durrent, 2005).

The WAS Technical Group is consulted on the imputation methodology to be adopted.

5.5.2 Donor Selection

The key to a successful application of Nearest-Neighbour imputation is the selection of a suitable donor. In general, donors were selected based on information specified by other 'auxiliary' variables in the data. Typically, auxiliary variables are employed to constrain donor selection in two ways. Primarily, they serve to identify donors with similar characteristics as the respondent with missing data. Importantly, the auxiliary variables should be related with the data observed in the variable currently being imputed to help estimate accurately the missing value. Auxiliary variables can also be applied to ensure donor selection is tuned towards the key analytical aims of the survey and planned outputs. For all imputed variables in the Wealth and Assets Survey, appropriate auxiliary variables were identified through traditional regression-based modelling supplemented by guidance from experts familiar, not only with a particular subject domain, but also with the analytical program designed to provide outputs that meet customer needs.

Imputation was implemented in CANCEIS, a Nearest-Neighbour imputation tool designed and developed by Statistics Canada (Cancies, 2009). The CANCEIS platform was configured to select a suitable donor for each record needing treatment in two stages. In the first stage, a pool of potential donors was established through two nested processes. The first process divided all records in the survey into 'imputation classes' based on cross-classification of auxiliary variables chosen for this stage. Potential donors could only be selected from the sub-population of records in the same class as the record currently being imputed. The second process served to refine the potential donor pool by ranking all of the records within the class. Ranking was determined by calculating the 'distance' between the potential donor and the recipient record based on a second set of auxiliary variables referred to as matching variables. Where appropriate, the calculation included differential weighting to account for cases were some auxiliary variables were more important than others. In general, one of two distance functions were used to calculate the distance between the potential

donor and the recipient record, depending on the characteristics of each particular auxiliary variable:-

$x_f =$ the recipient record with *n* auxiliary variables
$x_d =$ the potential donor record with *n* auxiliary variables

$$D_{fd} = \sum_{i=1}^{n} \omega_i D_i$$

$\omega_i =$ the weight for the i^{th} variable

D_i = the individual distance for the i^{th} variable

For categorical data with no ordinal relationship between categories:-

$$(2) \qquad D_i = \begin{cases} 0 \ where \ x_f = x_d \\ 1 \ where \ x_f \neq x_d \end{cases}$$

For categorical or continuous data with an ordinal and/or ratio relationship between categories or values:-

$$(2) \qquad D_i = \begin{cases} 1 & if \quad |x_f - x_d| \geq y \\ 1 - \left(1 - \dfrac{|x_f - x_d|}{y}\right) & otherwise \end{cases}$$

y = desired minimum$(|x_f - x_d|)$ at which point and beyond D_i = 1

A subset of records with the smallest distance values were selected for the final potential donor pool as these were most similar to the record being imputed. For non-categorical data, extreme outliers were excluded from the donor pool to prevent propagation of values likely to have a significant impact on estimates derived from the data. These were identified through expert review and routinely represented values greater than the 95th percentile of the observed data's distribution. Table 1 shows a typical example of an auxiliary variable set. This particular set was used to impute an unknown value for a respondent's private pension. All Wealth and Asset variables were treated in a similar way.

Table 1. Imputation Classes and Matching Variables used for imputing values for Private Pensions[1]

Imputation Class		Matching Variable		
Variable	Classification	Variable	ω	Classification
Banded Estimate	1: Less than £2,500	Annual Gross Salary	0.3	Various amounts
	2: £2,500 > £4,999			
	3: £5,000 > £9,999	Employment Status	0.2	1: Employee
	4: £10,000 > £19,999			2: Self-Employed
	5: £20,000 > £49,999			
	6: £50,000 > £99,999	Age Group	0.1	1: 16-24
	7: £100,000 or more			2: 25-44
				3: 45-59 (Female)
tSample	3 month sampling time frame			45-64 (Male)
				4: 60-74 (Female)
				65-74 (Male)
To impute missing values for private pensions donors were selected from an imputation class derived from the cross-classification of observed Banded Estimates and tSample. The Banded Estimate provided an important constraint on donor selection based on observed data. tSample was also significant as research had indicated that private pensions were particularly sensitive to economic trends over a short time frame.				5: 75+
		Sex	0.1	1: Male
				2: Female
		NS-SEC	0.1	1: Professional
				2: Intermediate
				3: Routine
				4: Never worked
				5: Unclassified
The matching variable set consisted of variables related to the observed data identified through modelling and domain-expert review. Annual Gross Salary and Employment status were given higher weights when calculating the distance between the recipient record and the potential donor as the strength of association was stronger for these variables.		Employment Sector	0.1	1: Private
				2: Public
				3: Other
		Education	0.1	1: Degree level
				2: Other level
				3: Level unknown
				4: No qualifications

1 Applied only to cross-sectional data where the respondent was new to the survey and did not have observed data for other waves

Typically, the final potential donor pool was set to contain between 10 and 20 records. It is important to note that through the first stage of constructing a potential donor pool, the two nested processes used to establish this pool provide an implicit distributional model of the frequency, range, and variance of the set of discrete values observed in the data for records with characteristics similar to the record being imputed. In the last stage of the process the final donor was selected at random. Consequently, the probability of a particular category or value being selected was proportional to the number of times that category or value was observed with respect to the total number of observations. This strategy served to support the aim of ensuring that the imputation did not have an unwarranted impact on the distributional properties of data.

5.5.3 Processing Strategy

The Wealth and Assets Survey data were processed in three Sections: Property & Physical, Pensions, and Financial. For all variables, imputation followed a basic processing strategy. First, missing routing was imputed against an appropriate set of auxiliary variables. Following that, where the routing indicated a missing value for the amount associated with a particular asset/liability, the value was imputed against its own set of auxiliary variables. To meet the key analytical aim of the survey; to provide longitudinal estimates of change over time as well as cross-sectional/single year estimates, the detail of the basic processing strategy varied for cross-sectional data belonging to respondents new to the survey, compared to the longitudinal data belonging to respondents who had been in the survey for both Wave1 and Wave2.

In general, for respondents with cross sectional data only, processing focused on imputing a discrete category or value drawn from the range and distribution of categories/values observed directly in the data of records reaching the final potential donor pool. For these respondents, donors were selected against a set of auxiliary variables in a way similar to those outlined in Table 1. In contrast, for respondents with longitudinal data, the processing strategy was tuned more towards the observable interdependencies and rates of change in the data between Wave1 and Wave2. To this end, when imputing each variable, respondents with longitudinal data were divided into four imputation groups as outlined in Table 2.

Table 2. Wave1 and Wave2 longitudinal Imputation groups

Data Status		
Wave1	Wave2	Imputation Group
Observed	Observed	Potential donor (O:O)
Missing	Missing	Missing both Waves (M:M)
Missing	Observed	Missing Wave1 (M:O)
Observed	Missing	Missing Wave2 (O:M)

For each variable, potential donors were selected only from records with valid observations in both waves (O:O). When imputing values for respondents with data missing in both waves (M:M), discrete values for both waves were drawn from a single donor. This strategy served to preserve any implicit interdependencies between waves for categorical data and any implicit rates of growth and/or decay for data with continuous characteristics.

To maintain the principle of the longitudinal processing strategy when imputing missing data in records where data was observed in one wave but missing in the other (M:O or O:M) categorical data was treated slightly differently than continuous data. For categorical data, a discrete value observed in one wave was employed to serve as a constraint on donor selection in the same way as an imputation class when imputing the missing value in the other wave. For continuous data, an appropriately banded range was used in a similar way. However, instead of taking a discrete value from the donor, the ratio that described the rate of growth or decay in the donor between waves was transferred to the record to be imputed. The ratio was then used in conjunction with the observed value in one wave to calculate missing value in the other. This strategy is typically referred to as ratio-based roll-back (M:O) or roll-forward (O:M) imputation. Table 3 shows a typical example

of a longitudinal auxiliary variable set used to impute a missing value for a respondent's private pension in Wave2 in the presence of observable data in Wave1. Comparing Table 3 and Table 1 will help identify the subtle differences between cross-sectional and longitudinal imputation processing strategies.

Table 3. Imputation Classes and Matching Variables used for the longitudinal imputation of Private Pensions in Wave2 in the presence of observed data in Wave1

Imputation Class		Matching Variable		
Variable	Classification	Variable	ω	Classification
Banded Value observed in Wave1	1: Less than £2,500 2: £2,500 > £4,999 3: £5,000 > £9,999 4: £10,000 > £19,999 5: £20,000 > £49,999 6: £50,000 > £99,999 7: £100,000 or more 8: No Pension in Wave1	Annual Gross Salary Wave1 & Wave2	0.3	Various amounts
		Employment Status Wave1 & Wave2	0.2	1: Employee 2: Self-Employed
		Age Group Wave2	0.1	1: 16-24 2: 25-44 3: 45-59 (Female) 45-64 (Male) 4: 59-74 (Female) 65-74 (Male) 5: 75+
Banded Estimate Wave2	1: Less than £2,500 2: £2,500 > £4,999 3: £5,000 > £9,999 4: £10,000 > £19,999 5: £20,000 > £49,999 6: £50,000 > £99,999 7: £100,000 or more	Sex Wave2	0.1	1: Male 2: Female
tSample Wave1 & Wave2	3 month sampling time frame	NS-SEC Wave2		1: Professional 2: Intermediate 3: Routine 4: Never worked 5: Unclassified
To impute missing data in Wave2 based on rates of growth/decay between Waves, donors were selected with reference points in Wave1 similar to the recipient record based on an imputation class derived from the cross-classification of observed Banded Values in Wave1, observed Banded Estimates in Wave2, and tSample in both Waves. The category 'No Pension in Wave1' helped differentiate between new and established pensions. *Topic expert review also indicated that changes in Gross Salary and Employment Status were likely to contribute to the variance in rates of change between waves. Consequently Wave1 and Wave2 data for these variables were included in the donor selection process.*		Employment Sector Wave2	0.1	1: Private 2: Public 3: Other
		Education Wave2	0.1	1: Degree level 2: Other level 3: Level unknown 4: No qualifications

Other notable variations in the processing strategy applied to the Wealth and Assets data described to this point were associated typically with samples too small to implement imputation classes based on complex multivariate cross-classification. In such cases, variables that would have been included in donor selection as an imputation class were included instead as a matching variable. Accordingly, the weights applied to the matching variables were adjusted to best suit a preferred priority order.

In extreme cases, where for instance, a variable contained less than twenty observations and a small number of missing values, imputation was based on deterministic editing. The range and variance of values imputed this way was guided by a topic expert review and was often based on the mean, median, or mode of the observable data.

5.5.4 Quality Assurance and Evaluation

Without exception, the imputed data for all Wealth and Asset variables was examined and tested before being formally accepted. The overarching aim of each evaluation was to ensure that the distributional properties of the observed data had not been distorted inappropriately by the imputation process. Fundamentally, evaluation was based on comparing the observed data prior to imputation with the fully imputed data. In all cases, any notable departures from the observed data based on statistical measures such as shifts in central tendency or variance and/or the introduction of unexpected changes in the shape of the distribution had to be justified. Justification was based on the identification of sub-populations in the data with proportionally higher non-response rates that would correspond with an appropriate observable change in the properties of the data. This preliminary evaluation was supplemented by a more detailed review of the utility of the data by topic experts familiar, not only with the analytical aims of the survey, but also with expected data trends and characteristics inferred from other reliable external data sources.

5.5.5 Discussion

The Wealth and Assets Survey is an extremely complex study of various types of wealth across GB. Many of the survey variables are dependent or related to significant but extraneous social and economic factors. These factors are subject to change leading necessarily to structural changes in the design of the questionnaire and, as a consequence, the range and distribution of the observed data. Subjectively, the survey attempts to elicit information from respondents on topics that in most circumstances would be considered too sensitive for disclosure. This adds to the complexity of the survey design and the data collection methodology needed to elicit information with an appropriate level of accuracy.

Because of the complex nature of the survey, imputing for item non-response was challenging. While a good understanding of the principles and theory that underpins imputation methodology is paramount, the correct application of this methodology is highly contextual. Consequently, the challenge is extended further as the fundamental aims of the imputation cannot be met easily without a detailed understanding of the structure and design of the questionnaire and data collection methodology, the topic material that a particular set of questions is directed towards, expectations based on inference form other data sources, and not least, the analytical aims of the survey with respect to customer needs.

Despite these challenges, the primary aim of the imputation, to improve the utility of the data, was met successfully. The key to this success was without doubt the ongoing collaboration and

communication that brought together an eclectic set of domain experts at appropriate times throughout the project. Amongst other things, this model served to specify a set of shared and agreed imputation objectives, inform the design of the imputation process including the specification of appropriate imputation classes and matching variables, and identify and resolve unexpected issues arising with the data. Going forward and moving into a new survey cycle, this approach should continue to be fostered and develop further. This will serve to improve both the quality and efficiency of the imputation process. Time saved through improved efficiency will feed naturally into ongoing methodological development. The lessons learnt from wave two imputation should feed into a well developed imputation specification; signed off by methodology, Social Survey Division and HLM analysts.

Conclusion: Continue to use the existing imputation methodology, accompanied by a well developed imputation specification.

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5.6 Weighting

5.6.1 Overview

The weighting strategy embeds two important principles. The first principle is to maintain the link between the initial selection probability and the ongoing loss to follow up (LTFU) adjustments that remain for the evolving respondent subset over time. This is achieved through developing the longitudinal base-weight from the Wave 1 cross-sectional weight. The second principle is that SSMs in the survey receive a temporary share of the base weight appropriate to their status at any given time point. These principles enable the weighting to refer back to the desired populations as closely as is possible with the current design.

5.6.2 Cross-sectional Wave 1 Weight

Survey data are routinely weighted to compensate for the different probabilities of individual households and people included in the analysis data and to help reduce the random variation in survey estimates.

Some of the variation in the inclusion probabilities can be controlled as, for example, WAS has been designed to give those addresses predicted to have higher wealth a higher chance of selection than others. If this were not compensated for in the weighting, estimates of wealth from the collection would be biased upwards. Therefore, the initial step in weighting WAS data was to create a design weight equal to the reciprocal of the address selection probabilities.

For Wave 1, the weights were constructed separately for each quarter. This enabled us to combine the quarterly weights as an average over the quarters for a Year1 or Year 2 annual weight as well as a two year biennial weight. The design weight has the form:

$$w^{d}_{1qk} = w^{d1}_{1qk} w^{d2}_{1qk} \qquad (1)$$

w^{d}_{1qk} is the final Wave 1 design weight in the *qth* quarter for the *kth* respondent and is the product of the initial selection probability for the PSU (w^{d1}_{1qk}) and the selection probability for an address within the PSU (w^{d2}_{1qk}).

$$w^{d1}_{qi} = 1 \Big/ f_{1qi} = \left(n_q N_i \Big/ N \right)^{-1} \qquad (2)$$

Where n_q is the number of selected psus (300 per quarter, 2400 overall), N_i is the number of addresses in the *i*th cluster and *N* is the total number of addresses on the frame.

$$w^{d2}_{qi} = 1 \Big/ f_{2qih} \qquad (3)$$

Where, for a household at an address in the low (h=1) or high (h=2) wealth stratum, in the ith psu is:

$$f_{2qi1} = \begin{cases} \dfrac{26}{M_i^{lo} + M_i^{hi} c_j} & \text{low wealth stratum} \\ \dfrac{26\, c_j}{M_i^{lo} + M_i^{hi} c_j} & \text{high wealth stratum} \end{cases} \qquad (4)$$

Where M_i^{lo} is the number of addresses in the low wealth stratum, in the *k*th psu, M_i^{hi} is the number of addresses in the high wealth stratum for the psu and c_j is an over-sampling constant within year *j*, where *j* = 2.5 in the first year and *j* = 3 in the second year. The sampling rate between high and 'low' wealth stratum addresses was set at 2.5 in Year 1. However, this was increased to 3 for Year 2 as the 2.5 over-sampling rate did not appear to be succeeding in gaining the requisite number of high wealth households.

If it were possible to achieve complete response, the design weight alone would be sufficient to give unbiased estimates from the collected survey data. However, differences in the survey outcomes between sampled households that do or do not respond to the survey would lead to non-response bias. For example, if wealthier households were less likely to take part in the survey, then there is a risk that wealth estimates will be biased downwards.

It was not possible to directly test whether response rates were different for different wealth levels as WAS data were only recorded for the responding households. However, a limited amount of information was available for both the responding and non-responding households. This can be used in sample-based non-response weighting to compensate for non-response bias.

This was done by estimating the response rate for different classes and weighting by the reciprocal of the observed response rate for each class. For a bias reduction on a survey estimate, the following information was required:

- The weighting classes have different response rates
- The survey variable used in the estimate has a different mean in different weighting classes
- The mean of the survey variable was similar for responders and non-responders within each weighting class

The key available information for both responding and non-responding households was the Financial ACORN code. This uses census and survey information to segment the UK population according to financial sophistication into 11 groups and then 49 types. The Financial ACORN code was attached through the postcode of the sampled address.

Using a logistic regression analysis, the Financial ACORN type variable was found to be a significant predictor of household response to WAS. The response rate was calculated and weighted using the design weight for each of the Financial ACORN types. The reciprocal of this response rate was used as a weight factor to compensate for non response to the survey. The original design weight was multiplied by this non-response weight factor to produce an initial weight taking account of both the design and non-response adjustment.

The non-response weight was calculated as

$$w_i^{nr} = \frac{1}{\hat{\phi}_i},\ i \in s^r \qquad (5)$$

Where $\hat{\phi}_i$ is the estimated probability of household *i* responding to the survey, derived from a logistic model .

The initial weight derived above can be used to produce estimated population counts for different groups defined by age, sex and region. ONS publishes regular population projections for different groups based on the census and information about births, deaths and migration. The estimates from WAS using the initial weight will differ from these population projections because of non-response not yet accounted for and because of random variation. The initial weight was adjusted using a process called calibration to produce a final weight that ensures that the survey estimates of the population match the population projections.

As the fieldwork was balanced on a monthly basis it was possible to divide the two-year fieldwork period into smaller time frames to provide estimates for those particular time points. Consequently, the sample was conceived as permitting the following sets of estimates: eight quarterly, two annual and one biennial. This process necessitated the creation of a set of 11 weights. The eight quarterly weights were constructed independently, as described below. The sum of the weights from the first four quarters was then divided by four to get an annual weight for Year one. This averaging process was used again to create a year two weight from quarters five through eight. Finally, the two annual weights were averaged to produce a biennial weight.

Each of the quarterly weights was calibrated to fixed population totals of the number of residents living in private households for age group by sex and for region derived from official mid-year population estimates. The weighting was carried out at the household level so that a single weight was produced at the household level that could be used for both individual-level and household-level analysis.

For a given quarter *q*, the Wave 1 cross-sectional calibration weight was constructed as:

$$^{cal}w_{1qk}^{xs} = w_{1qk}^{g} w_{1qk}^{d} w_{1k}^{nr} \qquad (6)$$

Where w^g is a calibration factor applied to the kth household, w_{qik}^d is the design weight and w_k^{nr} is the non-response weight (with coefficients derived from calculating response probabilities over the combined two year period).

The table shows a summary of the weight distribution at each stage of the weighting process. For ease of presentation, only the biennial weight is shown. At the first stage, the range of design weights is due to the oversampling of the predicted high wealth addresses. The ratio of the 95th percentile to the 5th percentile is 3 to 1. At the second stage, the design weights were multiplied by the non-response weighting factor to produce the initial weight. The ratio of the 95th percentile to the 5th percentile increased a little to 3.3 to 1. The final WAS weight includes the impact of calibration. This tends to increase the range of weights and in particular it can be seen that there

were a few outlying weights to the right of the distribution. The ratio of the 95th percentile to the 5th percentile has increased to 4 to1.

The weights are only part of the impact of outlying values on the variance of the survey estimate. The overall impact can be summarised by the product of the weight and the survey variable contributing to the estimate. If this contribution is considered to be too large, it is possible to reduce the weight to reduce volatility in the estimates while accepting a small bias.

Summary of weight distribution at each stage in the weighting: 2006/08

Great Britain

	Percentile points						
	min	0.01	0.05	0.5	0.95	0.99	max
Design weight	137	146	166	434	520	571	716
Initial weight	237	267	301	802	975	1,105	1444
Final weight	133	239	293	831	1,212	1,432	2245

Source: Office for National Statistics

5.6.3 Wave 2 Weights

The first step in the Wave 2 weighting process was to develop the attrition models for Wave 2. The product of the Wave 1 weight and the attrition weights creates the longitudinal base weight. This base weight is the foundation for the development of both the Wave 2 longitudinal and cross-sectional weights.

There are two separate steps that were used to adjust for attrition:

i. Unknown eligibility[17]
ii. Non-response/non-contact

In both cases logistic regression[18] was used to predict the propensity, first for known eligibility status and second for a response. This gives us an estimated propensity for each case denoted by $\hat{\phi}$. Generically, i.e. ignoring subscripting, this is calculated as:

$$\hat{\phi} = \frac{\exp(\hat{\boldsymbol{\beta}}^T \mathbf{x})}{1 + \exp(\hat{\boldsymbol{\beta}}^T \mathbf{x})} \qquad (1)$$

[17] This often, but not exclusively, occurs when interviewers are unable to trace people who have moved address (either whole households or household splits).
[18] The regression model accounts for the clustered survey design with the nesting of observations (people within households, households within PSUs) using the PSU as the ultimate cluster for the purposes of calculating standard errors of coefficients.

The first model predicted the log-odds of known (to unknown) eligibility using a set of characteristics taken from the Wave 1 survey data and using the Wave 1 weight in the analysis. As both respondents and non-respondents to Wave 2 have data from Wave 1, a rich set of response predictors is available.

The weights were then constructed as follows: where in (2) *e* represents the probability that outcome eligibility at time 2 is known, conditional upon the logit model *s* regressing known/unknown eligibility on various Wave 1 individual and household level characteristics.

$$w_{2k}^{e} = \frac{1}{\hat{\phi}_k^{e}},\ k \in s_2^{e} \qquad (2)$$

s_2^e is the sample of k people enumerated within the households with known eligibility status at Wave 2, where the superscript e refers to the eligible sample, which excludes both cases with unknown eligibility and known ineligibles.

In (3) *r* represents the predicted probability of response from the known outcome eligible sample base again using a logit model with Wave 1 individual and household level characteristics.

$$w_{2k}^{nr} = \frac{1}{\hat{\phi}_k^{r}},\ k \in s_2^{r} \qquad (3)$$

s_2^r is the sample of k individuals within a respondent household at Wave 2.

The longitudinal base weight (w_{2k}^{long}) is product of the Wave 1 weight (w_{1k}^{cal}) and the two loss to follow up (LTFU) adjustment weights for people in a respondent household and is the unknown outcome ineligibility adjusted Wave 1 weight for those classed as known outcome ineligible at Wave 2.

$$w_{2k}^{long} = \begin{cases} w_{1k}^{cal} w_{2k}^{e} w_{2k}^{nr}, & k \in s_2^{r}, \quad \text{longitudinal} \\ w_{1jl}^{cal} w_{2jl}^{e}, & j \in s_2^{ie}, \quad \text{W2 outcome-ineligible} \end{cases} \qquad (4)$$

The base weight is trimmed at the 99th percentile of the unadjusted distribution of the weight and scaled to the Wave 1 population values used in calibration[19].

[19] In fact, this population total is an average of the eight quarters used in the quarterly calibration of the Wave 1 weights.

The longitudinal base weight, as constructed above, would be sufficient for longitudinal analysis. However, a final calibration step was applied to take advantage of the calibration options available using the Wave 1 population data. The two longitudinal sub-samples (eligible non-respondents and ineligible outflows) when pooled are, after adjustment for attrition, representative of the Wave 1 population; so it is possible to calibrate the longitudinal base-weight to the Wave 1 population totals. This procedure should have the advantage of further correcting for any attrition not already accounted for by adjusting to the Wave 1 calibration control groups.

The calibration weights are calculated to sum to a set of known calibration totals t, minimising the distance between the calibrated weight (${}^{cal}w_{2l}^{long}$) and the pre-calibration weight (${}^{pre-cal}w_{2l}^{long}$). If the membership of the calibration groups is represented by a vector of auxiliary values x_l , then the problem can be represented as -

$$g_k = \min\left\langle \sum_l dist({}^{pre-cal}w_{2l}^{long}, {}^{cal}w_{2l}^{long}) \right\rangle \text{ such that } \sum_l x_{2l}\,{}^{cal}w_{2l}^{long} = t \qquad (5)$$

which has a solution in the form of:

$${}^{cal}w_{2l}^{long} = g_l\,{}^{pre-cal}w_{2l}^{long} \qquad (6)$$

The final longitudinal calibration weight is the product of the *g* weight and the initial longitudinal base weight, where the g-weight is defined as the solution to (5). The g-weight helps to rebalance the sample towards the population values of the variables included in the calibration model.

Basic descriptive statistics for the longitudinal calibration and base weights are provided in Table 2, along with their Wave 1 cross-sectional counterpart weight descriptives,[20] for comparison. It is perhaps worth noting the comparatively high coefficient of variation seen at Wave 1, which was largely a result of oversampling wealthy households. Both weights are viable candidates for use with the data but calibration has added some extra variability which reflects some further bias adjustment additional to that undertaken in the attrition modelling.

A preliminary, albeit small scale, comparison was made from estimates using the longitudinal base weight and the final calibration weight on the longitudinal sample.[21] These longitudinal estimates were compared to estimates produced using the Wave 1 weight on the full Wave 1 cross-sectional sample. Both of the longitudinal weights produced estimates that compared well to the original Wave 1 estimates; but, in general, the calibrated weight performed slightly better than the base weight.

[20] The wave 1 weight has been rescaled slightly because further data cleaning after production of the Wave 1 weights resulted in a small number of cases being dropped from the dataset. In order to provide a consistent reference point a scaling factor of 1.002 was used to equilibrate the weights.

[21] Here including longitudinal respondents and population outflow ineligibles.

Table 2: Summary of Descriptive Statistics Comparing the Longitudinal and Wave 1 Cross-sectional Weights

Weight	n	Mean	Standard deviation	Coefficient variation	Minimum	Maximum
Wave 1	71,268	816	284	35	133	2250
Longitudinal base	43,338	1,341	602	45	214	3439
Longitudinal calibration	43,338	1,341	643	48	203	3900

It is apparent that calibration has made some minor adjustments to the weight for both the set of respondents and the set containing the ineligible population outflow. The sum of the respondents has been slightly downwardly adjusted and the weight for group of ineligible people has been correspondingly slightly upwardly adjusted (Table 3). For both groups, calibration has increased the range of the distribution. This suggests that calibration has adjusted for non-response differentials not otherwise adjusted for in the previous LTFU modelling adjustments.

Table 3: Summary of Descriptive Statistics Comparing Respondent and Outflow Sub-samples of the Longitudinal Weights

Group	n	Sum	Mean	Standard deviation	Coefficient variation	Minimum	Maximum
Respondent	41,331						
Base weight		56,048,842	1356	604	45	214	3439
Calibrated weight		56,028,929	1356	646	48	203	3900
Ineligible	2,007						
Base weight		2,086,996	1040	455	44	229	3439
Calibrated weight		2,106,909	1050	494	47	218	3900

Note: respondent here refers to all longitudinal OSM people enumerated in a respondent household whether eligible for an interview or not.

The cross-sectional weight was constructed using information from the following groups of people:

- Longitudinal OSMs - using the longitudinal base weight.
- SSMs – based on a weight share derived from the longitudinal base weight.
- Wave 2 entrant OSMs - based on their original design weight.

The aim was to create a single weight to cover both households and individuals. In order to achieve this aim an 'integrative calibration' (Lemaître & Dufour, 1987) approach was used simultaneously to create both household and person level Wave 2 (pseudo) cross-sectional weights. This results in all people in the household having the same weight, which is also the household weight. The construction was based on counting the numbers of all Wave 2 enumerated cases (i.e. those people eligible and ineligible for an interview) to calibrate to the population totals. The population totals were based on interpolations of ONS' mid-year estimates taken from the midpoint of the Wave 2 fieldwork period.

The first challenge for the Wave 2 pseudo cross-sectional weight was to assign a weight to people entering the sample as SSMs. It is common to use a weight share method to approximate these probabilities (e.g. Huang 1984, Ernst 1989, Kalton & Brick 1995), rather than attempting to work out selection probabilities directly. A standard approach is to assign weight shares based on Wave 1 household members to people in target Wave 2 households. A variety of weight share algorithms exist (see e.g. Rendtel & Harms 2009).

The WAS weight share was constructed following Kalton & Brick (1995), where the weight at time t_T for household w_i can be defined as the product of the initial weight and a constant:

$$w_i = \sum_j \sum_k \alpha_{ijk} w'_{ijk} \qquad (7)$$

The *i*th household weight w_i at time t_T is the initial weight[22] w'_{ijk} summed over the *k* individuals in households *j* at time 1 contributing to membership of household *i* at time t_T. The constant (α) is defined in terms of the number of people in household *i* at time t_T who were in household (*j*) in the population at time t_1. As long as the sum of alpha within households equals unity, estimation will be unbiased (Kalton & Brick 1995).

$$\alpha_{ijk} = \begin{cases} 1/N_h & \text{if individual } k \text{ lives in household } i \\ 0 & \text{otherwise} \end{cases} \qquad (8)$$

[22] This may be the Horvitz Thompson estimator or an adjustment of this, e.g. for non-response and/or through calibration. For WAS it is the longitudinal base weight.

Finally, the weight w_i is assigned to all *k* household members of household *i*.

Ideally, in this scheme a population entrant at Wave 2 is assigned a zero contribution to α and a zero initial weight (w'_{ijk}). However, a sample entrant who was in the population at wave 1 but only in the sample at wave 2 contributes to α but has a zero initial weight. Consequently, sample entrants in the population do not increase the sum of the weights; whereas population entrants do increase the sum of the population weights.

This is the fair share method of Huang (1984) and also the weight share method of Ernst (1989). Lavallée (1995, 2007) also shows how this approach is a special case of his generalised weight share method. An alternative method, known as multiplicity, or equal household share, is possible but can be difficult to implement in practice because it requires knowing whether or not two (or more) sample entrants to a household *i* from the t_1 population came from the same household or not.

A key challenge for the weight share method is being able to distinguish between those SSMs who are new population entrants and those who were originally in the population but not originally in the sample. Unfortunately it is not possible to make this distinction with WAS data and consequently, excepting births, we treated all SSM entrants as if they were in the population at the time the sample was drawn. Births to OSM mothers were allocated their mother's weight.

Different surveys use different approaches to weight sharing. For WAS, weights were summed over and shared across all people in the household at times t and t+1. This is not universal practice. Some surveys restrict the sharing to adults or use other criteria, see Schonlau & Kroh (2010), who detail the methods used by key international longitudinal surveys. As WAS is concerned with enabling estimation for all population members and weighting is based on calibrated population totals, it seemed desirable and appropriate to ensure sharing was across all cases enumerated within households.

The weight share allows the longitudinal OSM and SSM sample members to be treated together as a single sample but the construction of the cross sectional weight requires an amalgamation with the group of entrant OSMs whose first interview was in Wave 2.

$$ {}^{pre-cal}w_{2i}^{xs} = \begin{Bmatrix} (1-\theta)\sum_j \sum_k \alpha_{ijk} w_{2ijk}^{long} & \text{longitudinal} \\ \theta \sum_i w_{1i}^{d} w_{1i}^{nr} & \text{entrant} \end{Bmatrix} \qquad (9) $$

For the longitudinal sample, the pre-calibration Wave 2 cross-sectional weight is constructed through bringing forward the longitudinal weight for OSMs and sharing out between OSMs and SSMs in the wave two household. The entrant sample members have their design weight constructed as the inverse of the product of the selection probability and the non-response

adjustment. This produces a household level weight which is constant for each individual in the household.

The final stage is to calibrate the cross-sectional weight to population totals at time t_T, using integrative calibration. Descriptive statistics of the resulting weight are given in Table 4. It is apparent that the bias adjustment is leading to a substantial increase in the coefficient of variation which will decrease the precision of estimates.

Table 4: Summary of Descriptive Statistics of the Wave 2 Cross-sectional Weight

Weight	n	Sum	Mean	Standard deviation	Coefficient variation	Minimum	Maximum
Wave 2	46,347	59,191,698	1277	731	57	106	3700

Conclusion: Continue with the existing weighting methodology.

Chapter 5 Annex 1: Base Checks and Outlier Detection

1. Introduction

The Wealth and Assets Survey (WAS) dataset is particularly large and subject to extensive checking to ensure variables are populated as they should be according to routing within the Blaise CAPI instrument (base checks). Due to the complex nature of the survey routing, issues have existed since wave one (W1) that are still being discovered within these checks. Counter to this, there are areas of the questionnaire which never produce errors in base checks. In assessing the volume of error found in base checks it is possible to determine whether there is scope to focus checks on the problematic areas.

This review also aims to improve the current editing process, reviewing the selection criteria applied to pulling out cases from the dataset. This may or may not alter the number of cases that are actually listed for investigation.

Finally, the experience of handling data at earlier waves has shown that data responses across different areas of the questionnaire may not be credible. Checks have been conducted to validate the relational responses through the questionnaire so it is important that these are documented to allow researchers within the WAS team to anticipate any potential problematic data.

2. Base checks

2.1 Background

In W1 the population of the WAS dataset was checked by comparing frequencies for variables with that of a derived variable based on the routing to said variable, created in SPSS. If a case did not have data in the variable but was expected to according to the derived variable, these were checked and imputed. If there was data in the variable but it should not have according to the derived variable, it was removed.

This process remained largely the same at wave two (W2), with the inclusion of some automation whereby the cases in error were output into Excel spreadsheets by SPSS. Base checks continued in the same manner at wave three, amending SPSS scripts to reflect changes in the questionnaire content.

Automating the process at W2 did help move the process along but even at wave three there still remained a great deal of checking to be done. In wave three year one (W3Y1), there are 729 person level checks across 18 scripts and 97 household checks across two scripts.

2.2 Review

Using the W3Y1 spreadsheets, figures were collated on:

1. The total number of checks
2. The total number of checks that produced cases in error
3. The total number of checks that had zero valid cases

Table 2.2a Person bases

Syntax	Total no. of checks	No. of variables with errors	No. of variables with no valid cases
1	34	6	0
2	59	8	0
3	26	6	0
4	16	3	0
5	16	3	0
6	33	17	0
6a	30	4	2
7	25	1	1
8	38	7	4
8a	36	9	1
9	12	8	0
10	75	16	1
11	151	45	4
12	25	0	0
13	56	10	4
14	63	23	5
15	26	1	0
16	8	2	0
Total	**729**	**169**	**22**

Table 2.2b Household bases

Syntax	Total no. of checks	No. of variables with errors	No. of variables with no valid cases
1	62	16	1
2	35	6	5
Total	**97**	**22**	**6**

As highlighted by the tables above, the vast majority of base checks do not produce any errors. 169 of the person bases and 22 of the household bases output cases to investigate by the WAS research team. A further 22 variables at person level and 6 at household level had no valid cases.

The questionnaire has been subject to some corrections and changes since the beginning of wave three. Some errors may no longer exist within the questionnaire as corrections have been made

within the wave. In these instances, the number of errors would be expected to decrease as time progresses.

In terms of fixing questionnaire problems found during base checks, assuming the timetable would not face any delays, wave four errors would be corrected as per the table below. This table shows that there are up to eight months of data collected (July-February) that could contain errors between finding the error in January 2013, and implementing the fix in March 2013.

Table 2.2c Wave four base check timetable

Wave four, year 1	IM to deliver datasets to SSD[23]	Base checks completed	Questionnaire amended	Implement fixes within (months)[24]
July	Thu/01/11/2012	31/01/2013	March 2013	8
August	Fri/23/11/2012			
September	Thu/20/12/2012			
October	Fri/18/01/2013	30/04/2013	June 2013	8
November	Tue/05/02/2013			
December	Fri/08/03/2013			
January	Mon/08/04/2013	31/07/2013	Sep 2013	8
February	Mon/06/05/2013			
March	Thu/06/06/2013			
April	Mon/08/07/2013	31/10/2013	Dec 2013	8
May	Tue/06/08/2013			
June	Thu/05/09/2013			

2.3 Proposal

A longstanding problem for the survey is the lag between finding errors in base checks and taking action to correct issues within the Blaise programme. During the data collection period for wave three, problems were still being reported with routing found from looking at wave one data. All routing errors identified to date have led to corrections ahead of wave four. Further corrections may be required and a timely mechanism for implementing these is being established through this review. The most significant improvement is to the timeliness of feedback from wave four – within the wave as opposed to post data collection.

[23] Taken from Data Collection timetable, sign-off
[24] Between month of data and questionnaire amended

An alternative to running base checks on a quarterly basis as was planned for wave four would be to run the checks on a monthly basis, allowing fixes to be implemented up to three months earlier. Overall completion for fixing all W4 year one problems is only one month earlier than quarterly processing (November 2013 compared to December 2013). However, by picking up errors earlier – on a month by month basis – around an extra three months of data can be collected correctly through taking action earlier.

Table 2.3a – Wave four proposed base check timetable

Wave four, year 1	IM to deliver datasets to SSD	Complete run of base checks[25]	Questionnaire amended	Implement fixes within (months)
July	Mon/29/10/2012	Mon/26/11/2012	Jan 2013	6
August	Thu/29/11/2012	Thu/27/12/2012	Feb 2013	6
September	Thu/27/12/2012	Thu/24/01/2013	Feb/March 2013	5
October	Mon/28/01/2013	Mon/25/02/2013	March/April 2013	5
November	Thu/28/02/2013	Thu/28/03/2013	April 2013	5
December	Fri/29/03/2013	Fri/26/04/2013	May 2013	5
January	Wed/01/05/2013	Wed/29/05/2013	June 2013	5
February	Wed/29/05/2013	Wed/26/06/2013	July 2013	5
March	Thu/27/06/2013	Thu/25/07/2013	Aug 2013	5
April	Mon/29/07/2013	Mon/26/08/2013	Sep 2013	5
May	Thu/29/08/2013	Thu/26/09/2013	Oct 2013	5
June	Thu/26/09/2013	Thu/24/10/2013	Nov 2013	5

If scripts are to be run on a monthly as opposed to quarterly basis, some additional resource may be required. To offset this it is proposed to remove from the base checks any scripts that have not produced any cases in error across two successive quarters. If the survey were to reduce the time spent running checks on areas of the questionnaire that are stable and known to be correct, more time can be spent focusing on those areas which are in error. When the source of the problem is found, this can promptly be fed back to colleagues responsible for the questionnaire programming.

The move to a slimmed down base check process should be tapered in from the start of wave four. Wave four will start with all variables being checked but following two quarters of data being shown as correct for a variable, the decision could be made whether to remove the variable from the

[25] Assuming a 28 day turn around, based on the Wave 3 & 4 processing plan which allows one month for a quarter of data. Errors can be reported as scripts are run so there it will not be necessary to wait for the base checks to be completed before passing feedback to questionnaire programmers

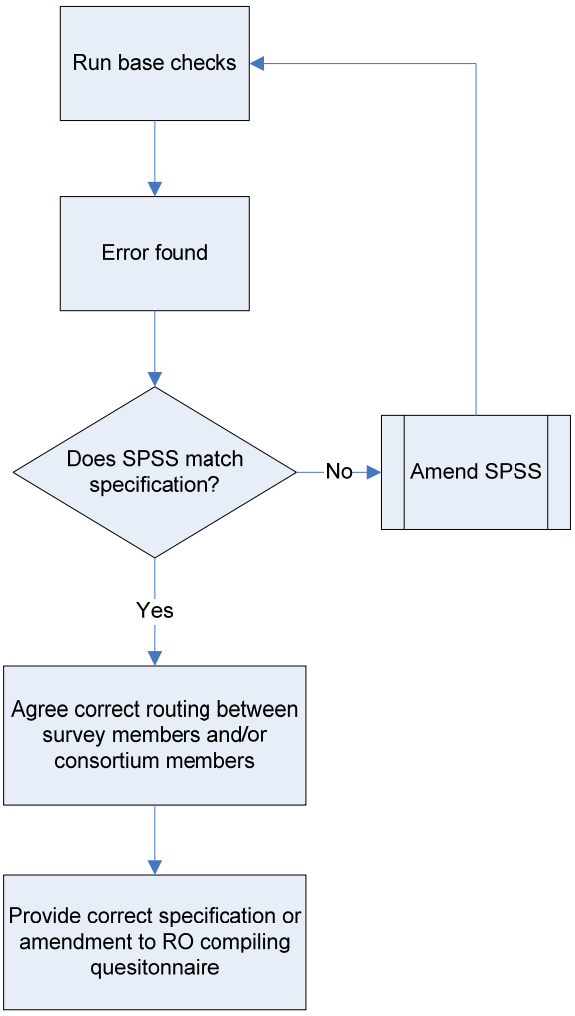
scripts. This could be done by blanking out the code in the syntax so that it can be reintroduced at any time.

Not running a check will save some time in producing outputs. Around 75 percent of variables are correct. Within six months it may be possible to only be checking around 25 percent of variables within the WAS dataset.

When into wave four, the checks to remain could be kept according to these criteria:

1. Cases have been output in error;
2. No valid cases have been produced;
3. A change has been made in the routing to a variable.

In terms of reacting to errors, the process steps should be followed as:



3. Outliers

3.1 Background

Wave one data checking relied on the knowledge of analysts and researchers to check any data that appeared not to be correct. This was a subjective process which was not automated.

Lessons learned from W1 helped inform some of the edits at W2 in terms of the values checked. Analysts from outside of ONSSS would also provide details of checks they thought should be applied to data such as proportional changes or arbitrary limits.

Whilst the checks done at W1 and W2 highlighted some cases in error, the method for selecting outliers was not consistent across variables.

3.2 Review

Variables that require most focus are those that feed into derived variables for total wealth. The current state of play is that variables are checked according to the below criteria[26]:

Non-wealth checks

- Relationships coded as brothers/sisters instead of son/daughter
- Individual outcome code checked against age

Financial wealth checks

- Savings and investments held in a child's name and >50,000.
- Shared and individual current accounts in credit if >=50,000
- Shared and individual current accounts overdrawn if >=15,000
- Shared savings account if >=300,000
- Individual savings accounts if >=350,000
- Total ISA accounts if >=200,000
- Informal loans and savings if >=50,000
- Bonds if >=350,000
- Trusts if >=400,000
- Employee shares if >=500,000
- UK shares if >=550,000
- Oversee shares if >=300,000
- National saving products if >=200,000
- UK government bonds and gilts >=150,000
- Oversee government bonds and gilts >=150,000
- Endowment policies if >=350,000

[26] Taken from "Business Case for Change of Editing Process"

- Single premium policies or investment bonds if >=400,000
- Friendly Society saving plans if >=50,000
- Insurance policy if >=400,000
- Other financial assets if >=500,000
- Balance carried over on first credit card >=15,000 and further cards >=10,000
- Outstanding balance if >=10,000
- Outstanding balance on store cards >=5000 each
- MO catalogue instalments if >=200 each
- Hire purchase instalments if <10 or >=450 each
- Loan instalments if =0 or >=1000
- Outstanding balance on student loans if >=25,000
- Missed or overdue loan payments if >20,000
- Missed or overdue bill payments if >10,000
- Outstanding balance on loans if >15,000
- 'Other' frequency for loan, mail order, and hire purchase instalments
- Collectables if <50 or >200,000

Physical wealth checks

- Comparison of collectables value with house value
- Vehicles if <50 or >60,000
- Number plates if <50 or >20,000
- Other vehicles if <50 or >100,000

Property wealth checks

- Mortgage value is greater than house value
- Percentage difference between mortgage and house value is >20
- Mortgage value >= 500,000 or =0
- House value <=50,000 or >=2,000,000 or =999999.7

Pension wealth variables have no record of the checking as this was ad-hoc with no scripts used. Analysts in Pension Analysis Unit (PAU) picked out cases where derived variables were either double or half the value in the previous wave.

3.3 Proposal

The proposal for changing the way cases are edited by research staff in Newport has two components.

3.3.1 Selection of cases

One method available to select outliers would be picking out those that are greater than three standard deviations above or below the mean. This method is used to check variables on the Family Resources Survey. However, wealth data is not normally distributed and has a large skew so this method may not be appropriate.

a) Change in DV component variable
Instead, outliers will be highlighted in relation to the Interquartile Range (IQR) and upper and lower quartiles (Q1, Q3). This will be applied to all variables that are imputed as elements of derived variables.
The value of the component change across waves is an outlier in relation to the IQR for the change of the dataset. Cases are selected:

   i. IF (W3 value-W2 value)>(Q3 + 3IQR)
   ii. IF (W3 value-W2 value)<(Q1 - 3IQR)

b) DV component variable within W3
The value of the component is an outlier in relation to the IQR for the dataset within the wave. Cases are selected:
   i. IF (W3 value)>(Q3 + 3IQR)
   ii. IF (W3 value) <(Q1 - 3IQR)

c) W2 Rules
A number of rules applied for wave two have been included for to the wave three checks. These will be given a cross-sectional or longitudinal flag as appropriate

Variable	Rule	Flag
HValue	<50000	Cross-sectional
MVal	=0	Cross-sectional
GColl	<50	Cross-sectional
VEstV	<50	Cross-sectional
VRemV	<50	Cross-sectional
VPerV	<50	Cross-sectional
VOVal	<10	Cross-sectional
CACTV	+100%	Longitudinal
CASvV	+300%	Longitudinal

The WAS dataset includes many instances of data being collected in more than one iteration (Credit cards, Loans, Mortgages). The issue here is that iteration '1' may not be the same account as iteration '1' in both waves so a comparison of the two is difficult to make. As it is not practical to compare individual iterations, sums of data will be used instead.

So that more cases can be checked, where a banded response value is given, the mid-point of that band will be used as a substitute for the missing value of the actual value. Consideration was given to whether or not outliers should be based on point values only, or calculated the quartiles and IQR after including mid-points of banded values. Feedback from colleagues in PAU suggests that banded values tend to be given by respondents who have low wealth. Not including the mid-points may mean that the cut-off for selecting the large outliers may be too high. Therefore, cut-offs will be calculated after substituting a missing response with the mid-point of the banded response.

3.3.2 Highlighting cases

In previous waves, cases were selected on a variable basis – if the case was in error for a variable it was selected, the questionnaire object was opened in casebook and investigated. This is a time-consuming process and may mean some cases are opened more than once if they are in error for multiple variables.

It is proposed that cases are highlighted as in error and split out into sections of the questionnaire. Errors will be output on a case basis with a flag for each variable in error within a section. There will be four workbooks produced according to the four wealth types: Pension; Property; Physical; Financial. Each workbook will have a 'front page' which contains the list of cases in error and the

flags for each variable in error. The data for all cases will then appear on subsequent worksheets throughout the workbook, split by variable for reference.

The flags for errors would be:

1. Cross-sectional
2. Longitudinal
3. Cross-sectional & Longitudinal

4. Credibility checks

4.1 Background

In addition to cases being in error because their values are outliers (high/low), some data may be in error because it is not credible in relation to other responses within the dataset. Some examples of this may be gross pay being lower than net pay; non-mortgage debt with a final payment date reported as 100 years into the future; individual outcomes that do not apply to the age of the respondent. Areas of the questionnaire should be checked prior to the sign-off of datasets following base checks but before edit checks are run.

These checks and rules will not have scripts written for them as part of this review. The reason for this being threefold:

i. Scripts already exist for many checks and have been used at W2;
ii. Some flexibility is given to amend or adjust checks as data is being processed;
iii. An element of writing syntax from start to finish can help maintain the current SPSS skill set and ability within the WAS team as well as offer opportunities to develop new staff members as they join the survey.[27]

Researchers should judge when these should be run and an appropriate way of including them in the wider editing process.

[27] When attending a Quality Workshop, colleagues in Health Analysis explained that they do not automate all checks for this reason

6. Analysis and dissemination

6.1 Analysis

6.1.1 Publications to date

To date, the following publications have been released by ONS:

1) December 2009: Wealth in Great Britain: Main Results from the Wealth and Assets Survey 2006/08
2) December 2011: Wealth in Great Britain: Main Results from the Wealth and Assets Survey 2008/10 (Physical and property wealth)

The remaining cross-sectional results from wave two covering financial and pensions wealth, as well as total wealth, are due for publication in July 2012; along side some initial 'correlates of change' results drawing upon the first longitudinal analysis using WAS data.

ONS had intended to publish a wave two interim report updating the 'Wealth in Great Britain' report published December 2009, taking on board the year one results from Wave two. This was in reaction to recommendations made by the National Statistics accreditation panel[28] for more timely data and general demand to have data indicating the impact of the recession on household wealth.

In January 2011, following some concerns regarding the quality of the year one data available, ONS decided to withdraw the publication, and to focus resources on the production of the main wave two report.

The work carried out with regard to the interim report was invaluable as it enabled systems to be tested; quality assurance processes reviewed; and, gave us an insight of what might be expected from the full wave two data.

6.1.2 Publication Strategy

Publication strategies, covering planned analysis and report content have been proposed by ONS for approval by the WAS consortium, via the Technical and Steering Groups. The publication strategy covers the scope of the report; the proposed approach to analysis; and, the report outline.

6.1.3 Standard errors

The calculation of standard errors (SEs) is an important quality dimension of any report containing survey based statistical point estimates. Ideally, SEs should be produced routinely but this is not always practicable for complex surveys. There are complexities arising both from the design side and the type of estimator which need to be accounted for and it is typically not straightforward routinely to produce SEs directly through most of the widely available statistical packages. The aim of the project will be to produce standard errors to coincide with the publication of Wave 3 and

[28] http://www.statisticsauthority.gov.uk/assessment/assessment/assessment-reports/assessment-report-17---wealth-in-great-britain.pdf

differences between Waves 2 and 3, along with documented guidance for users to produce their own SEs.

Standard errors are required for three different types of point estimator for WAS results:

- Totals
- Ratios (including means and proportions)
- Medians (and other percentile values)

The SE calculations are relatively straightforward when done for estimates of totals and ratios but require special procedures for medians (and other percentile values). WAS uses all three of these point estimates frequently throughout its reports, so it is important we have in place procedures to routinely produce the relevant SEs.

6.1.3.1 Complexities in the Calculation of Standard Errors

Further complications arise in the production of SEs in that both the weights and the survey design contribute to the size of the SE. Ideally, the calculation should account for the following:

- The incorporation of the variance of the weights to the variance of the SE
- The sample design (clustering and stratification)
- The effect of calibration

In addition, the calculation of the SE of the net change in an output between waves is complicated by the fact that the measures are correlated over time. This correlation is generally positive (e.g. wealthy people at time *t* are also likely to be wealthy at time *t+r*) and is subtracted from the sum of the variances at the two time points. It is possible to ignore the correlation but this will result in a loss of precision for the estimator and is not an efficient use of the design.

Many of the major statistics packages (e.g. SAS, SPSS, STATA) provide statistical procedures that will routinely account for the survey design and the variability in the weights when estimating totals and ratios. However, accounting for the effect of calibration requires that the user undertakes some preliminary work prior to running the standard routines available with the package. In many cases, it is likely to be acceptable to skip the impact of calibration because ignoring the calibration used to produce the weights usually results in a slightly larger SE than when calibration is accurately accounted for. In other words, ignoring the effect of calibration produces a conservative estimate of the SE.

Calculating the SE of a difference estimate between two waves (net change) for a total, or ratio, requires estimating the covariance of the estimates over time as well as a variance for each time point. This is possible to do using major statistical packages (for totals and ratios) but requires the data to be set-up appropriately and some degree of user intervention.

Calculating SEs for percentile values (e.g. medians) is a far more complex procedure and is seldom produced routinely by statistical packages. There are, however, a number of possibilities that can be explored, including established methods such as the Woodruff method for producing confidence

intervals. We will investigate some of the available methods and produce estimates and recommendations.

6.1.3.2 Resolution

Solutions to the challenges of calculating of SEs can be grouped broadly under two headings: (i) analytic and (ii) replication approaches. In this project we will focus on analytic solutions, though, time and resource permitting, we will seek to explore replication approaches in the future.

6.1.4 UK Statistics Authority

In 2009 the UK Statistics Authority conducted an independent review WAS' compliance with the Code of Practice for Official Statistics. This review considered all aspects of the survey across the statistical value chain. WAS successfully achieved National Statistics accreditation in November 2009.

6.2 Dissemination

6.2.1 Data release mechanisms

6.2.1.1 Statistical Disclosure Control

ONS Methodology has a branch dedicated to assessing the disclosure risk of data – both microdata and aggregated tables. WAS microdata has been assessed for disclosure; the results of which has been used to inform the specification of the special license dataset. Whilst the special license dataset contains a lot of detail, there are some variables that are not included in the release to protect respondent's identity. For example, there are no geographical identifiers below Local Authority and some variables have collapsed categories, e.g. sexual identity.

The role of statistical disclosure control is also useful for handling ad-hoc requests for variables to be added to datasets. For example, in 2010 there was a request for Output Area Classifications (OAC) to be added to the WAS special license dataset; however, this was deemed to be too disclosure when provided in conjunction with local authority, as these geographies can overlap, thus allowing very low level geographical differencing to occur.

6.2.1.2 Microdata Release Panel

The ONS' Microdata Release Panel (MRP) effectively has an audit role in the release of WAS data. Every single release of WAS data, whether to the consortium or to an approved researcher via the UK Data Archive, will have been recorded and authorised by the MRP. The MRP record all releases of microdata from ONS and occasionally conduct reviews and audits of data releases to ensure that appropriate protocols have been followed in the release of microdata.

6.2.1.3 Data Access Agreements

Data Access Agreements (DAAs) provide a record of the terms and conditions of the release and receipt of data from ONS. It records the purpose of the access; the person responsible for the release/receipt; those who will access the data once released; the term of the access and other conditions in relation to keeping the data secure. A DAA is held between ONS and each government department in receipt of WAS data. DAAs are updated to reflect the release of new datasets, and must be updated when staff changes within departments means that different people need to access, or assume responsibility for the data.

Annex 1 to this chapter looks at the ways in which improvements to this system have been implemented.

6.2.2 UK Data Archive

WAS data is deposited in the UK Data Archive at the University of Essex. To date, data for the first 2 waves of WAS has been deposited.

6.2.2.1 End User Licence Dataset

Up until early 2013, special license datasets only have been used. This allowed ONS to deposit very rich datasets with a lot of potential for analysis. Although the data contains no personal details, the data is still very rich in detail. This means that ONS is reliant on the license granted to approved researchers to prevent disclosure. The license carries statutory backing in the UK to prosecute anyone who accesses the data and subsequently discloses a respondent's identity. The special license has the benefit that there is a facility to perform very detailed analysis; however it does not come without drawbacks. Firstly, all requests for access have to be approved by ONS – this places an administrative burden on both researchers and ONS. Secondly, because UK legislation does not extend beyond the UK, special license datasets can only be accessed from within the UK. This second drawback is more significant as it means that overseas researchers are not able to access the data.

6.2.2.2 End User Licence Dataset

Access to WAS data has been opened up via the UK Data Archive by providing an End User License (EUL) dataset. This is a non-disclosive dataset which is accessible to anyone, *anywhere*, who agrees to the online terms and conditions, hence this is often referred to as a 'click license'.

With the consideration that the wealth variables are of paramount importance (as they are of most interest to users) by applying disclosure methods to/removing them would greatly reduce the analytical utility of the data. It was therefore agreed that maintaining the analytical value of wealth variables should be the primary objective, and removing or suppressing variables of 'secondary importance' would ensure that data utility is maximised whilst complying with acceptable risk thresholds for an End User License dataset.

The following rules have been applied:

Standard EUL guidance has been applied, e.g. top coding age at 80, removal of any households size 10+ etc. In addition, specifically for a longitudinal WAS data series:

Variables removed:

- Removing geography variables to create GB files (GOR, Country, urban/rural flag) also Area, Address, Hhold, HSerial (these variables will be pseudo-anonymised to remove any geographical reference, whilst enabling a unique identifier for linkage of waves).
- Removing sensitive and 'observable' socio-demographic variables (HCoB - country of birth, Ethnicity - Ethnic, Religion, sexual identity).
- Removing flags that can identify births (H_flag3, P_flag2), other flags can remain as these only label split households, mover and entrant households which can be identified easily in the data using other variables and will help users with their analysis.
- Limiting the number of iterations of 'vestv' (value of vehicles) to 3. Removing the fourth and fifth iterations and including them within the third.

Variables that remain/code:

- All other WAS variables not stated.
- Age to be coded in 5 year bands.
- Introduction of full 52 group Output Area Classification. (As there is no geography below GB the smallest number of OACs in one category is c. 590 and spread around the country).
  (This is not provided on the special license; as not deemed appropriate in combination with GOR and LA. The lack of geography on the EUL permits this).
- Limiting SOC to 2 digits as the categories at 2 digit are less precise (and therefore less disclosive).
- Income, (employed, self-employed, gross and net). These will be restricted to 3 significant figures.
  Many salaries are published and so could allow an intruder to be pretty certain who they think they have found. However, the rounding to 3sf (equivalent of nearest thousand for £100k-£999k, for example) would create some uncertainty, with the absence of detailed SOC, geography and no ethnic group information, but still retain most (if not all) of the data utility.

Other points to note:

- The removal of geography **significantly** reduces the risk of disclosure. There are no country level questions that would reveal Scotland/Wales cases.
- The WAS data, although longitudinal, will not be pre-linked in the archive. Analysts will need to link the data themselves; thus reducing the likelihood of 'Joe Bloggs' identifying split households and disclosing information about new household (temporary household) members.
- The disclosure risk is also decreased due to the age of the data (Wave 1 are data are up to 6 years old and Wave 2 data are up to 4 years old). Future datasets will be available in a timelier manner, but the additional risk associated with this is acceptable.

The EUL datasets still retain a lot of utility and importantly allows international use of the data. It will also reduce the number of applications to ONS for approved researcher status. There have been occasions where researchers could have used an EUL dataset, instead of the special license dataset - had one existed.

6.2.3 Documentation

For wave 1, alongside the special license microdata, some user documentation was provided. It was agreed that the detail of this guidance would need to be greater for the release of the wave two linkable files. It is imperative that users understand how to link the longitudinal datasets correctly, in order to perform longitudinal analysis.

ONS reviewed and improved the documentation released with the final wave two data. Indeed, the customer satisfaction questionnaire issued in May/June 2012 asks for researchers input on what additional guidance they would find useful. The findings of this questionnaire fed into the final wave two documentation supplied to the UK Data Archive in August 2012. It has been noted that further guidance on the construction of DVs would assist some data users.

A description of the user documentation currently available is given at Annex 2 to this chapter.

6.2.4 WAS User group

ONS has hosted WAS User Group meetings to inform users of developments with the survey. The last meeting was in March 2012. These events are useful for engaging with users and learning more about how they want to use the data and how the consortium can assist them.

WAS is a unique data source. Its potential is vast. There is a huge opportunity to promote the potential of the data for analysis with the wider research community – WAS is relevant to the GSS, GSR and GES; as well as academics, charities and other organisations. The consortium should give some consideration to how to best promote wider use of the survey data; particularly with the release of WAS wave two data in June 2012. ONS has considered all its strategies used to promote the use of data from WAS. These are discussed in Annex 3 to this chapter.

It is important to ensure that there is two-way communication with the User Group; in previous meetings the User Group has not provided the level or detail of feedback the consortium would like. The consortium needs to consider how best to elicit feedback from external users; particularly with the view to informing future analysis plans (e.g. topics for short stories).

As part of this review a customer satisfaction survey was conducted by ONS in order that two key objectives could be addressed; firstly, a better understanding of the users needs would inform and enable improvements to the service provided and secondly, identifying the uses of the data would provide further justification for the continuation of the WAS. A short report on this survey is given at Annex 4 of this chapter.

6.2.5 Timing

WAS collects detailed financial data using complex routing. The data validation, which checks the routing; outliers and linkage of data across waves takes a considerable amount of resource and time. This data processing delays the dissemination of the data to users, which in turn reduces the utility of the data. There is a trade off between data precision and timeliness. The main results for wave 2 of the survey were published in three parts, the final part of which was published in July 2012: two years following the completion of data collection. ONS has reviewed procedures with the view of reducing the time lag between data collection and dissemination. Results from this review are given in Annex 5 of this chapter.

6.3 Uses of the data post publication

6.3.1 Overview

The Wealth and Assets Survey is a truly unique data source. No other data source in Great Britain provides the breadth and detail on household and individual wealth that WAS affords; WAS therefore fills a major information gap. Furthermore, the opportunity to conduct longitudinal analysis further enhances data utility. As such there is a huge amount of interest in using the data post publication. The survey's data is used extensively by policy makers and by an increasing number of academics. There is strong support for the continuation of the survey from both within and outside government.

6.3.2 Uses of the data across the WAS consortium

Office for National Statistics

WAS is contributing significantly to the national well-being measurement agenda. In particular, WAS supports two of the recommendations in the Stiglitz, Sen, Fituousi Report (2009): *Recommendation 3: Consider income and consumption jointly with wealth* and *Recommendation 4: Give more prominence to the distribution of income, consumption and wealth.* From July 2011, the four test questions measuring well-being will be included on WAS to enhance our ability to use these data in the WAS contributions to this project.

There is great potential for WAS to improve National Account estimates of wealth, pensions, and inheritance published in the household sector accounts.

More and more emphasis is being placed on longitudinal data sources. This survey is a very large and complex survey which has the potential of becoming a world leader for ONS. The methodology being developed in terms of imputation, weighting and data linking will benefit not only this survey but other ONS surveys now and in the future. It is important that such knowledge continues to be built up within ONS.

Social Mobility is a cross-government project lead by the Cabinet Office. ONS is preparing a paper for the Cabinet Office Sub-Committee responsible for this project highlighting the advantages of using longitudinal data to develop and monitor policies in this area - following individuals across time and through life events. The WAS would form a key source of data in this area.

WAS is a primary source of data for pension wealth and retirement savings. The new chapter of Pension Trends - chapter 10 Saving for Retirement was based almost exclusively on WAS data and would not have been possible without this survey.

Department for Work and Pensions

DWP regard WAS as central to informing policy response to the UK's ageing society and has been used in the development and evaluation of a number of reforms - workplace pension reforms; in developing the DWP's Green paper on future state pension reforms and other related policy areas. It is important that such reforms are underpinned by a robust evidence base - WAS is uniquely position to inform these.

HM Revenue & Customs

HMRC have used WAS to provide evidence for new policies where no other sources of data were available. Examples include: changes in pension lifetime allowance; budget analysis of charity options; characteristics of investors; a recent policy decision to annuitise pensions by the age of 75; review of HMRC wealth estimates - WAS is now the main source of wealth estimates for the lower end of the wealth distribution.

Business Innovation & Skills

BIS use WAS data in three primary ways: to evaluate recent legislative changes; to assess the impact of proposed legislative changes and in the development of future policies to help those in financial difficulty. One of the main policy areas where WAS has been and will be used is that of Consumer Credit, financial difficulty and debt. WAS will also be used to look at the link between personal and business assets.

HM Treasury

HMT do not directly contribute to the survey funding but have been active members of the Steering and Technical Group for the survey. They use the data in a number of ways, much of which would not be possible without WAS - including budget submissions, and strategic work on saving, pensions and wealth. HMT are also working with NIESR to develop a model of lifetime incomes which will be based on WAS data, for use in policy development and evaluation.

Financial Services Authority (FSA) now the Financial Conduct Authority (FCA)

The FSA joined the funding consortium for WAS at the start of wave 4 of the survey, bringing to the group expertise on property investments, financial acuity and debts.

6.3.3 Uses of the data by other organisations

There has been strong support shown for WAS from outside of government, both during and subsequent to the public consultation exercise. Recent support includes:

- Commission on Funding of Care and Support, Andrew Dilnott
- Institute for Fiscal Studies, Carl Emmerson
- Former members of the Pension Commission (Lord Turner, Baroness Drake, Professor John Hills)
- Pensions Policy Institute, Chris Curry
- National Employment Saving Trust, Mark Fawcett
- Former members of the National Equalities Panel (John Hills, Mike Brewer, Stephen Jenkins, Ruth Lister, Ruth Lupton, Stephen Machin, Colin Mills, Tariq Modood, Teresa Rees, Sheila Riddell)

6.3.4 Uses of the data by approved researchers

WAS data is deposited with the UK Data Archive at the University of Essex. Currently a WAS wave one special license dataset is available to approved researchers. Wave two data is due to be deposited with the UK Data Archive in June.

To date there are about 50 approved researchers use WAS data for a wide variety of purposes. The primary use of WAS data is to model wealth against socio-demographic characteristics in order to understand more about the wealth distribution and the drivers of inequality. There is a growing interest in the potential to conduct longitudinal analysis of WAS data; particularly given that wave one was conducted prior to the financial crash – detailed comparisons with wave two will enable analysts to understand more about how the economic downturn affected households in Great Britain.

One aim of the user satisfaction survey described in Annex 4 of this chapter was to better understand the requirements of users, to ensure that the data provided from WAS meets users requirements and the utility of the data is maximised.

Chapter 6 Annex 1: Departmental Access to WAS Data

1. Background

At present ONS have released WAS datasets to consortium members, the UK Data Archive and the ONS Virtual Microdata Laboratory (VML). These have been Special Licence datasets, accesses to which are strictly controlled.

ONS have recently released End User Licence datasets which will allow wider access with less formal access arrangements. (See section 6.2.3.2). The remainder of this annex refers solely to the Special Licence Datasets.

2. Access Routes

Annex 1 attached is a table summarising the access routes for researchers depending on where they are from.

All members of the consortium are given access to the Special Licence Datasets. An MRP application is required (initiated by SSD in ONS) and a single person in each department is considered the 'responsible officer'. This person signs a Data Access Agreement after which the formal responsibility for use of the data within their department lies with them.

The responsible officer is also responsible for informing ONS of any individuals in their department who will be given access to the datasets **prior to them being given access**.

Government Departments outside of the consortium are, in general, given access via the UKDA or VML, although most request data on an ad-hoc basis and only go to this route if they wish to have regular access.

3. WAS Departmental Access List

A WAS departmental access list is circulated to consortium members on a monthly basis with Technical Group papers, and acts as an aide memoir for the responsible officer to check and inform ONS of any changes required. Departments should review their access list on a monthly basis and send all changes to the Survey Manager in SSD so that the MRP unit can be kept informed, and a new Data Access Agreement (DAA) provided.

Chapter 6 Annex 2: The User Guide for Wave 2

1. Summary

To coincide with the release of the Wave 2 report dataset to the UKDA (UK Data Archive - http://www.esds.ac.uk/findingData/snDescription.asp?sn=6415) two user guides were made available to consortium members and analysts. The first detailed those variables which were present on the special licence datasets; the second provided the information which would enable use of the data effectively. To further increase the accessibility of the survey a review of the guidance made available to users is underway. Details of this review are explored within the current paper.

2. What is planned?

As has been discussed in the past, ONS has always intended to increase the portfolio of documents available. The focus of each of the volumes has been provided below:

Volume 1: A Short Guide to WAS

- This volume will provide a brief overview of the survey and will outline the key things that analysts of WAS will need to consider. Although limited in length, it will point users in the direction of other user guides if more information is required

Volume 2: Background and Methodology

- This will provide substantial details of the background and methodology of the survey. Much of this has been published in the past either in the Wealth in Great Britain reports and/or specific methodology papers.

Volume 3: WAS Questionnaires

- These present the final scattered questionnaire issued to the field for each wave of the survey

Volume 4: Details of WAS variables

- This volume will provide essential information about each variable on the dataset. Such information will include: the type of variable it is (e.g. a questionnaire variable, a BLAISE derived variable etc); the level of the variable (e.g. household or person); who the variable is relevant to; and any associated routing.

Volume 5: Derived Variable Specifications

- This volume will present the flowcharts for each derived variable ensuring that analysts are aware of how each was created.

Volume 6: Extended Glossary

- A glossary was provided as part of the 2006/08 Wealth in Great Britain publication in order to define key terms and concepts mentioned within the report. This is currently being expanded and will become a volume in its own right.

These guides are being delivered to the consortium and also made available on the UKDA as they are finalised. These are also available on-line and can be found through typing "Wealth and Assets user guidance" into a web-based search engine or directly via: http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/weakth-and-assets-survey/wealth-and-assets-survey---user-guidance/index.html

Chapter 6 Annex 3: Promotion of WAS Data for Wave 2

1. Summary

In order to justify the continuation of the survey it is a requirement to prove it is useful to users. This paper outlines six strategies to be followed by the Wealth and Assets Survey in order to promote user awareness and dissemination of the data.

Strategies

1. User Guide

Work is currently underway to increase the accessibility of the WAS data by expanding the user guide portfolio. This portfolio, containing six volumes, will be released to analysts within the next few weeks via a new survey web site and via the UKDA.

2. User feedback collection

A customer satisfaction survey was conducted with users of WAS data to address two issues:

a. Understanding of the users needs; to enable improvement to the service provided
b. Identifying the uses of the data; in order to justify the continuation of the WAS

The findings of the survey were collected and have been produced in a report, please see annex 4 of the current chapter. The report discusses the findings about individual users requirements and alternative sources to the WAS data.

3. EUL Dataset

Work is continuing on the agreement of an End User Licence dataset. The availability of only a Special Licence dataset on the archive is limiting the accessibility of the data and also preventing access to analysts outside of the UK.

4. User group meetings

User group meetings provide the perfect platform for addressing the needs of users and for promoting the benefits of the survey. To date three user group meetings have taken place, providing users with an opportunity to network and share their analysis. The next User Group meeting should be held before the end of this calendar year to discuss the findings of the user feedback.

5. Training course

A training course has been developed and piloted with current experts and new users to the WAS both within ONS, and with external users from DWP, HMT, HMRC, BIS and FCA. Feedback from the course is being collected and a report is due to be produced.

The course has four objectives of interest:

a. To understand the structure of the WAS datasets
    - Household and Person level datasets
    - Cross-sectional and Longitudinal Datasets
    - Respondents and Enumerated records
b. To be aware of the information available in the WAS User Guides
    - A Key Facts sheet was provided for Wave 2 data
c. To have the knowledge necessary to construct cross-sectional tabulations for both wave 1 and wave 2 data
d. To be able to construct linked datasets using wave 1 and wave 2 data for longitudinal analysis of the survey.
    - Handouts with examples of data analysis were provided to aid learning

6. Short stories

To increase dissemination of the WAS and to highlight the variety of analyses that can be performed, three short stories are planned over the next few months:

a. The Wealth of the Wealthiest Households
b. The Middle Squeeze
c. Indebtedness

The intention of the short stories is to increase awareness of the WAS in hope of increasing the number and variety of data users.

Chapter 6 Annex 4: Data User Feedback

1. Introduction

A customer satisfaction survey was conducted by ONS in order that two key objectives could be addressed; firstly, a better understanding of the users needs would inform and enable improvements to the service provided and secondly, identifying the uses of the data would provide further justification for the continuation of the WAS.

The sample comprised registered users of the WAS data. The questionnaire content covered uses of the data (including the most useful topics and purpose for using the data), alternative sources to the WAS and also sought to collate users views on the questionnaire content and the current status of documentation.

Responses to the feedback survey were received from the University of St Andrews, HMT, DWP, IFS, IPPR, Lancaster University, NIESR, Scottish Government and the University of Bristol. This paper provides an overview of the findings from the feedback survey.

2. Overall Viewpoints

“WAS is a unique survey in this country – being the only source of data on the full range of individual and household savings, other assets, and debt. It serves a variety of analytical purposes not possible from other data sources.” - DWP

“WAS is in a unique position to provide evidence with its broad scope of wealth types and longitudinal aspect. Securing the ongoing production of WAS is an important factor in the future development of good policy.” - HM Treasury

“WAS has been a welcome addition to the UK evidence base” - IFS

“The WAS has a really important contribution to make to public debates” - IPPR

“For questions on assets, wealth, and credit use it is unparalleled. The WAS is a global leader and it marks the path that nations ought to be taking.” - University of Bristol

3. Examples of current uses of WAS data

One aspect of the survey sought to elucidate uses of WAS data. Below a handful of these have been described:

WAS outputs have been used as illustrative evidence in policy briefings for Ministers and other officials. A 'household savings key facts and figures' document is produced which uses WAS wealth estimates, particularly the distribution of wealth across UK households [HMT].

Data from the WAS has aided understanding of individual attitudes to savings and to future inheritance and to design policies which effectively increase savings and the ability to be financially independent in retirement [DWP].

An economic model is being built with data from the WAS being used as a foundation. The subsequent model will allow the exploration of the fiscal incidence of existing government policies and is expected to be an integral part of HMT's tax and benefit policy making process for many years to come [HMT].

Household-level data provided by WAS improves understanding of the distribution of ISAs which is very important for helping HMT ensure that their policies are valid [HMT].

WAS data on liabilities enables a better understanding of the extent of non-mortgage debt, how this is dealt with and when such debt becomes a problem for households [DWP].

WAS data have been used to look at the characteristics and circumstances of householders that have mortgages or loans secured on their property; part of a Leverhulme Trust funded project entitled Mind the (housing) wealth gap: inter-generational justice and family welfare [University of St Andrews]

WAS data have permitted analysis of savings in defined contribution (DC) pensions on the eve of auto-enrolment; part of a briefing note funded by the National Association of Pension Funds and the Economic and Social Research Council. A similar usage was also reported by DWP who have used WAS data to measure the size and distribution of private pensions savings before the start of a national programme in October 2012 [DWP].

WAS data are being used in the development of a micro-simulation model of household wealth in the UK enabling estimation of the fiscal and distributional effects of changes to the wealth tax regime in the UK [IPPR].

The WAS dataset has underpinned a great deal of government funded work undertaken by the Department of Business, Industry and Skills at the University of Bristol exploring consumer borrowing, over-indebtedness and financial inclusion, particularly among lower income/vulnerable groups [University of Bristol].

4. Alternatives to WAS

The questionnaire also asked users to describe other sources that they utilise alongside WAS. These included the British Household Panel Survey (BHPS)/Understanding Society (US), the Family Resources Survey (FRS) , the Living Costs and Food Survey (LCF), the English Longitudinal Study of Ageing (ELSA) and HMRC personal wealth and ISA statistics.

Feedback highlighted the inability of these other sources to provide comprehensive information on the wealth holdings of households in Britain. Although advantages might lie in the use of alternative sources (e.g. the length that the FRS has been running enables longer time series analysis), the ability to aggregate data from these other surveys to provide a comprehensive picture of household wealth is not possible. Additionally, these alternatives do not drill down into the details of wealth and assets or the financial wellbeing of households more generally. Further strengths in WAS, as described by users, include the survey's ability to produce a detailed breakdown of wealth held in each asset type, the measurement of different forms of wealth including property and pension wealth, and the breadth and depth of the questions asked. This information was unavailable in the other wealth sources.

The IFS also raised the fact that in the absence of WAS, no comprehensive information is collected on wealth holdings and saving behaviour of younger individuals, alternative sources such as the ELSA are only representative of the population over age 50.

5. Questionnaire Content

Users were also asked to list what they felt were essential WAS questions alongside potential questions for inclusion. Unsurprisingly given the diverse uses of the data, those questions reported as essential for analytical needs covered the spectrum of questions on the WAS. Responses illustrated users awareness of the length of the WAS survey; something which appeared to lead to a reluctance to recommend further questions. It was noted that the survey was strong in asking questions about stocks of wealth but considerably weaker when it came to asking about transfers.

6. User documentation

Where asked to describe experiences of, and comments regarding the guidance provided, the general consensus was positive.

Possible suggestions for improving the documentation included:-

- more detail on what the variables actually mean instead of merely a repetition of the question wording
- a specification of the changes to the sample for the second wave
- the possibility for un-weighted frequencies to be included for each question. This would help the user to assess/evaluate the capacity of the survey to meet analysis needs.

7. Conclusion

The findings from the customer satisfaction survey have illustrated the sheer breadth of analysis that is being performed using WAS; the advantages that the survey provides over alternative sources and; certain areas for improvement, particularly with the survey's documentation. Ultimately however, it has highlighted the value placed on the WAS by its users and provided significant justification for the continuation of the survey.

Chapter 6 Annex 5: Reducing the lag between data collection and dissemination of results

One of the key recommendations from the WAS review position paper was to 'explore and implement an approach that reduces the lag between data collection and dissemination'. For WAS wave two, the lag between completion of data collection and final dissemination was two years. Plans are in place to reduce this to 18 months for wave three and 15 months for wave four. This paper draws together a number of different initiatives to be implemented in order to realise this objective.

1. Automation of longitudinal linking

Over the last 12 months work has been undertaken to further automate the longitudinal linking of WAS interviews. This has helped to reduce the amount of manual intervention and therefore led to time efficiencies being realised in the production of wave three longitudinal datasets.

2. Automation of edit checks

For wave three outlier checking, ONS developed an automated system to identify outliers; based on statistical variance. Again, this reduced the need for manual intervention in the process which introduced efficiencies to WAS data processing.

In addition to automating the identification of outliers, the approach to investigating outliers was also streamlined. Instead to looking at each variable at a time, outlier identification is broken down by topic file (e.g. property, physical, pensions and financial). This means that each case needs to be opened for investigation much less – as numerous outliers can be explored within each case in one go, rather than simultaneously. This more efficient approach will significantly reduce the amount of time it takes to investigate outliers.

3. Improvements in imputation planning and documentation

In March 2012, HLM, Methodology (MD) and SSD held a workshop to reflect on, and learn from, the wave two imputation exercise. This workshop was extremely useful in identifying lessons learnt and how ONS could make improvements for WAS wave three imputation. The key point from the workshop was the importance of having well documented imputation specifications, signed off by HLM prior to the start of imputation. SSD have taken the lead on improving the imputation specifications and initial feedback from MD indicates that the property specification provided in September 2012 marks a significant improvement on wave two documentation. This introduces

efficiencies in the imputation in two ways; 1) there is a better understanding of the requirements so the imputation is conducted in such a way that meets analysis requirements at the first attempt; and, 2) there are less queries going between the teams during imputation, which reduces downtime.

HLM, MD and SSD are meeting on a weekly basis during wave three imputation to ensure that communication is open between teams, and to mitigate any potential issues as soon as possible.

The imputation strategy for wave three (and beyond) was agreed with the WAS Consortium and will be developed and tested on wave three year one data.

4. Year one table generation

SSD and HLM have been corresponding to sign off the wave three derived variables (DVs) specifications ahead of finalising the imputation specifications. Once the DV specifications have been signed off, SSD have started refining the SPSS programmes that will create the DVs post imputation. This means that there will be a reduced time period between receiving and checking imputed data from MD and passing this onto HLM.

This should afford HLM more time than in previous years to start creating the tables for the final report based on year one data (for a given wave). Quality assurance can be undertaken using year one data – thus identifying any issues earlier; which again saves time if adjustments to imputation or weighting can be made in parallel to the imputation of the second year's data. MD are scheduled to provide initial weights to enable the generation of WAS results based on the first year's worth of data. This should make the quality assurance process for the whole dataset, including the second years' worth of data, easier and less likely to throw up problems.

Plans are also in place for other consortium members to be involved in data quality assurance at an earlier stage for wave three. Again, this provides the opportunity to identify any potential issues earlier, thus reducing the risk of bottlenecks later in the production cycle. This additional QA time is also likely to maximise the quality of the final published results.

5. Within wave data processing

The previous initiatives are all in motion and together will help to realise significant time savings for wave three. However, another significant development to be implemented for wave four is 'within wave processing'. As with some of the previous plans, this will not only help to ensure WAS results are disseminated in a more timely manner, but also has potential to improve the quality of data at the point of data collection. This is achieved by identifying questionnaire errors earlier and correcting the CAPI questionnaire within a matter of months.

From November 2012, SSD will start checking and editing the wave four data. There is a lead time of three months to take account of re-issues, an initial edit, and data delivery from IM. Base checks and linkage will be conducted on a monthly basis; with outlier checks conducted once six months worth

of data is available (required to support the statistical variance thresholds). It is estimated that the within wave data processing will deliver around three months worth of time savings, relative to wave three.

6. Summary

The initiatives outlined aim to deliver time savings in two ways:

1) Streamlining and automating the approach to data processing; and,
2) Bringing work forward to reduce the post imputation workload of the full dataset.

In addition to delivering time savings, these initiatives also have the potential to offer both an improvement in data quality, but also a reduction in resource requirements. The latter either implies a lower level of staffing, or, more resource being allocated to further research and development on the WAS.

A timetable providing the schedule for waves three and four data processing was presented to the WAS Technical Group in March 2012. It was agreed that this timetable should be reviewed by the Technical Group in early 2013.

ONS will continue to report progress with wave three and wave four processing to the WAS Technical and Steering Groups.

7. Administration and governance

7.1 Overview

The Wealth and Assets Survey is managed by a consortium of government departments (BIS, DWP, HMRC, HMT, ONS, SG, WG, FCA).

The ONS manage the survey design, data collection, data analysis and dissemination, to meet funding department's requirements. As such, ONS report to the consortium via a Technical and Steering Group comprised of the government departments listed above. The Technical Group consider the approach to take across all elements of the statistical value chain and make recommendations to the Steering Group; which has ultimate decision making responsibility.

7.2 Background

A Wealth and Assets Steering Group was set up in 2000, since when it has comprised representatives from the Department for Work and Pensions, the Department for Business, Innovation and Skills, HM Revenue and Customs, the Department of Communities and Local Government, the Financial Conduct Authority, the Scottish Government and the Office for National Statistics, collectively known as the Consortium.

The Consortium commissioned ONS to set up a new survey with the objective of providing representative data for households and individuals in Great Britain, measuring:

- the level, distribution nature and type of assets (including savings) and debts of all types
- attitudes to financial planning, saving and financial advice
- change in the above over time

Following feasibility studies and a pilot in early 2006, the full survey known as the Household Assets Survey (HAS) commenced in July 2006. The survey is managed and funded by the Consortium mentioned above.

7.3 Decision making forums

7.3.1 Technical Group

The WAS Technical Group meet monthly, on the final Thursday of each month. The Technical Group discuss issues across the statistical value chain; from survey design, to data collection performance metrics, through to analysis and dissemination. The Technical Group discusses issues in depth and reports recommendations to the Steering Group as a collective.

Regular papers are provided to the Technical Group detailing progress since the last meeting and reporting on scheduled items as detailed by the Technical Group work programme (*see documentation below*). Papers are circulated one working week in advance of the meeting.

7.3.2 Steering Group

The WAS Steering Group meet less frequently than the Technical Group; generally twice per year, but more frequently if project milestones require it.

The Steering Group's role is not to consider issues in detail, but rather to consider and ratify decisions made by the Technical Group. The Steering Group is comprised of senior staff from the consortium that are able to sign off decisions on behalf of their department. Technical Groups always precede the Steering Group so that departments are well briefed on any issues and the decisions recommended by the consortium's Technical Group.

As with the Technical Group, papers are provided to the Steering Group detailing progress since the last meeting and reporting on scheduled items as appropriate. Papers are circulated one working week in advance of the meeting.

Conclusion: The decision making forums are generally working as intended and ensure appropriate governance of the survey.

7.4 Documentation

7.4.1 Progress reports

ONS provides a monthly progress report to the Technical Group. This report details progress made across each of the 'active' waves. In addition to this monthly report, ONS started circulating a weekly update to consortium members in the build up to the wave two publications. This helped to ensure that consortium members are updated very regularly on the likelihood of meeting publication dates and importantly when their input will be required for quality assurance.

7.4.2 Risk Register

The risk register details risks to the survey meeting its objectives – as identified by consortium members. The risk register uses a standard template and scoring system adopted by all ONS projects. The nature of the risk is detailed, alongside a score associated with the likelihood and impact should the risk materialise. The product of multiplying these scores provides an overall score out of 30. The total exposure will determine the extent to which resources are allocated across the consortium to manage that risk.

In addition to documenting the nature and potential exposure to a risk, a mitigation and contingency plan are also identified in order to manage the risk, or how to manage the consequences should the risk become an issue.

Prior to the review, a number of Risk Registers were maintained depending on the audience for which it was designed. ONS now have all its Risks on a Corporate Risk Register and the Risk Registers used for the whole project are logged on here. This reduces duplication and ensures consistency.

7.4.3 Service Level Agreements

A Service Level Agreement (SLA) is held between ONS and the departments that form the WAS consortium. The SLA details the design, performance standards, deliverables, communication and cost to each department for the project. The SLA is reviewed annually to reflect the forthcoming wave requirements and the funding required within each financial year.

7.4.4 Technical Group work programme

The Technical Group work programme timetables the input required from Technical Group members. This covers both inputs to questionnaire changes and outputs; in terms of quality assuring the results from the survey. The work programme is maintained on a monthly basis and is discussed as a standing item at every Technical Group meeting. The work programme is used to inform the agenda of the Technical Group meeting.

7.4.5 Timetable

ONS maintains a 'consolidated timetable' which details the key milestones across relevant waves of the survey. This timetable is regularly maintained, with progress considered on a monthly basis at each Technical Group.

ONS is responsible for notifying the consortium of key milestones that must be met in order to achieve agreed targets, and for proposing a realistic timetable to meet these milestones, preventing unmanageable conflicting demands to the consortium for work to be carried out on the different work streams in the project (e.g. wave two report publication work stream, wave three work stream, wave four pilot work stream, etc.), by allowing sufficient time for work in all areas to be undertaken. Where consortium members are unable to allocate sufficient resource to meet these requirements, ONS is responsible for considering the implications of specific key milestones not being met on the overall project and/or individual work streams and taking mitigating actions to ensure the delivery of high quality outputs and effective project management.

One of the main areas of duplication and replication was in the production of project timetables, which has also lead to difficulties with version control. We have now designed, in consultation with the WAS Technical Group, a single timetable that is used for all project management meetings.

The timetable is circulated to consortium members near the beginning of each month.

There are three standard parts of the timetable:

a. The outputs of the current month – TG meetings occur on the last Thursday of every month, therefore a report on the activities of that month is given. RAG status (see Box 1) is included for each task.
b. A detailed timetable for the coming month, also including the RAG status for each task.
c. A consolidated timetable for the full project covering at least 6 months in advance – but with future key dates as they are proposed.

In addition, specific project timetables (for example the quality assurance timetable for wave 3 data) will also be included, as deemed necessary by the consortium. Also weekly updates may be introduced for specific projects, keeping the consortium up to date within each month.

Box 1: RED AMBER GREEN (RAG) Status
Red - Preparations seriously behind schedule with the result that expected deadlines will NOT be met
Red/Amber - Preparations seriously behind schedule but not thought to have knock on effect on deadline
Amber - Preparations behind schedule but not thought to have knock on effect on deadline or timetable extremely tight
Amber/Green - Preparations behind schedule but not thought to have knock on effect on deadline or timetable tight
Green - Work on schedule

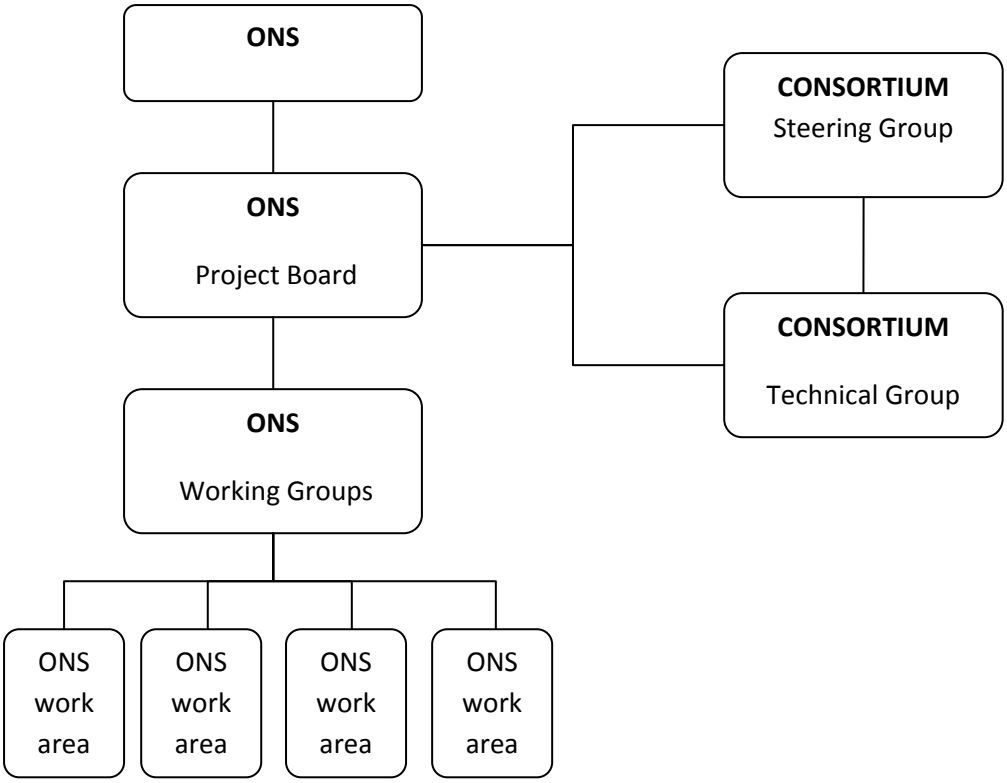
Like all timetables, these are subject to change as the project progresses, but by looking at the month that has just past, together with the upcoming month all project management groups should be able to assess the overall status of the project and be forewarned of any possible risks to the future timetable.

Conclusion: The documentation provided for the project is now thought to be adequate. ONS should continue to provide consortium progress updates between Technical Group meetings, as appropriate.

7.5 Governance structure

The following chart illustrates how the survey is governed. There are four business areas within ONS that work together to deliver the survey; Information Management (IM), Methodology Directorate (MD), Social Survey Division (SSD) and Public Policy Analysis Division (PPA). These business areas report to working groups that discuss the detailed operations of the survey; split between an inputs (questionnaire programming/data collection) and outputs (data processing/analysis). The project board within ONS is chaired by Public Policy Analysis Division; which is also the business area that liaises with external stakeholders.

Outside of ONS, there are two groups responsible for survey decision making; the Technical and Steering Group. See decision making forums for a description of the roles of these groups.



The governance structure is designed to ensure that consortium members needs/interests are taken into account before final decisions on the project are made.

Conclusion: Continue to govern the survey with the existing structure and Technical/Steering group roles.

7.6 Funding

The Wealth and Assets Survey is funded by a consortium of government departments. The primary funders of the survey for waves 1 – 4 are the DWP and ONS. There is not a direct link between the questions asked on the survey and the funding stakeholders. The amount contributed by each consortium member is dependent upon the funding that their department has available – which in turn is partly related to the relative importance of the survey to each department. DWP and ONS are the key stakeholders in the survey and therefore contribute the most financially to the survey.

It is vitally important for planning purposes that finances of consortium members are known before the start of each wave of the survey. This is important for planning whether the sample size is feasible, or whether there is scope to enhance the design of the survey.

- Each wave of the survey spans five financial years, from development to dissemination, with fieldwork itself spanning 3 financial years.

- Once a wave of the survey goes into the field, it is essential that the consortium seek to continue to fund their agreed share for the whole of that wave: in recent years financial uncertainty has led to the unplanned reduction in sample sizes or removal of questions mid wave.

The Service Level Agreement is in the process of being redesigned to cover each wave of the survey and new consortium members are being sort in order to secure wave 5 of the survey.