Department for
Communities and
Local Government

English Housing Survey
Technical Report, 2014-15

Contents

Introduction

1. The English Housing Survey (EHS) is a national survey of people's housing circumstances and the condition and energy efficiency of housing in England. It is an annual survey and the first survey was run in 2008-09. Prior to then, the survey was run as two standalone surveys: the English House Condition Survey and the Survey of English Housing.

2. The EHS consists of two main elements: an interview survey with an annual sample of approximately 13,300 households and a follow up physical inspection of the dwelling of 6,000 of the participating households together with an inspection of around 200 vacant dwellings.

3. This report describes the key technical features of the EHS. Each chapter of the report covers a specific aspect of the survey and is designed to be read as a standalone document.

Chapter 1
Sampling

The English Housing Survey (EHS) consists of two main elements: an interview survey of approximately 13,300 households and a follow up physical inspection of the dwelling of 6,000 of the participating households together with an inspection of around 200 vacant dwellings. This chapter provides information on how the household and dwelling samples were selected for inclusion in the interview and physical inspection elements of the 2014-15 EHS.

Overview

1.1   As in previous years, addresses for the initial 2014-15 EHS sample were selected using a systematic random sample design. Interviews were attempted at all of these addresses. This is referred to throughout this report as the 'interview survey sample'.

1.2   The design delivers a representative sample of households in England for 2014-15, with the sample being unclustered when combined with the 2013-14 sample.

1.3   In addition to the interview survey sample, a sub-sample of addresses was selected for physical inspection. This sub-sample included both occupied and vacant dwellings and is referred to as the 'physical survey sample'. To ensure that a sufficient number of rented properties were included in the dwelling sample, all rented properties were selected for physical inspection while around half of owner occupied dwellings were randomly selected for a physical inspection (the percentage selected varied each quarter, ranging from 49% to 60%).

1.4   In 2014-15, 25,980 addresses were issued to interviewers. A small proportion of these (907 addresses) were found to be ineligible because they fall outside the scope of the EHS, they include addresses that were found to be commercial premises, second and holiday homes, demolished properties or instances where the address was not found.[1] Productive interviews were achieved at 13,174 of the eligible addresses. Just under three-quarters of the

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[1] When counting ineligible cases for the purpose of the calculating response rates presented in Chapter 4, we have included additional categories as ineligible. Those additional categories are cases that fall within the scope of the EHS, i.e. cases with an identifiable primary residential address, but are ineligible for an interview or survey, such as vacant properties and derelict properties (both ineligible for household interview but eligible for a physical survey), institutions and addresses under construction. See Annex Table 4.1. for details of cases in scope of the EHS but ineligible for interview or physical survey.

productive addresses (10,230) were passed to surveyors, and physical surveys were achieved at 6,103 of these.

Interview survey sample

1.5 The requirement for the 2014-15 EHS was to achieve 13,300 interviews across the four housing tenure types (i.e. owner occupied, private rented, local authority and housing association).

Initial sample

1.6 To achieve these interviews, an initial sample of 40,000 addresses was drawn from the Postcode Address File (PAF). These addresses were drawn as a systematic two-stage random sample from the Royal Mail's Small User PAF.

1.7 For the first stage of sampling, the whole of England was grouped into 1,808 geographic 'merged areas' (clusters). Those areas were generated by combining neighbouring (18 on average) Lower Layer Super Output Areas (LSOAs) within region, so that each cluster contained about 12,500 addresses (with a range from about 11,200 to 13,800).

1.8 The 1,808 clusters were stratified by region, Census estimates of the percentage of dwellings in the cluster that are owner occupied (in tertiles within region) and the percentage of owner occupied dwellings (for the tertile with the highest percentage of owner occupied dwellings) and Census estimates of the proportion of households with a Household Reference Person (HRP) who works in non-manual occupations (for the other two tertiles).

1.9 The clusters were then randomly allocated to years, by assigning them in pairs going down the list, and then randomly (and independently) allocating one of each pair to "Year 1" and the other to "Year 2" (i.e. 904 clusters per year). Thus, each year the EHS covers one half of England, giving rise to this design being referred to as the 'half-England model'. The allocation of clusters to years was fixed since 2012-13: "Year 1" clusters were used for 2012-13 and 2014-15 and "Year 2" clusters for 2013-14 and 2015-16.

1.10 At the second stage of sampling, all addresses in the PAF in the 904 clusters selected for the 2014-15 sample were stratified by cluster, lower layer super output area (LSOA) ordered by Census estimates of the percentage of owner occupied dwelling, Census output area and postcode. Then a systematic random sample of 40,000 initial addresses were selected.

1.11 The advantage of using a two-stage approach involving the clusters is that it reduces the fieldwork area to half the country so interviewer and surveyor travel time and costs are reduced. The disadvantage is that for any single

survey year the survey is partially clustered, which results in a small loss[2] in statistical efficiency. However, when analysing any two years of survey data, the combined sample is entirely unclustered.

Sample issued to interviewers

1.12   The social rented sector (local authority and housing association) is less prevalent compared with the other sectors. To ensure that there is a sufficiently large sample of social renters for analysis, the 40,000 addresses were sub-sampled to sift out about half of the owner occupiers and private renters. The sub-sampling was carried out based on the 'predicted tenure' of the sampled addresses derived from the predominant tenure within the postcode that contained that address. Predominant tenure was identified using Experian's Residata[3] classifications and attached to the address records. Sub-sampling was carried out by grouping the addresses into the four housing tenure types and sub-sampling at the rates of 58% for owner occupied and private rented and 95% for social rented. That process produced 25,980 addresses for issuing to interviewers, Table 1.1.

Table 1.1: Sub-sampling of PAF addresses, 2014-15

	PAF sample	Sub-sampling rate	Issued EHS sample
	addresses	*percentages*	*addresses*
predominant tenure			
owner occupied	27,864	57.7%	16,067
private rented	4,326	57.7%	2,494
social rented	7,209	95.0%	6,848
unknown tenure	601	95.0%	571
Total	**40,000**	**65.0%**	**25,980**

1.13   Interviews were achieved at 13,174 households, Table 1.2.

Table 1.2: Number of interviews achieved, 2014-15

tenure	
owner occupiers	7,817
private rented	2,087
local authority	1,446
housing association	1,824
Total	**13,174**

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[2] NatCen estimates that the maximum design factor due to clustering would be about 1.08.
[3] Experian possess a database that contains information obtained from a number of sources including insurance companies, Census, etc. referred to as Residata. It is from this that information was taken on predominant tenure within a postcode as well as other information. The matching of the EHS sample to Residata was carried out by BRE.

Physical survey sample

1.14   The requirement for the 2014-15 physical survey sample was 6,200 physical surveys across the four housing tenures.

1.15   To ensure that the EHS delivers findings on renters that have the same level of precision as its predecessor, the English House Condition Survey, a disproportionate number of renters is included by under-sampling owner-occupied dwellings, Table 1.3.

Table 1.3: Tenure distribution of achieved physical survey sample compared with the national stock

	Achieved sample		National stock
	number	*percentages*	*percentages*
tenure			
owner occupiers	2,538	41.6%	63.0%
private rented	1,272	20.8%	19.9%
local authority	996	16.3%	7.1%
housing association	1,297	21.3%	10.1%
Total	**6,103**	**100.0%**	**100.0%**

1.16   The issued sample for the physical survey was drawn as a stratified sub-sample of the dwellings of those households who responded to the interview survey, together with a stratified sub-sample of dwellings found to be vacant during fieldwork. Calculation of the size of the sample to be issued took account of the expected physical survey response rates by tenure.

1.17   The sub-sampling of interview survey cases for the physical survey was carried out during the interview by the Computer-Assisted Personal Interviewing (CAPI) program. The program used the tenure of the dwelling established at the interview to select the subsample and advised the interviewers if the household they were interviewing was eligible for the physical survey. If so, they would attempt to gain agreement from respondents to take part in the physical survey and pass on the address details to CADS Housing Surveys who managed the fieldwork of the physical surveys.

1.18   Different sub-sampling rates were applied to each tenure group to identify cases eligible for the physical survey. As the owner occupied sector is larger than the rented sector, it was under-sampled to ensure sufficient numbers of renters for analysis. Sub-sampling rates were reviewed at the start of the year and were kept under review throughout the year in order to ensure a

sufficiently large sample was achieved. The sub-sampling rates for 2014-15 are shown in Table 1.4.
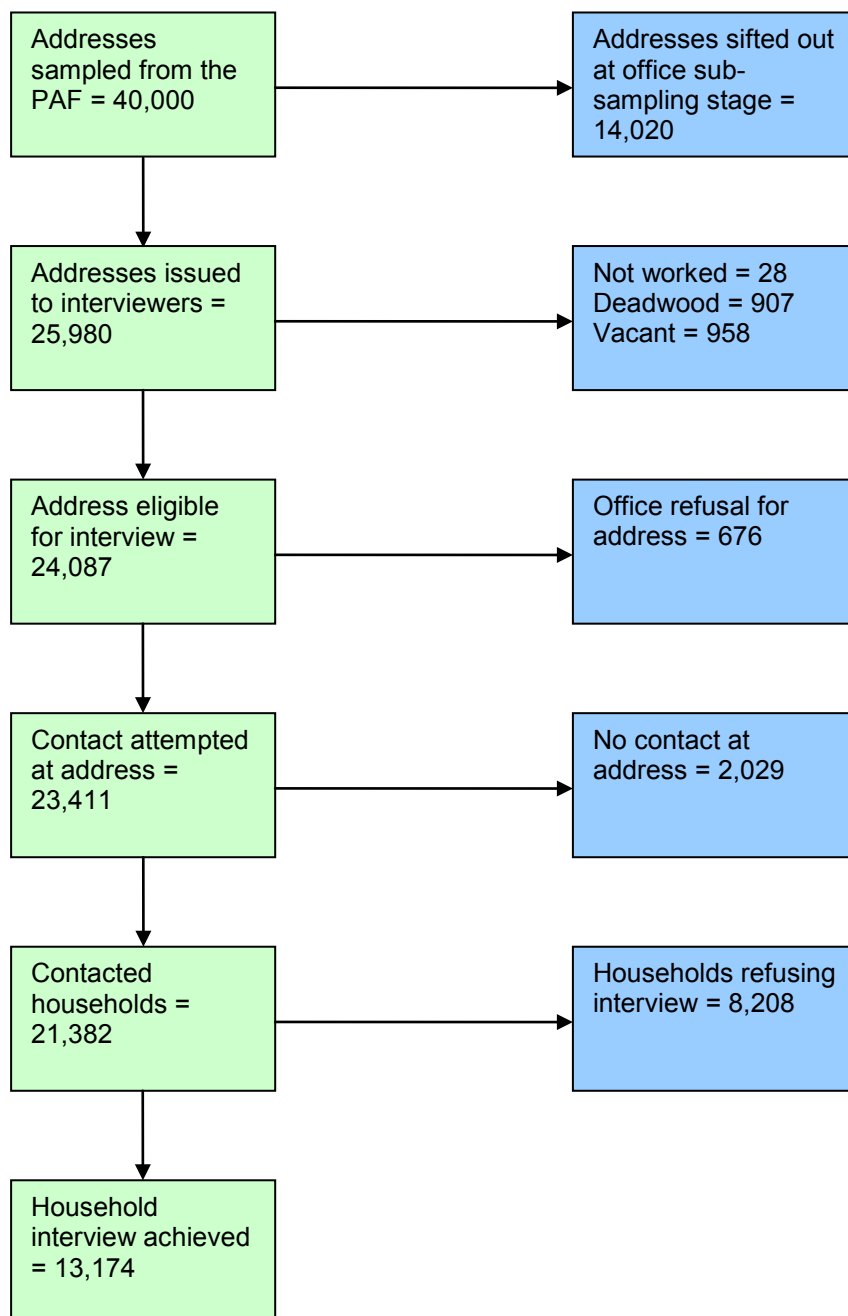
Table 1.4: Sub-sampling rates, 2014-15 physical survey

	Sub-sample rates			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
				percentages
tenure				
owner occupiers	51.0%	49.0%	50.0%	60.0%
private rented	100.0%	100.0%	100.0%	100.0%
local authority	100.0%	100.0%	100.0%	100.0%
housing association	100.0%	100.0%	100.0%	100.0%

1.19   To ensure that there were roughly equal numbers of surveys across the quarters to reduce the impact of seasonality (for example, damp problems are more likely to be identified in the winter), the sub-sampling rate was kept fairly constant. However, the sub-sample rate for owner occupiers was increased from around 50% to 60% in quarter 4 to ensure the overall target for 6,200 physical surveys across the four housing tenure groups was achieved given the response rates in quarters 1 to 3.

1.20   Vacant properties were sub-sampled at the same rates as occupied cases based on information about their last known tenure. This information was gathered by interviewers as part of their initial visit (from talking to the landlord or neighbours) or based on the interviewer's best estimate of tenure derived from available evidence. Permission and access for the survey was then sought by the surveyors managed by CADS Housing Surveys.

1.21   Not surprisingly, a lower proportion of full physical surveys were obtained in unoccupied dwellings, compared with occupied dwellings, because of the difficulty in gaining access to a property that was unoccupied. In 2014-15, surveyors managed to gain access and obtain full physical surveys in 28% of dwellings that were unoccupied at the time fieldwork took place.

1.22   The 2014-15 sampling and response process is summarised in Figure 1.1.

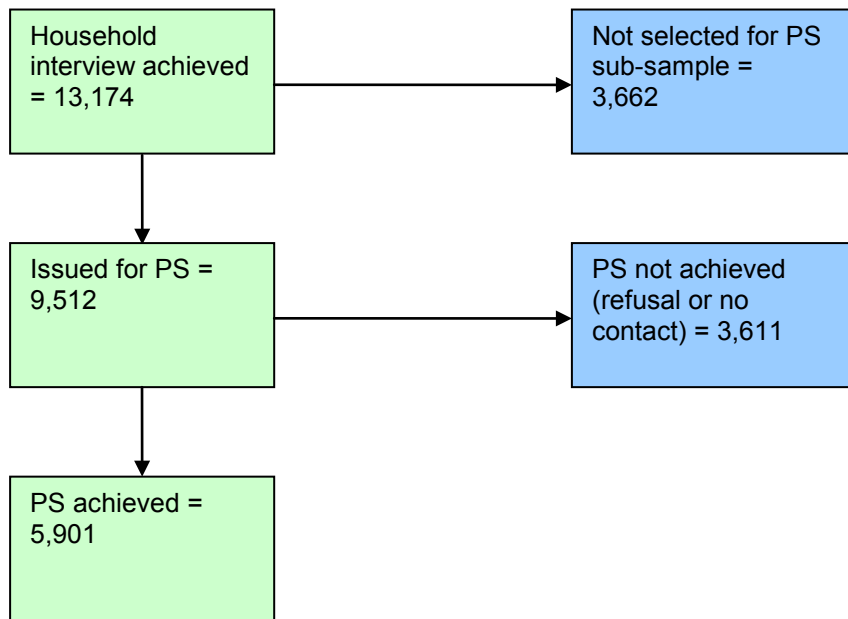## Figure 1.1: Sample structure of the EHS, 2014-15[4]

Interview survey sample

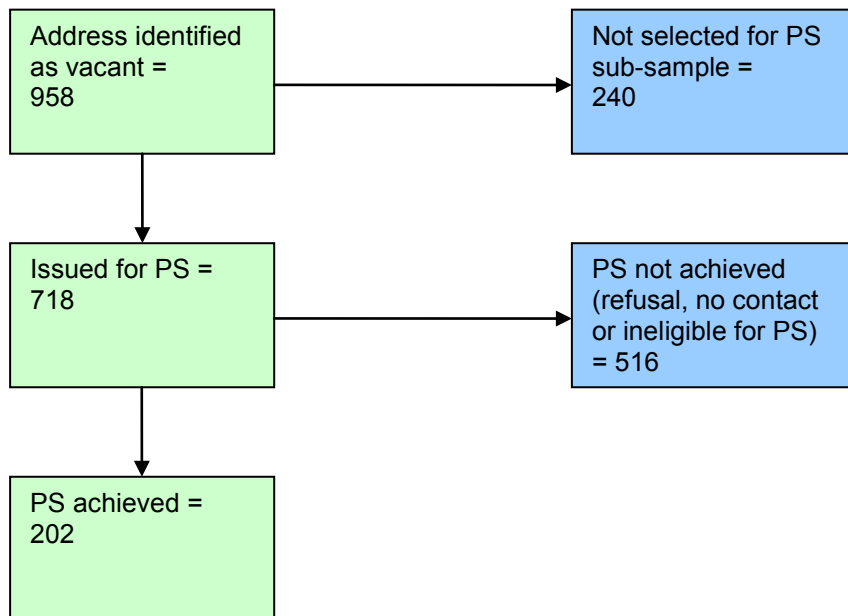|	
Addresses sampled from the PAF = 40,000	Addresses sifted out at office sub-sampling stage = 14,020
Addresses issued to interviewers = 25,980	Not worked = 28 Deadwood = 907 Vacant = 958
Address eligible for interview = 24,087	Office refusal for address = 676
Contact attempted at address = 23,411	No contact at address = 2,029
Contacted households = 21,382	Households refusing interview = 8,208
Household interview achieved = 13,174	

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[4] The way case outcomes are grouped for the purposes of calculating response rates is slightly different to the sampling overview presented here. See Annex Table 4.1 for details of household interview outcomes. Note:
1) Categories 'unable to locate address' and 'not worked' are included under in-scope addresses for the purposes of response rate calculations, but grouped within ineligible in the above.
2) In the diagram above 'no contact' includes categories 'unknown whether residential: no contact', 'residential but unknown eligibility: no contact', and 'other unknown eligibility'. These are treated as a separate category 'unknown eligibility' for the purposes of response rate calculations.
3) 'Households refusing interview' above includes other unproductive categories including 'language difficulties', 'lost productive' and 'away in hospital during fieldwork period'. These are treated as a separate category 'other unproductive' for the purposes of calculating response rates.

Physical survey sample: occupied dwellings

```
┌─────────────────────────┐                    ┌─────────────────────────┐
│ Household                │                    │ Not selected for PS     │
│ interview achieved       │───────────────────▶│ sub-sample =            │
│ = 13,174                 │                    │ 3,662                   │
└─────────────────────────┘                    └─────────────────────────┘
            │
            ▼
┌─────────────────────────┐                    ┌─────────────────────────┐
│ Issued for PS =          │                    │ PS not achieved         │
│ 9,512                    │───────────────────▶│ (refusal or no          │
│                          │                    │ contact) = 3,611        │
└─────────────────────────┘                    └─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ PS achieved =            │
│ 5,901                    │
│                          │
└─────────────────────────┘
```

Physical survey sample: vacant dwellings

```
┌─────────────────────────┐                    ┌─────────────────────────┐
│ Address identified       │                    │ Not selected for PS     │
│ as vacant =              │───────────────────▶│ sub-sample =            │
│ 958                      │                    │ 240                     │
└─────────────────────────┘                    └─────────────────────────┘
            │
            ▼
┌─────────────────────────┐                    ┌─────────────────────────┐
│ Issued for PS =          │                    │ PS not achieved         │
│ 718                      │───────────────────▶│ (refusal, no contact    │
│                          │                    │ or ineligible for PS)   │
│                          │                    │ = 516                   │
└─────────────────────────┘                    └─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ PS achieved =            │
│ 202                      │
│                          │
└─────────────────────────┘
```

Sampling at addresses

1.23   Most addresses contained a single dwelling and a single household. However, at a small proportion of addresses (less than 1%) this was not the case. There were standard procedures for interviewers to select one dwelling and/or one household at random when more than one was identified.

1.24   The interviewer listed the dwellings identified at multi-dwelling address and then randomly selected one from the list, using a pre-selected random number. The random number was obtained from a sheet (called a Kish grid) which had a column for the number of dwellings identified, and a column for which numbered dwelling to select.

1.25   The same procedure was used to select the household to interview when more than one was identified at a dwelling.

Chapter 2
Questionnaires

The English Housing Survey (EHS) collects data in two separate phases. In the first phase, an interviewer visits a sampled address and conducts a face-to-face interview, using a laptop computer – i.e. computer assisted personal interviewing (CAPI). Following the interview, a second phase of data collection occurs when, for a sub-sample of cases, a qualified surveyor visits the address to make an assessment of all physical aspects of the property. The surveyor completes a detailed survey form using a digital pen, an input device which captures the surveyor's handwriting and brush strokes and converts them into digital data.

Overview

2.1   The content of the interview survey is reviewed annually. Each year, the relevance of the data collected by the interview questionnaire and physical survey form is reviewed. Questions are revised to improve data quality, or removed altogether if the information they elicit is no longer relevant to users' needs. The questionnaire contains a number of rotating question sets which come in and out of the survey on an annual, biennial or less frequent basis. The review process also selects the rotating question sets to be included in a particular year.

2.2   The annual questionnaire review is led by the Department for Communities and Local Government (DCLG) in consultation with the Department for Business, Energy and Industrial Strategy (BEIS) and key survey users across both departments.[5]

2.3   While the content of the physical survey has remained largely unchanged from the former English House Condition Survey (EHCS), the interview questionnaire has undergone more changes since its inception in 2008-09. A fairly radical overhaul of the questionnaire was undertaken during the development of the 2011-12 survey. This was driven by a significant reduction in funding and the consequent requirement to reduce the length of the questionnaire from 50 to 30 minutes. By comparison, changes to the interview questionnaire since this time have been relatively minor.

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[5] The Department for Business, Energy and Industrial Strategy was created on 14 July 2016. This Department took over energy policy from the former Department of Energy and Climate Change.

Interview questionnaire

2.4   A core set of questions is asked of respondents every year. They cover:

- household composition, ethnicity, nationality, economic status, education and health;
- household accommodation and length of residence;
- housing history and aspirations;
- rent and mortgage payments;
- satisfaction with landlord/attitudes to neighbourhood; and
- income.

These topics cover the key attributes of a household and the dwelling it occupies. The permanent inclusion of questions on these topics (with minimal change to the phrasing of the questions) ensures that a consistent picture is provided over time. A number of questions (such as marital status and ethnic group) adopt the wording of the Office for National Statistics Harmonised Questions for Social Data Sources to allow comparison across different government surveys:

http://www.ons.gov.uk/ons/guide-method/harmonisation/primary-set-of-harmonised-concepts-and-questions/index.html

2.5   The questionnaire also contains a number of rotating question sets which come in and out of the survey on an annual or biennial basis (or, in some cases, less frequently). Topics covered in these modules include:

- second homes;
- fire and fire safety;
- satisfaction with the neighbourhood;
- work undertaken to improve energy efficiency of the home;
- adaptations made to the home to improve accessibility; and
- tenancy deposits.

2.6   Table 2.1 outlines the topics included in the 2014-15 questionnaire. In addition to a number of minor wording changes designed to improve comprehension of questions, the main changes that were made to the 2014-15 questionnaire were the addition of questions on:

- whether individual respondents have served in the armed forces;

- whether health conditions or illnesses are a consequence of serving in the armed forces;

- private renting history;

- the length of respondents' tenancies;

- safety in the neighbourhood;

- responsibility for repairs of rented properties;

- length of social renters' tenancy agreements;

- whether social renters have considered moving;

- receipt of financial support for energy saving improvements;

- the effect of new government schemes on respondents' likelihood of buying a property; and

- reasons why mortgage applications were turned down.

Table 2.1 Household interview questionnaire topics 2014-15

demographics including age, sex, marital status, household reference person and household relationships
type of property
tenure
individual characteristics including nationality, country of birth, ethnicity, wellbeing, time at address, health and disability, education
age of accommodation
housing history
subletting
waiting lists (for social housing)
rooms available to the household and shared facilities
type of dwelling and household
satisfaction with accommodation and neighbourhood
access to vehicles
council tax and utilities
energy efficiency
ownership type (i.e. leasehold or freehold)
satisfaction with repairs and maintenance
ownership details including when bought property, how financed purchase, who bought it from, how much it cost
mortgages, including type, payments and arrears
tenancy type
social renting details
rent and housing benefit including payments and arrears
number of tenancy agreements
fire safety – smoke alarms
buying aspirations
working status and job details
economic status
income and earnings
benefits
income support and mortgage interest
savings and investments

In addition, the rotating question set on fire hazards and outbreaks of fires was rotated out of the questionnaire. It was replaced by the rotating question sets on tenancy deposits and on the adaptions to the home needed for household members with a long-term disability. The full EHS 2014-15 questionnaire is published on the DCLG website: https://www.gov.uk/government/publications/english-housing-survey-questionnaires.

2.7   In 2014-15, the median interview length including recruitment to the physical survey was 33 minutes. This length is calculated on full interviews only; partial interviews are excluded[6].

Physical survey

2.8   The physical survey form is designed to collect information about the dwelling and its surroundings, and about the condition of the property and what would need to be done to remedy defects.

2.9   The content of the physical survey has remained largely unaltered from the former EHCS. Surveyors continue to record the following:

- details of the nature and type of each dwelling;
- the presence and condition of facilities and services;
- the condition of the internal and external building materials;
- the presence and condition of shared facilities and services in blocks of flats or on estates;
- an assessment of the environment in which the dwelling is located; and
- assessments of the health and safety risks associated with the dwelling (these were extended in 2008-09).

2.10   The content of the physical survey is reviewed annually and new questions are added where appropriate to reflect changing technology, for example, the presence of solar panels or wind turbines.

2.11   In 2011, as part of the major EHS review, BRE and DCLG undertook an extensive review to identify and recommend areas and options for reducing the scope and complexity of the physical survey. Following this review:

- redundant questions were removed (see the 2012-13 technical report for the full details);
- the separate form for house in multiple occupation (HMO) was dropped with some questions added to section 7 of the main form; and

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[6] A partial interview is when a substantial part of the interview is carried out (up to the question PlanTen which asks about the type of housing the respondent expects occupy in the longer term) but the interview is stopped before the end is reached.

- the number of housing health and safety rating system (HHSRS) hazards that were directly measured by the surveyor was reduced from ten to six; the others were flagged only when an extreme risk (equating to a Category 1 Hazard) was found as part of the physical survey.

2.12   Table 2.2 outlines the topics covered in the 2014-15 physical survey. In comparison with previous years, changes to the 2014-15 physical survey were relatively minor and included:

- the presence of smart meters for gas or electric meters (Page 5);

- the inclusion of biomass fuel options for the type of heating fuel (page 6);

- new questions to the household questionnaire on the presence of overheating in the dwelling, the presence of an in house display and whether the dwelling has any internal or external solid wall insulation (page 8);

- whether there is any stone present in the construction materials of the dwelling and if so its proportion and type (page 13)

- the area in m^2 of roof covered with PV panels (page 14); and

- summary questions on the presence of internal / external wall insulation and further question on % of walls with insulation present (page 18).

Table 2.2 Physical survey topics 2014-15

amenities
services, heating and energy
construction
measurement
exterior and plot
ageing elements
internal / external defects
structural faults
housing health and safety rating system
pests
drains
common parts
shared facilities
flat construction and faults
local area and environment

2.13   The full EHS 2014-15 physical survey form is published on the DCLG website: https://www.gov.uk/government/publications/english-housing-survey-physical-surveys

Chapter 3
Fieldwork

Fieldwork for the 2014-15 English Housing Survey (EHS) was managed on behalf of the Department for Communities and Local Government (DCLG) by NatCen Social Research. There are two parts to the EHS: the interview survey and the physical survey. All interviews were carried out by trained NatCen Social Research interviewers; the surveys by professional surveyors employed by CADS Housing Surveys. This chapter provides further details of fieldwork procedures, including interviewer and surveyor training.

Overview

3.1   The 2014-15 survey was conducted by a consortium led by NatCen Social Research. The consortium included CADS Housing Surveys who employ a large field force of professional surveyors to undertake the visual inspection of properties, and Building Research Establishment (BRE) who is responsible for developing the physical survey questionnaire and surveyor training manuals as well as for delivering the surveyor training sessions.

Fieldwork period

3.2   Fieldwork for the survey commences in April each year and is spread over the year, in eight batches (or waves) with two waves of fieldwork per quarter. In each wave, interviewers are given six weeks in which to complete their quotas of work. Surveyor fieldwork is the last two weeks of the interview fieldwork period plus a week beyond the end of interviewer fieldwork date.

3.3 Fieldwork dates for 2014-15 were as follows[7]:

	Interviewer		Surveyor	
	Start	**Finish**	**Start**	**Finish**
Quarter 1				
Wave 1	31/03/2014	11/05/2014	26/04/2014	18/05/2014
Wave 2	28/04/2014	8/06/2014	24/05/2014	15/06/2014
Quarter 2				
Wave 1	23/06/2014	03/08/2014	19/07/2014	10/08/2014
Wave 2	21/07/2014	31/08/2014	16/08/2014	07/09/2014
Quarter 3				
Wave 1	15/09/2014	26/10/2014	11/10/2014	02/11/2014
Wave 2	13/10/2014	23/11/2014	08/11/2014	30/11/2014
Quarter 4				
Wave 1	07/01/2015	15/02/2015	31/01/2015	22/02/2015
Wave 2	02/02/2015	15/03/2015	28/02/2015	22/03/2015

Training and project briefings

Interviewers

3.4 Interviewers working on the EHS are drawn from the NatCen Social Research pool of interviewers. Prior to starting work at NatCen, all interviewers receive three days of intensive training, which includes training in computer-assisted personal interviewing (CAPI) and workshops on doorstep technique. After this, interviewers are supervised for up to three days in the field. Interviewers are also encouraged to 'shadow' more experienced colleagues as a method to learn from others and to share experiences.

3.5 Before starting work on the EHS, all interviewers are required to complete a briefing on the survey. In 2014-15, there were three types of briefing:

- Interviewers who had not previously worked on the project were required to attend a one day face-to-face briefing. In total, 112 interviewers were briefed at such briefings. These briefings covered:
    - o purpose of the study
    - o how the study data are used
    - o previous EHS findings

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[7] A small number of cases were released early (8th April) to interviewers in order to check the systems were working.

- study procedures including making contact with respondents as well as the identification and selection of dwellings and households, including houses in multiple occupation (HMOs)
- how to motivate respondents to take part
- survey documents
- booking appointments for the physical surveyor visit
- various exercises to test their understanding of the EHS
- (for less experienced interviewers) going through a dummy interview

- Interviewers who had previously worked on the survey and who achieved 90% or more of the predicted target for their area did not attend a briefing but, instead, were sent documents so they could brief themselves. A total of 312 interviewers were briefed in this way. This self- briefing focused on the changes that had been made to the survey for 2014-15 and the important protocols for the survey.

3.6 The briefings were run by NatCen Social Research and attended, where possible, by members of the EHS Team from DCLG and CADS Housing Surveys.

3.7 In advance of the face-to-face briefings, interviewers were required to undertake a pre-briefing exercise. This involved reading the project instructions and completing a questionnaire covering the main survey procedures. The completed exercises were marked after the briefings.

Surveyors

3.8 EHS surveyors are employed by CADS Housing Surveys and trained by BRE on the technical content of the survey. Surveyors working on the EHS come from a range of professional backgrounds with approximately half being qualified Environmental Health Officers and the remaining from a variety of professional groups including architects and building surveyors.

3.9 There is a limited amount of turnover of surveyors each year. In 2014-15, 152 surveyors (including Regional Managers) worked on the EHS, all of which had worked on the previous year's survey.

3.10 Surveyors new to the EHS receive a five-day residential briefing. The rigorous residential training involves both desk-based and practical sessions and is designed to enable surveyors to adopt a standard approach to the assessment and reporting of the condition of the dwellings they will be inspecting. It was not necessary to recruit any new surveyors for the 2014-2015 survey.

3.11 In advance of their training, all new surveyors are issued with an EHS technical manual, written by BRE, which sets out key definitions and provides guidance on correct completion of the survey form. New surveyors also

receive a set of worked examples on the Housing Health and Safety Rating System (HHSRS). The worked examples are made up of model answers from DCLG and scenarios based on test properties used in previous EHCS/EHS briefing years. Used primarily for benchmarking purposes, those scenarios are intended solely to aid the completion of the sections on the HHSRS within the EHS form.

3.12   All new surveyors receive a five-day briefing on all areas of the physical survey, the substantive topics covered in the physical survey briefing are listed below.

- survey procedure and administration
- digital pen methodology for surveying
- survey validation procedures
- amenities
- services, heating and energy
- construction
- measurement
- exterior and plot
- ageing elements
- external defects
- structural faults
- Housing Health and Safety Rating System
- pests
- drains
- common parts or areas for blocks of flats
- shared facilities
- flat construction and faults, and
- area and environment

3.13   As soon as possible after training, Regional Managers arrange accompanied visits with their new surveyors to check on the competence of those surveyors and to answer any practical questions surveyors might have.

Making contact with respondents

Letters announcing the interviewer's visit

3.14   All addresses sampled for the EHS receive a letter, in advance of the interviewer's first visit, explaining the purpose of the study and stating that an interviewer will be visiting shortly. The letter also includes details of how the address has been selected and gave reassurances about confidentiality by stating:

We will treat information you give in the strictest confidence under the Data Protection Act 1998. The results collected are used for research

purposes only and no one looking at the findings will be able to identify you in any way. Your information will be used by the Department for Communities and Local Government (DCLG), and their counterparts in the Department of Energy and Climate Change (DECC), for the production of statistics only.[8]

3.15   These letters are sent out centrally by NatCen Social Research,not by the interviewers. The interviewers carry laminated copies of the letters with them to aid respondents' recall of the advance letter on the doorstep. A copy of the advance letter is available at Annex 3.2.

Leaflets

3.16   Respondents are also sent a leaflet about the study with their advance letter. This provides additional information about the survey including examples of how previous EHS data have been used. It also addresses potential concerns about data protection, provided contact details for NatCen Social Research and web addresses for DCLG and NatCen Social Research.

3.17   There are three different versions of the leaflet, one targeted at owner occupiers, one at private renters and the third at social renters. Each version includes pictures and study findings which were considered to be particularly relevant for that tenure group.

3.18   Households selected for a physical survey are also given a leaflet describing the purpose of the surveyor's visit and what to expect from the physical inspection. These leaflets are updated annually. Copies of the 2014-15 interviewer and physical survey leaflets are available at Annex 3.3.

Interview survey data collection

3.19   Prior to seeking an interview with a respondent at a sampled address, the interviewer undertakes a series of contact procedures using the EHS 'doorstep form'. These include:

- Collecting 'first impression' data from the sampled address to be used in non-response analysis.

- Identifying the sampled dwelling. A dwelling is defined as a unit of accommodation where all the rooms and amenities are for the exclusive use of the household(s) occupying them.

- In cases where there was more than one dwelling at the sampled address, for example, if a house has been split into two self-contained

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[8] On 14 July 2016 the Department for Business, Energy and Industrial Strategy took over energy policy from the former Department of Energy and Climate Change.

flats, randomly selecting a dwelling at the sampled address for the interview.

- Identifying the households living at the dwelling and, in cases where a dwelling contains more than one households, randomly selecting a household for interview

- Collecting information from neighbours about addresses that are vacant or where the interviewer has been unable to make contact with the occupants.

3.20 Properties that are vacant at the time of the interviewer's first call are passed to CADS Housing Surveys to approach for a physical survey. These are sub-sampled on the same basis as occupied dwellings based on the last known tenure of the property.

Interviewing non-English speakers

3.21 NatCen employs some interviewers who can conduct the interview in a language other than English. However this is not always possible and interviewers tend to rely on household interpreters to complete interviews with non-English speakers. Household interpreters must be aged 13 or over and willing to interpret on behalf of the interviewer. None of the survey documents are translated.

3.22 In 2014-15, 12 interviews were carried out by a NatCen interviewer in a language other than English; 24 interviews were undertaken using a family or friend of the respondent as an interpreter.

Maximising response

3.23 In 2014-15, interviews were achieved for 13,306 households. This represents 60% of sampled addresses eligible for interview and is in line with the target response rate. Interviewers used a number of established procedures to maximise response rates.

3.24 Interviewers are encouraged to make a minimum of nine calls at each address before classifying the address as a non-contact. These calls have to be at different times of the day and spread across the fieldwork period. At least two of these calls need to be in the evening from Monday to Thursday and two has to be at the weekend.

3.25 In an attempt to maximise response, some survey agencies have procedures to reissue/reassign addresses that have not yielded a productive interview to another interviewer to attempt. EHS addresses are not generally reissued because doing so would delay the completion of the interview survey component and would reduce the amount of time the physical surveyors have to complete the fieldwork of the physical surveys. Instead of reissuing

unproductive addresses, interviewers are required to make a comparatively high number of calls at each address to contact the occupants and attempt to secure an interview.

3.26 All participating households were given a £10 gift card at the end of the interview as a token of appreciation. A new visual aid was produced for interviewers in 2013-14 to show respondents some examples of how the EHS data is used. This was designed to be used by interviewers on the doorstep to encourage respondents to take part.

Surveyor appointments

3.27 Interviewers are also responsible for gaining consent from those households eligible for the physical survey. The approach to making appointments is kept under close review in order to maximise the consent rate. Information about the appointment times/preferences is transferred from NatCen Social Research to a secure CADS Housing Surveys website and CADS Helpline staff assist in changing and confirming arrangements between the surveyors and respondents for the physical inspection.

3.28 Interviewers are asked to make a firm, timed appointment wherever possible using information about the surveyor's availability. The interviewers are provided with a list of dates and 59-minute 'slots' when their surveyor has indicated they are available. This information is built into the CAPI interview programme. Surveyors are also able to provide daily notes about each of their available days and overarching notes about their general availability and preferences for working. Those notes are also displayed on the interviewers' laptop.

3.29 The surveyor's availability is updated each night during the fieldwork period. Interviewers obtained current availability, plus details of any existing appointments allocated to their surveyor, each time they connect with NatCen Social Research's servers, which they are instructed to do before starting work and when finishing work each day.

3.30 Interviewers and surveyors are encouraged to speak to each other before interviewer fieldwork commenced to discuss any issues there may be on availability and booking appointments for the physical survey. Interviewers and surveyors are also provided with reciprocal contact details so that they can discuss work patterns and scheduling preferences if necessary.

3.31 As part of their training, interviewers are briefed on how to explain the physical survey to respondents and arrange the appointment for the surveyor to visit. Interviewer training include:

- the surveyor fieldwork periods;

- transfer of information about appointments between CADS and NatCen;

- how to make appointments and what to take into account when making them;

- how to gain agreement from respondents for the physical survey; and

- a practice of the booking appointment section of the CAPI program.

Interview survey data collection

3.32   The contents of the interview survey is reviewed annually (see Chapter 2 for more detail). NatCen and DCLG thoroughly check all new and revised questions in the CAPI program before the beginning of fieldwork, including:

- question and answer texts
- all routing alternatives
- textfills inserted into the CAPI programme to customise the questions
- checks built into the CAPI programme to improve the accuracy of data collected during the interview

3.33   The data for the first wave are also checked to ensure that the new/revised questions are working properly.

3.34   The data collection process for the interview survey is as follows:

- interviewers conduct a computer-assisted personal interview (CAPI) with the household reference person (HRP) or their partner using a laptop
- interviewers upload the survey data to NatCen
- interviews are checked and edited where necessary by a team of editors. For example, if an interviewer writes an electronic note using the CAPI programme saying they are unsure how many bedrooms there are, the editor will look at the note and check it against the criteria for bedrooms and correct the answer if it is wrong.

Physical survey data collection

3.35   The data collection process for the physical survey is as follows:

- Surveyors conduct the survey using a paper form designed to be used with a digital pen. They also take photographs of the outside of the property using a digital camera.
- The paper form features a series of small black dots arranged in a special non-repeating pattern (the Anoto pattern) which can be read by a digital pen which features an inbuilt digital camera. Every page has a unique Anoto pattern. As the pattern on each page is unique and non-repeating, the camera in the pen can determine the page the pen is on as well as the exact position of the pen as it writes across each page. During a survey the digital pen's inbuilt camera collects data by recording the position of the pen, captures and stores digital snapshots of the pen marks across the Anoto pattern.
- After the survey, surveyors upload the survey data to a dedicated website which displays the data as a facsimile of each page for the surveyor to check and correct electronically. An extensive series of validation checks on range, plausibility and consistency have been developed which enable surveyors to validate their own survey before submitting it to their regional manager.
- Photographs of the properties surveyed are added to the website.
- Corrected data are submitted to their regional manager for final checking and, if necessary, returned to the surveyor for correction or clarification via the website.
- The checked data are forwarded to BRE by regional managers for consolidation with the rest of the EHS results.
- An additional stage of checking was introduced for 2013-14 whereby all forms that would have previously been submitted to BRE with one or more 'error' messages were filtered and subjected to further checks by the CADS Survey Director. The aim of these additional checks was to reduce the numbers of forms being passed to BRE with errors. In 2014-15, only 5 completed full surveys retained legitimate system errors when passed to BRE for further data validation and acceptance testing. More information on data validation can be found in section 5.4 of Chapter 5 'Data Processing'.

3.36   The subjective nature of some assessments required for the physical survey means that a degree of variability is inevitable between surveyors in some of their judgements. To minimise the impact that any one surveyor can have on the results of any one area or type of property an annual upper target of 65 is set on the number of surveys any one surveyor can complete. An additional

restriction is set relating to work within any one region, such that no one surveyor should complete more than 45 full surveys in any region (a limit of 36 exists for the North East as less physical surveys are conducted in this area compared with other regions). These rules help to minimise bias within the survey and to provide more robust measures of housing condition below the national level. In 2014-15, 86% of surveyors did not exceed any Regional target and 99% of surveyors did not exceeded the annual upper target of 65 full surveys.

3.37   In 2014-15, a calibration exercise was undertaken to detect any variability that arises from surveyors making different judgements given the same information. Results from the 2014-15 exercise showed no significant difference overall in the surveyors' assessments of repair costs, the overall distribution of which remained similar through 2001 to 2009-10. The next scheduled calibration exercise is due to be undertaken in 2018-19 under the next EHS contract. . More detail on the rationale, process and how those exercises have informed previous years of the survey can be found in the 2011-12 technical advice note on data quality, published on the DCLG website: https://www.gov.uk/government/publications/english-housing-survey-technical-advice.

3.38   To provide further insight into the effects of systematic surveyor variability on the precision of estimates from the physical survey, a Surveyor Variability Study (SVS) is routinely undertaken. This exercise was also conducted in 2014-15 the study involved a call-back exercise in which 300 properties were surveyed again by a second surveyor and the results were compared. The analysis is currently ongoing and a report is due Autumn 2016. The findings will be summarised in the 2015-16 Technical report. More information on the previous SVS survey can be found in the 2009-10 SVS summary report, published on the DCLG website: https://www.gov.uk/government/publications/english-housing-survey-technical-advice.

Annex 3.2: **Advance Letters**

Advance letter (generic version, front page)

Department for
Communities and
Local Government

ENGLISH
HOUSING
SURVEY

Help improve homes for family, friends and neighbours in your area

Dear Sir or Madam,
You've been selected to take part in the English Housing Survey – we hope we can count on your help in this important survey.

Each year a number of people are chosen at random from across the country to be interviewed, so this is a unique chance to put forward your views about homes in your area.

From reducing our carbon emissions to helping young people get a foot on the housing ladder – the survey will help shape the future of housing in your area. So you could end up helping your neighbours, family and friends.

What's next?
One of our interviewers will call at your house in the next week or so. So you know who they are, they all carry a photo ID.

Any questions?
If you have any questions, please call us on freephone **0800 652 4572** or visit **www.natcen.ac.uk/taking-part/ehs**

Thanks for your help
As a thank you, we will give your household a high street gift voucher when you take part. Your help will really give us a better understanding of the housing situation in England today, so thanks again for playing such an important part.

Yours Sincerely,

Sarah Allcock
Project Coordinator,
English Housing Survey

NatCen
Social Research that works for society

NatCen Social Research, Kings House, 101-135 Kings Road, Brentwood, Essex CM14 4LX Tel. 0800 526 397. Company limited by guarantee. Reg No. 4392418. A Charity registered in England and Wales (1091768) and in Scotland (SC038454)   GenV1

Advance letter (social rented, front page)

Department for
Communities and
Local Government

ENGLISH
HOUSING
SURVEY

The Householder
<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

<Post_Date>
Reference no.:P93173/<SerialNumber><CL1>

One chance to help improve homes and housing around <sector_name>

Dear Sir or Madam,

You've been selected to take part in the English Housing Survey – we hope we can count on your help in this important survey.

Each year a number of people are chosen at random from across the country to be interviewed, so this is a unique chance to share your opinions on homes in your area. Your views could help influence government policies around <sector_name>.

From giving a helping hand with fuel bills to helping improve poor housing conditions – the survey will help shape the future of housing around <sector_name>. So you could end up helping your neighbours, family and friends.

What's next?
One of our interviewers will call at your house in the next week or so.
So you know who they are, they all carry a photo ID.
<Intv_Caption> < Intv_NAME>

Any questions?
If you have any questions, please call us on freephone **0800 652 4572** or visit
www.natcen.ac.uk/taking-part/ehs

Thanks for your help
As a thank you, we will give your household a £<voucher> voucher when you take part.
Your help will really give us a better understanding of the housing situation in England today, so thanks again for playing such an important part.

Yours Sincerely,

Sarah Allcock
Project Coordinator,
English Housing Survey

NatCen
Social Research that works for society

NatCen Social Research, Kings House, 101-135 Kings Road, Brentwood, Essex CM14 4LX Tel. 0800 526 397. Company limited by guarantee.
Reg No. 4392418. A Charity registered in England and Wales (1091768) and in Scotland (SC038454)

SocV1

Advance letter (private rented and owner occupier, front page)

Department for
Communities and
Local Government

ENGLISH HOUSING SURVEY

The Householder
<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

<Post_Date>
Reference no.:P93173/<SerialNumber><CL1>

Help improve homes for family, friends and neighbours around <sector_name>

Dear Sir or Madam,

You've been selected to take part in the English Housing Survey – we hope we can count on your help in this important survey.

Each year a number of people are chosen at random from across the country to be interviewed, so this is a unique chance to put forward your views about homes around <sector_name>.

From reducing our carbon emissions to helping young people get a foot on the housing ladder – the survey will help shape the future of housing around <sector_name>. So you could end up helping your neighbours, family and friends.

What's next?
One of our interviewers will call at your house in the next week or so.
So you know who they are, they all carry a photo ID.
<Intv_Caption> < Intv_NAME>

Any questions?
If you have any questions, please call us on freephone **0800 652 4572** or visit **www.natcen.ac.uk/taking-part/ehs**

Thanks for your help
As a thank you, we will give your household a £<voucher> voucher when you take part.
Your help will really give us a better understanding of the housing situation in England today, so thanks again for playing such an important part.

Yours Sincerely,

Sarah Allcock
Project Coordinator,
English Housing Survey

NatCen
Social Research that works for society

Priv/OwnV1

Advance letter (back page of all versions)

How did you choose my address?

We chose your address at random from the Postcode Address File. This file is held by the Post Office and is available to the public.

What will happen to any information I give?

We will treat information you give in the strictest confidence under the Data Protection Act 1998. The results collected are used for research purposes only and no one looking at the findings will be able to identify you in any way. Your information will be used by the Department for Communities and Local Government (DCLG), and their counterparts in the Department of Energy and Climate Change (DECC), for the production of statistics only.

Who is carrying out the study?

NatCen Social Research carries out the study which is funded by the Department for Communities and Local Government. NatCen is independent of all government departments and political parties. For more information about NatCen Social Research visit **www.natcen.ao.uk**

What is the interview about?

The interview covers a range of topics including your housing circumstances, satisfaction with your accommodation and neighbourhood, and energy efficiency in your home.

Where can I find out more?

See the enclosed leaflet, visit **www.natcen.ao.uk/taking-part/ehs** or phone us free on **0800 652 4572**.

Where can I spend my voucher?

Your voucher is a gift card which you can spend at a range of high street shops, such as Argos, Debenhams and Boots.

Annex 3.3: Leaflets

Interviewer (main survey) leaflet (Q1)

The English Housing Survey

This leaflet answers some of the questions you may have about taking part in this study.

? What is the English Housing Survey?

The English Housing Survey (EHS) is conducted by NatCen Social Research on behalf of the Department for Communities and Local Government (DCLG), the department responsible for developing government housing policy in England.

The study is the main source of information on people's housing circumstances and the condition of housing in England. It collects up-to-date information from all types of households — whether they are owner-occupiers or rent from a local authority, housing association, or private landlord. The EHS is conducted throughout the year across England.

All sectors of society are represented, ensuring that the study results reflect the population of the country.

? Who are NatCen Social Research?

NatCen Social Research are an independent, non-profit institute with a core team of over 150 research specialists and 1,200 interviewers. Last year we developed more than 75 social research reports for government, educational bodies, charities and

responsible businesses. At NatCen Social Research we believe our work has the power to make people's lives better.

? Why does this study matter?

The study results are used by the government to assess how housing circumstances vary across the country and between different types of household.
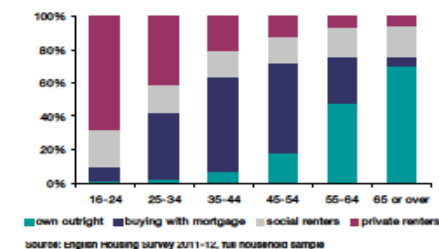
This information helps to:

- measure whether housing conditions are getting better or worse, and how satisfied people are with their home and neighbourhood;

- understand whether housing is affordable, both for renters and private owners;

- show whether the steps taken to improve energy efficiency and cut carbon emissions in both public and private housing are working; and

- target housing policies and resources. The study's results are used to ensure that funding is directed to the people and regions where it is most needed.

More information about the study is available from the DCLG web site:
www.gov.uk/government/organisations/department-for-communities-and-local-government/series/english-housing-survey
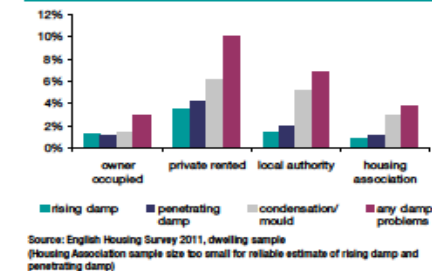
The study's results

The study's results are also used by housing Associations, non-governmental organisations, surveyors, universities and others. Here are two examples of results:

Tenure split within age group of householder, England, 2011-12

own outright   buying with mortgage   social renters   private renters

Source: English Housing Survey 2011-12, full household sample

Percentage of homes with damp problems, by tenure, 2011

rising damp   penetrating damp   condensation/mould   any damp problems

Source: English Housing Survey 2011, dwelling sample
(Housing Association sample size too small for reliable estimate of rising damp and penetrating damp)

Is the study confidential?

Yes. Information you give us is treated as strictly confidential as directed by the Code of Practice for Official Statistics and the Data Protection Act. It will be used by the Department for Communities and Local Government (DCLG), and the Department of Energy and Climate Change (DECC), to produce anonymous statistics that will not identify you or anyone in your household. These anonymous statistics are analysed by government and other approved organisations, such as universities, non-governmental organisations, and surveyors. For further details see DCLG's EHS Data Security Strategy on their website.

Why did we choose you?

As it is not possible to ask everyone to take part in the study, a selection of addresses is selected to represent the entire country. Your address is one of these and was selected at random from a list of postal addresses held by Royal Mail.

You are important for the study because the random sample will give a true cross-section of the community. We are interested in people from all age groups, all parts of the country, and all types of homes.

We cannot substitute another address for yours as this would bias the sample's results, so your contribution is very important to the study. By taking part you help us provide an accurate picture of how changes in the economy and government policy affect you and your community.

Contact us

If you have any queries about taking part in this study, please call our freephone Survey Enquiry Line on 0800 652 4572.

Alternatively, you can write to:

NatCen Social Research
Operations Department
101-135 Kings House
Kings Road
Brentwood
Essex
CM14 4LX

Thank you for your help.

To find out more about NatCen Social Research, visit our website: www.natcen.ac.uk/about-us

Department for Communities and Local Government

NatCen
Social Research that works for society

Interviewer leaflet_v4

ENGLISH HOUSING SURVEY

Why your help is important

www.natcen.ac.uk

Physical Survey leaflet (Q1)

The survey team comprises:

Department for
Communities and
Local Government

The Department for Communities and Local Government (DCLG) is the
government department that sponsors the EHS to collect information on
changing trends in housing, the condition of the housing stock and the
characteristics of households living in different types of housing.
www.gov.uk/government/organisations/department-for-communities-and-
local-government/series/english-housing-survey

NatCen
Social Research that works for society

NatCen Social Research are an independent, non-profit institute, working for
government, educational bodies, charities and responsible businesses. NatCen
Social Research are conducting the household interview part of the study.
www.natcen.ac.uk

CADS
Housing Surveys

CADS Housing Surveys will be conducting the visual inspection of the property
using professional surveyors qualified to assess housing conditions and energy
efficiency.
www.cadesignservices.co.uk

Your appointment with the surveyor is:

Date: ─────────────────────

Time: ─────────────────────

Name of surveyor: ──────────────

EHS Helpline: 020 3131 3179

Physical survey leaflet_v4

**ENGLISH
HOUSING
SURVEY**

Explaining the
surveyor's visit

Physical Survey leaflet_Y2Q5_Draft.indd 1   06/03/2013 18:17:32

Leaflet for owner occupiers a slightly modified version was sent to addresses anticipated to be renters.

How the English Housing Survey makes a difference

The information collected can help give the Government a clearer picture of the state of homes and housing in England. This means they can make more informed decisions - so resources are better used to help home owners and tenants.

Help for first time buyers
We all know it's hard for young people to buy their first home. Our research helps highlight to the Government the size of the problem. From 2013, with the Help to Buy scheme, first time buyers are now able to secure a special government loan to help them get a foot on the housing ladder.

Measuring our carbon footprint
The English Housing Survey (EHS) allows us to estimate the carbon footprint of houses and flats. This means Government can predict the contribution improvements in housing make to the national CO2 reduction targets.

Adaptations to remain in the home
England has an ageing population. This study identifies the type and scale of adaptations that are needed to allow people to remain in their own homes for as long as they want.

For more information

Freephone 0800 652 4572
Or visit www.natcen.ac.uk/taking-part/ehs
Email: info@natcen.ac.uk

NatCen have been carrying out high quality social resea
non-profit organisation, independent of all government

A Company Limited by Guarantee Registered in England
A Charity in England and Wales (1091768) and Scotland

NatCen
Social Research that works for society

How attached to your home are you?
61% of homeowners have lived in their property for over 10 years, compared to **just 9%** of those renting from a private landlord.

Content with y
It turns out most of us
87% of the nation sayi
neighbourhood.

Getting on the ladder
It's tough getting on the housing ladder these days.
Only 10% of homeowners are aged under 35. **<35**

Chapter 4
Response rates

The target response rate for the 2014-15 English Housing Survey (EHS) was 60%. This chapter provides details of the final response rates and information on action taken to maximise response.

Overview

4.1   The target response rate for the EHS is set by the Department for Communities and Local Government (DCLG). It is monitored closely by NatCen through analysis of electronic data reports and direct contact between interviewers and their team leader. NatCen sets and monitors targets for coverage within each wave and monitors response at an area and interviewer level. When response rates fall below the target, remedial action is taken.

Interview survey

4.2   In 2014-15, interviews were achieved at 13,174 households. This represents a response rate of 54.5%. More details on the response rate to the EHS interview survey in 2014-15 are provided in Table 4.1.

4.3   Of these 13,174 interviews, 80% were conducted with the household reference person (HRP), 19% with the HRP's partner and 1% with a proxy respondent, Annex Table 4.3.

Table 4.1: Interview survey response rate, 2014-15

All issued households

	Number (N)	Issued cases (%)	In-scope cases (%)
Total issued addresses	**25,980**		
Not yet built/under construction[1]	30	0.1	
Demolished/derelict[1]	59	0.2	
Vacant/empty or derelict housing unit	958	3.7	
Non-residential address[1]	421	1.6	
Address occupied - no resident household[1]	199	0.8	
Communal establishment/institution[1]	48	0.2	
Other ineligible[1]	73	0.3	
total ineligible addresses	**1,788**	**6.9**	
Total in-scope addresses	**24,192**	**93.1**	
Not issued			
Issued, but not attempted	9	0.0	0.0
Inaccessible	19	0.1	0.1
Unable to locate address[1]	77	0.3	0.3
Unknown whether residential: Info refused	4	0.0	0.0
Unknown whether residential: no contact	50	0.2	0.2
Residential but unknown eligibility : info refused	7	0.0	0.0
Residential but unknown eligibility : no contact	93	0.4	0.4
Other unknown eligibility	31	0.1	0.1
Info refused about whether address is residential	2	0.0	0.0
Contact but no confirm if address is residential	4	0.0	0.0
Info refused whether resident(s) are eligible	15	0.1	0.1
Eligibility not confirmed: language barrier	15	0.1	0.1
Other unknown eligibility	32	0.1	0.1
Total unknown eligibility	**358**	**1.4**	**1.5**
Office refusal	676	2.6	2.8
Information refused on no. of dwellings	135	0.5	0.6
Information refused on no. of households	119	0.5	0.5
Can't identify target respondent(s): info refused	251	1.0	1.0
Refusal before interview: by selected respondent	5,421	20.9	22.4
Proxy refusal	122	0.5	0.5
Refusal during interview (unproductive partial)	37	0.1	0.2
Broken appointment, no re-contact	1,044	4.0	4.3
Total refusals	**7,805**	**30.0**	**32.3**
No contact with anyone at address	1,533	5.9	6.3
Multi dwellings - No contact made with selected dwelling	13	0.1	0.1
No contact with responsible adult	228	0.9	0.9
Contact made at dwelling, but not from selected household	81	0.3	0.3
Total non-contact	**1,855**	**7.1**	**7.7**
Ill at home during survey period: Head Office	13	0.1	0.1
Ill at home during survey period: Interviewer	186	0.7	0.8
Away or in hospital all survey period: Head Office	31	0.1	0.1
Away or in hospital all survey period: Interviewer	265	1.0	1.1
Physically/mentally unable/incomp: Head Office	28	0.1	0.1
Physically/mentally unable/incomp: Interviewer	262	1.0	1.1
Language difficulties: Head Office	12	0.0	0.0
Language difficulties: Interviewer	153	0.6	0.6
Lost productive	3	0.0	0.0
Interview achieved but resp requested data deleted	6	0.0	0.0
Other unproductive	41	0.2	0.2
Total other unproductive	**1,000**	**3.8**	**4.1**
Full interview	13,169	50.7	54.4
Partial interview	5	0.0	0.0
Total interviews	**13,174**	**50.71**	**54.5**

notes:

1) **For the purposes of sampling, these cases are considered out of scope of the EHS.**

Physical survey

4.4   Not everyone who takes part in the interview survey is eligible to take part in the physical survey. Cases eligible[9] for the physical survey are identified by the computer-assisted personal interviewing program as part of the interview survey. Interviewers are then responsible for securing the consent of the householder to a physical survey. The interviewer explains the purpose of the survey and describes briefly what it will involve. If the respondent is willing, the interviewer arranges a fixed appointment for the physical survey. The interviewer is provided with the times the surveyor is available on their laptop computer to help make the appointment.

4.5   Of the 9,512 interviewed households eligible for the physical survey, 74% agreed to have a physical survey, which is below the target of 80%.

4.6   In 2014-15, 6,103 physical surveys were achieved. Of these, 5,901 were surveys in occupied properties. This represents 84% of households which agreed to a physical survey at the interview. This response missed the 85% conversion rate target.

4.7   The remaining 202 surveys were conducted at vacant or derelict addresses. This represents 28% of the vacant addresses eligible for a physical survey. This is below the target of 30% conversion rate for such properties. More details on the response rate to the physical survey for the EHS in 2014-15 are provided in Table 4.2.

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[9] See Chapter 1 on sub-sampling for more information on how addresses are deemed eligible for the physical survey.

Table 4.2: Physical survey response rate, 2014-15

all addresses eligible for physical survey

	Number (N)	Cases eligible for PS (%)	(Cases agreed to PS at IS (%)
Occupied addresses			
Total occupied addresses eligible for physical survey	**9,512**		
Eligible but refused appointment at interview	2,460	25.9	
Eligible and agreed appointment at interview	7,052	74.1	
Total unproductive	**1,151**	**12.2**	**16.3**
Incomplete survey	2	.0	0.0
Refusal on doorstep	277	2.9	3.9
Refusal to HQ	632	6.6	9.0
Household missed appointment	23	.2	0.3
Not referred for PS- eligible but non/late transmission	3	.1	0.0
Speculative call - no contact	199	2.1	2.8
Other reason for non-survey	15	.2	0.2
Full survey (paired cases)	**5,901**	**62.0**	**83.7**
Vacant/derelict addresses			
Total vacant/derelict addresses eligible for physical survey	**722**		
Eligible but refused appointment at interview	42	8.2	
Total unproductive	**474**	**65.7**	**69.7**
Incomplete survey	2	.4	0.3
Refusal on doorstep	138	27.0	20.3
Refusal to HQ	41	8.0	6.0
Household missed appointment	4	.8	0.6
Surveyor missed appointment	~	~	~
Spec call no contact	236	46.1	34.7
Address untraceble	1	.2	0.1
Other reasons for non survey	52	9.4	7.6
Survey achieved (vacant)	198		
Survey achieved (derelict)	4		
Total vacant/derelict physical surveys achieved	**202**	**28.0**	**29.7**
Total physical surveys achieved	**6,103**	**59.6**	**78.9**

Notes:
1) for the occupied addresses the cases eligible for a physical survey is the total occupied addresses eligible for the physical survey; and the cases agreed to a physical survey at interview survey is the total occupied addresses who agreed to have a physical survey at the interview.
2) for the vacant addresses the cases eligible for a physical survey is the total vacant addresses eligible for the physical survey; and the final column is the percentage out of all the eligible occupied addresses excluding those who refused an appointment at the interview stage (not all the vacant addresses were contacted at the interview stage so did not have the chance to refuse).
3) the cases eligible for a physical survey is all the occupied and vacant addresses eligible for the physical survey; and the cases agreed to a physical survey at the interview survey is all the occupied and vacant addresses who did not refuse to have a physical survey at the interview stage
4) A small number of unproductive cases in categories 'no longer usable as dwelling', 'dwelling demolished' and 'dwelling derelict' have been added to the 'other reasons for non survey' category.

Chapter 5
Data processing

Overview

5.1   This chapter outlines English Housing Survey (EHS) data processing procedures and gives information about the main derived variables and data outputs. The EHS has a number of quality assurance measures in place which are undertaken throughout the annual survey process, beginning at the point of data collection, both through the computer-aided personal interviewing (CAPI) system and through surveyors validating their forms using the online system developed by BRE (details below). As the data are collated, processed and modelled, additional validation procedures are undertaken.

Editing

Interview data

5.2   The CAPI program has numerous built-in checks for identifying obvious discrepancies so that they can be resolved by the interviewer during the interview. The discrepancies are resolved by either correcting a data entry error or by clarifying a response directly with the respondent. The CAPI checks include:

- range checks – e.g. if an unusually high/low weekly rent is entered

- conflicting answers to different questions – e.g. if the number of years living in the current accommodation is greater than the respondent's age

5.3   There are two types of checks:

- hard checks – where the interviewer cannot continue with the interview until they have changed the data entered in some way to remove the inconsistency. Hard checks are used when the inconsistency is impossible as with the example of the number of years living in current accommodation being greater than the respondent's age.

- soft checks (signals) – where the interviewer is told about the error but they can ignore it and move on to the next question. Soft checks are used when an answer is unlikely but not impossible, e.g. if a respondent says they have more than 5 bathrooms. These checks are used to get the interviewer to confirm that the answer is correct and is not a data entry error, checking the answer with the respondent if appropriate.

Physical survey data

5.4   For the physical survey, a system of automatic data validation was introduced in 2008 as part of the move to using digital pens to collect the data. The process is subject to continuous development and operates in three stages.

5.5   First, a large number of checks are built into the EHS surveyors' website as surveys are uploaded. These include:

- range checks – where the entered answer falls outside a valid range of responses

- logic checks – where a combination of responses to certain questions are not logically consistent (e.g. to check that the sum of 'tenths of area' across rows added up to ten)

- consistency checks – to determine whether linked responses in different parts of the form are consistent with each other (e.g. that detailed room data is only entered where a room coded as existing), and

- plausibility checks – to determine whether a response is reasonable given that there is not a well-defined range of possible answers (e.g. ceiling height of a room entered as 24 metres instead of 2.4 metres)

5.6   Surveyors also visually check all pages to ensure that the digital pen entries mirror those on the paper form i.e. that handwritten numbers have not been misinterpreted by the software.

5.7   Second, the CADS Housing Surveys Regional Managers check the data and where necessary discuss with surveyors to agree on a final set of responses.

5.8   Once all EHS physical surveys have been submitted by the surveyors for the survey year, BRE undertakes further consistency and plausibility checks on the raw physical survey data. The purpose of these checks is, firstly, to detect and eliminate certain logical inconsistencies that would cause problems for modelling and, secondly, to identify highly implausible answers, which if deemed necessary after investigation, are corrected. In some cases the raw EHS physical survey data are altered following these consistency and plausibility checks as outlined below.

- Levels checks – data may be inconsistent with regard to the number of storeys in the building, and the floor occupied by the dwelling. The BRE checks test for the following possible errors:

    o   a room on a floor that does not exist (e.g. 3rd floor of a three storey block, the 3 floors being recorded as ground, first and second)

    o   a room on a level that is not part of the flat (e.g. room on the 3rd floor but flat on the 2nd floor)

- a measured floor that is not part of the block (e.g. dimensions for 3rd floor when the dwelling only has three storeys)

- a flat on a level that does not exist (e.g. flat on the 3rd floor when the module only has three storeys)

- presence of a habitable attic/basement is inconsistent with the number of floors

- Plausible dimensions – checks are carried out on the dimensions, to identify any floor area that seems too large or too small. Where a reliable measurement is missing, BRE will attempt to work out the data from any measurements thought to be correct, or failing this by estimating the dimensions as best as possible from the photographs.

- Non-permissible values – on rare occasions a surveyor response may happen to be equal to a value that is reserved for special purposes. The numbers 77, 88 and 99 are reserved to indicate the section not applicable, question not applicable, or unknown. When these figures occur as real measurements or counts, they are reduced by one.

- Incorrect number of flats – the dimensions of the surveyed flat are checked against the total floor area of the survey module to identify if the number of flats per module seems realistic.

- Incorrect roof type – certain roof types (chalet and mansard) can only occur where the dwelling has an attic. On occasions surveyors may mistake steep pitched roofs for chalet roofs. In this situation, the data for pitched and chalet roofs are swapped over.

- Implausible wall and window areas/fenestration ratio – where a dwelling seems to have a wall or window area/fenestration ratio that is either too high or too low the data are checked. The surveyor's judgement is deemed correct unless there is clear evidence (e.g. from photographs) to amend the data.

- Wall thickness – cases are identified where the wall thickness as measured by the EHS surveyor is not typical of the wall selected i.e. cases where the EHS surveyors' website has triggered a wall thickness range check. Each case is checked by viewing the EHS surveyors' website and looking at the details recorded on the physical survey form in conjunction with the photos/EHS surveyor comments. Based upon the information gained, the action is decided upon for each case. This could be no action required or it could be that the physical survey data looks incorrect, either the wall thickness value or the way the surveyor has coded something as wall that should not be counted as wall. Where required, the appropriate modifications are applied to the physical survey data.

- Heating system consistency checks – cases which contain inconsistent heating system data on the physical survey form are flagged in the

validation process at BRE. Each case is checked by returning to the raw data; in cases where alterations can confidently be made, the data are modified accordingly.

Comparison edits

5.9   A further important quality check involves comparing interview survey data with the corresponding physical survey data for each case. The first step is a series of global edits to resolve particular discrepancies in the data, e.g.

- If tenure in the interview survey (IS) = owner occupied AND tenure in the physical survey (PS) = another tenure then the PS tenure was changed to owner occupied.

- If tenure in the interview survey (IS) = renting from local authority AND tenure in the physical survey (PS) = another tenure then the PS tenure was changed to renting from local authority.

5.10   The remaining discrepancies between the two parts of the survey are flagged, investigated and recoded where applicable. This process is carried out in order to:

- check that the correct sampled dwelling was visited at both the interview survey and the physical survey, and

- correct any inconsistencies in key variables (e.g. tenure or property type) between the two different parts of the survey. Where possible other information from the survey (e.g. other variables, interviewer's and surveyor's comments, photo of the property) is checked to help decide what information is correct.

Houses in multiple occupation (HMO) edits

5.11   An HMO is a property rented by more than one person who are not from one 'household' (e.g. a family) but share facilities like the bathroom or kitchen. These differ from a shared house in that the residents generally have separate tenancy agreements and usually have begun their tenancies independently of each other. The identification of HMOs is critical in order to help ensure the accuracy of the weighting for the sample dwelling. The procedure for monitoring, reconciliation and validation of cases which have been flagged as HMOs by NatCen Social Research interviewers and/or CADS Housing Surveys surveyors is described below.

5.12   Cases are flagged as HMOs depending upon responses to certain key questions in the household questionnaire. Interviewers are trained in applying the EHS household definition and assessing the type of occupancy in complex situations, particularly in making the distinction between a group of sharers forming one household and separate households sharing facilities. Where necessary, reference is made to a check list of supplementary

questions on the HMO Rules Card issued to interviewers (Annex 5.1) to help determine whether an address should be classified as an HMO.

5.13   Where the responses to the interview questions lead to the dwelling being flagged as an HMO or possible HMO, and the dwelling is eligible for a physical survey, the CADS Housing Surveys Regional Manager is notified. The Regional Manager will contact the interviewer to discuss the layout and occupation of the premises. The purpose of this contact is twofold:

- to confirm, as far as possible, that the address is an HMO for EHS purposes, and

- to determine whether the case is one that should be visited by the Regional Manager personally, as a complex HMO, or whether it should be allocated to a surveyor.

5.14   There will be occasions when a physical surveyor considers that a referred address appears to be an HMO despite not being flagged as such by the NatCen Social Research interviewer. In such cases, the surveyor will treat the case as an HMO, and a reconciliation process is applied to the interview and physical data during the final data validation stage.

5.15   CADS Housing Surveys Regional Managers compile and maintain a database of all cases they know to be HMOs. These cases, along with cases flagged as HMOs at the interview survey but which did not have a subsequent physical survey, are reviewed by BRE for data validation as part of the comparison edits process. The HMO checking process also includes cases that were not identified as HMOs at interview survey but which the data suggest could potentially be HMOs. BRE checks relevant interview and physical survey data such as number of households (NumHhld) and number of accommodation units (AcNumber). Where there are inconsistencies further investigation is undertaken and the data altered to the correct values.

5.16   During the HMO comparison process BRE also derives the ratios of addresses to dwellings and dwellings to households. This information is required to ensure the correct numbers of dwellings and households are used in the production of weights. As part of the QA process, DCLG conducts spot checks on these ratios as well as the HMO edits resulting from the process above.

5.17   A record of all address changes are kept by interviewers and/or Regional Managers for HMO cases as part of a comprehensive system for recording address changes for all issued cases. This feeds into the address file supplied to DCLG at the end of fieldwork.

Coding

5.18   After the interview, the data are coded and edited by trained coders and editors at NatCen Social Research. An edit programme is utilised by these staff to code open answers and back-code responses as appropriate. For example, at the interview, respondents are asked how they pay for their electricity (question HmpyElec2), and the respondent is shown eight possible answers (e.g. direct debit) on a card. If their payment method is not on the list the interviewer will code 'other' and is asked to enter the details of the payment method at a follow up question (Hmelothr). After the interview, the coder will look at the details given at Hmelothr and check it against the eight answer codes to see whether it could be classified as one of these payment methods and if it can they will change the answer as appropriate (i.e. backcode the answer). Job details are coded to the Standard Occupation Classification (SOC) and the Standard Industry Classification (SIC).

5.19   Errors detected by the edit programme are resolved by referring back to the original questionnaire documents by experienced editors. Individual corrections are made to the data and the corrected data are rerun through the edit programme until it confirms that the data are clean. Queries arising from the coding and editing process are recorded in a standardised way and these are examined by the supervision team on completion of each batch of work to ensure that they have been carried out correctly.

5.20   After the coding and editing stage further internal consistency checks on the data are carried out by a data manager and the data are corrected where appropriate.

Derived variables

5.21   Derived variables are created either by simply recoding a particular survey question or by combining the information collected from a number of questions, which can involve complex modelling. Examples of basic derived variables include dwelling age and dwelling type and examples of complex derived variables include basic repair costs, usable floor area and energy efficiency rating. The derived variables and geo-demographic variables, such as region, rurality and Index of Multiple Deprivation, included in the key EHS derived datasets interview.sav, physical.sav and general.sav can be found in Annex 5.2.

5.22   In addition to the three key EHS derived datasets, further detailed derived files such as actual costs.sav, energy performance.sav and HHSRS.sav are available on the EHS database, as listed in Table 5.1.

5.23 Further details on the derivation of these derived and detailed variables are available in the EHS Data Dictionary, made publicly available via the UK Data Archive (http://ukdataservice.ac.uk/).

5.24 The EHS derived variables are included in the datasets deposited at the UK Data Archive. To comply with the data disclosure control guidance issued by the Government Statistical Service, some of the variables are released under the more restricted Special Licence rather than through the End User Licence. The further detailed derived files are also available only via the Special Licence. In addition, the very disclosive geo-demographic variables (local authority and postcode) are available only through the Archive's Secure Data Service.

Modelling

5.25 The derivation of some of the derived variables involves complex modelling. A detailed description of how the more complex derived variables are defined and modelled is covered in Annexes to this chapter:

- Annex 5.3: Accessibility indicators

- Annex 5.4: Household derived indicators

- Annex 5.5: Housing conditions

- Annex 5.6: Energy efficiency

- Annex 5.7: Dimensions

- Annex 5.8: Poor quality environments

Imputation

5.26 As part of the modelling processes, it is sometimes necessary for any missing data to be substituted with imputed values. The imputation of missing data is more prevalent with the interview survey data than the physical survey data. This is because the interview survey data are based on information provided by the householder who can choose to refuse questions or who may not know the answer to particular questions leading to missing values. The physical survey data are based upon a physical inspection of the property and there are only a few sections of the physical survey form where the trained surveyor can select 'information unknown' as an option; the most notable is the loft inspection, where surveyors cannot always obtain access.

5.27 Imputation of data also takes place in the modelling of derived variables where a value provided in the raw data falls outside of consistency/plausibility checks. Such values are interrogated and only changed when it is almost

certain that the data are incorrect. See Annexes 5.3, 5.4, 5.5, 5.6, 5.7 and 5.8 for further details.

5.28 Examples of imputation that occurred in the modelling of EHS 2014-15 derived variables are as follows (figures are based upon weighted data):

- In the modelling of the derived variables from the EHS 2014-15 interview survey, 40% of the full sample had some form of income imputation (the highest imputation rate of all of the derived variables due to the sensitive nature of the questions), 13% of renters had weekly rents imputed and 14% of households with a mortgage had their weekly mortgage payments imputed. These imputations were due to a combination of missing raw data and implausible values. The 40% figure for imputation of income includes any change to any component of household income. This may only be to change the amount received from a particular benefit by a very small amount, which would not significantly impact the total household income.

- In the modelling of derived variables from the EHS 2014-15 physical survey on the dimensions of the property e.g. derivation of floor area, external wall area etc., a total of 140 cases in the paired single year dataset had some form of alteration to the raw physical survey data following consistency and plausibility checks on the raw physical survey data.

- In the derivation of loft insulation (which also feeds into SAP12 energy modelling and the modelling of Decent Homes), for the EHS 2014-15 single year paired sample, 9% of dwellings with a loft had a value for loft insulation imputed, due to either the property having a flat roof or because no access to the loft space was possible during the physical inspection of the property. This is the largest imputation rate in the derivation of the energy efficiency rating.

5.29 Where appropriate, the EHS Annual Reports contain details on the approach used to handle the cases that are missing from the raw physical and interview data during analysis.

Data outputs

5.30 A range of EHS datasets are produced annually and released via the UK Data Archive under the End User Licence or the Special Licence, Table 5.1.

Table 5.1 List of annual datasets

Physical datasets	Interview datasets	Detailed derived datasets	Derived datasets (paired sample)	Derived datasets (full household sample)
Available via the Special Licence only			Available under both End User Licence and Special Licence	
Amenity.sav	Adapt_hhld.sav*	Actual costs.sav	general.sav	generalfs.sav
Around.sav	Adapt_person.sav*	Dimensions.sav	physical.sav	interviewfs.sav
Chimney.sav	Adaptation_hhld.sav*	Energy performance.sav	interview.sav	
Commac.sav	Adaptation_person.sav*	Full and paired sample equivalised income.sav		
Common.sav	Attitudes.sav	HHSRS.sav		
Damppc.sav	Contact.sav	Standardised costs.sav		
Doors.sav	Disability.sav			
Dormers.sav	Dwelling.sav			
Elevate.sav	Employment.sav			
Firstimp_PS.sav	Energy.sav			
Flatdets.sav	Fire.sav			
Hhsrs.sav	Firstimp_IS.sav			
HQ.sav	HhldType.sav			
Interior.sav	Identity.sav			
Introoms.sav	Income.sav			
Numflats.sav	Owner.sav			
Plotlvl.sav	People.sav			
Roofcov.sav	Renter.sav			
Rooffeat.sav	Rooms.sav			
Roofstru.sav				
Services.sav	Vacant.sav			
Shape.sav	WaitList.sav			
Shared.sav				
Structure.sav				
Wallfin.sav				
Wallstru.sav				
Windows.sav				

* The 2014 adapt and adaption interview datasets are located on the full sample files only.

5.31   The data, user guides and supporting documentation are publicly available from the UK Data Archive (http://ukdataservice.ac.uk/). Datasets can be downloaded in SPSS and SAS format.

5.32   Prior to releasing the data in the UK Data Archive, all disclosive variables are removed to maintain the confidentiality of respondents. Some response categories are also condensed, several variables are top coded, and, in a few rare situations, data swapping between cases takes place for disclosure control reasons.

Annex 5.1: **HMO rules card**

Determining Houses in Multiple Occupation ('HMOs')

The following supplementary questions will help determine whether the dwelling is an HMO. Count the number of "yes" responses to the **key questions** and **additional questions** then use the table below to determine whether the pattern of responses indicates that the dwelling is an HMO or instead identifies the dwelling as a single household/shared household (i.e. NOT an HMO).

Key questions (ranked in order):
1. Does the landlord find new tenants to fill any rooms that become vacant (as opposed to the remaining tenants fulfilling this function)?
2. Does the landlord bear the cost of any shortfall in rent if one or more tenants defaults or vacates (as opposed to the remaining tenants having to pay)?
3. Did the occupiers come to rent the house separately (as opposed to a single group of renters)?

Additional questions (not in any ranking order):
4. Do the tenants identify themselves as multiple households?
5. Is there a large group of occupiers (i.e. more than 5 persons)?
6. Is there a separate tenancy agreement for each occupant (as opposed to a joint tenancy)?
7. Do individual tenants keep their rooms locked, excluding other tenants from their accommodation?
8. Has there been a large turnover of occupiers since the commencement of the tenancy? (Say more than 40% over last 18 months.)
9. Is there a mix of different types of occupants at the premises? (e.g. they are not all students)

Pattern of responses	Meaning
6+ questions answered 'Yes'	= bed-sits (which collectively would form an HMO)
4-5 questions answered 'Yes' including at least 1 'key question'	= bed-sits (which collectively would form an HMO)
4-5 questions answered 'Yes' but not any 'key questions'	= single household/shared house (i.e. NOT an HMO)
Less than 4 questions answered 'Yes'	= single household/shared house (i.e. NOT an HMO)

Annex 5.2: **List of derived variables**

5.33   This Annex includes a full list of derived and geo-demographic variables found on the End User Licence (EUL) and Special Licence (SL) versions of interview.sav, physical.sav and general.sav files, Annex Tables 5.2.1, 5.2.2 and 5.2.3 respectively. Further details on the derivation of these variables are available in the EHS Data Dictionary, publicly available on the UK Data Archive (http://ukdataservice.ac.uk/).

Annex Table 5.2.1: interview13+14.sav and interviewfs14.sav

accomhh	type of accommodation for household (interviewfs only)	SL only
accomhh1	type of accommodation for household & if not self-contained (interviewfs only)	EUL and SL
agehrp2x	age of household reference person - 2 band	EUL and SL
agehrp4x	age of household reference person - 4 band	EUL and SL
agehrp6x	age of household reference person - 6 band	EUL and SL
agehrpx	age of HRP – continuous	SL only
agen16	number of persons under 16 in household (interviewfs only)	SL only
ageoldbx	age of oldest person in household - banded	EUL and SL
ageoldx	age of oldest person in household	SL only
agepart6x	age of partner - 6 band	EUL and SL
agepartx	age of partner - continuous	SL only
ager	report age categories (interviewfs only)	EUL and SL
AHCinceq	AHC equivalised weekly income (modified OECD scale)	EUL and SL
AHCinceqv5	AHC equivalised income quintiles (weighted by peoplegross)	EUL and SL
AHCinceqv60h	AHC: below 60% of median income (weighted by peoplegross)	EUL and SL
ALLincx	annual gross income of the HRP and partner inc. income from housing benefit and LHA	EUL and SL
amthbenx	weekly housing benefit	EUL and SL
atspaany	is any household member at state pension age?	EUL and SL
atspahrp	is hrp at state pension age?	EUL and SL
atspaprt	is partner at state pension age?	EUL and SL
bedrqx	no. of bedrooms required by the household (2006 definition)	EUL and SL
bedstdx	bedroom standard (2006 definition)	EUL and SL
BHCinceq	BHC equivalised weekly income (modified OECD scale)	EUL and SL
BHCinceqv5	BHC equivalised income quintiles (weighted by peoplegross)	EUL and SL
BHCinceqv60h	BHC: below 60% of median income (weighted by peoplegross)	EUL and SL
Buypresh	year HRP bought present accommodation (interviewfs only)	SL only
Cohabhrp	if HRP is cohabiting (interviewfs only)	SL only
Cohabprt	if HRP partner is cohabiting (interviewfs only)	SL only
emphrp3x	working status of HRP (primary) - 3 categories	EUL and SL
emphrpx	employment status (primary) of HRP	EUL and SL
empprt3x	working status of partner (primary) - 3 categories	EUL and SL
empprtx	employment status (primary) of Partner	EUL and SL

equityr	equity in home (based on respondent valuation only)	EUL and SL
equityr5	equity in home (based on respondent valuation only)	EUL and SL
ethhrp2x	ethnic origin of HRP - 2 categories	EUL and SL
ethhrp4x	ethnic origin of HRP - 4 categories	SL only
ethhrp8x	ethnic origin of HRP - 8 categories	SL only
ethprt2x	ethnic group of hrp's partner - 2 categories (interviewfs only)	EUL and SL
ethprt	ethnic group of hrp's partner (interviewfs only)	SL only
famnumx	number of family units in hhold	SL only
FreeLeas	freehold or leasehold	EUL and SL
ftbuyer	if first-time buyer (interviewfs only)	EUL and SL
GrossA	age group & sex of youngest person in household (interviewfs only)	SL only
hatentp3	type of housing association tenancy (interviewfs only)	EUL and SL
hhbensx	household on means tested bens or tax credits with a relevant income below the threshold	EUL and SL
hhcomp1	household composition (interviewfs only)	EUL and SL
hhcompx	household composition	EUL and SL
hhempx	employment status of HRP and partner combined	EUL and SL
hhinc5x	all households - income in 5 bands	EUL and SL
hhincflg	imputations used to create net total hhold income	SL only
hhincx	EHS Basic Income (annual net household income (HRP + Partner) including savings)	EUL and SL
hhltsick	anyone in hhold have long term illness or disability?	EUL and SL
hhsizex	number of persons in the household	EUL and SL
hhtype11	househld type - full 11 categories	EUL and SL
hhtype6	household type - 6 categories	EUL and SL
hhtype7	household type - 7 categories	EUL and SL
hhvulx	household vulnerable - on means tested or certain disability related benefits?	EUL and SL
hhwhch	anyone in hhold uses a wheelchair	EUL and SL
housbenx	household (HRP + partner) receives any housing benefit?	EUL and SL
hpregdis	HRP or partner registered disabled?	EUL and SL
HYEARGRx	household gross annual income (inc. income from all adult household members)	EUL and SL
JOINTINCx	annual gross income of the HRP and partner	EUL and SL
lenown	length of ownership (years)	SL only
lenownb	length of ownership to date of survey	EUL and SL
lenres	length of residence (years)	SL only
lenres2	length of residence (paired interview only)	SL only
lenresb	length of residence	EUL and SL
LHArqx	no. of bedrooms required by the household (2011 definition)	EUL and SL
LHAstdx	bedroom standard (2011 definition)	EUL and SL
loncoupx	single householder or with partner	SL only
market_rent	tenancy types of renters	EUL and SL
mortwkx	weekly mortgage payments	EUL and SL
nbatha	if shares a bathroom, shower room or WC (interviewfs only)	SL only
NBedsX	total no of bedrooms household actually has	EUL and SL
ncouple	number of couples in household (interviewfs only)	SL only
ndepchild	number of dependent children in household	EUL and SL

NEmp	number of employed persons in household (interviewfs only)	SL only
NInac	number of economically inactive persons in household (interviewfs only)	SL only
nkita	if shares a kitchen (interviewfs only)	SL only
nliving	if shares other room (living room) (interviewfs only)	SL only
nlpar	number of lone parent families in household (interviewfs only)	SL only
NoUnits1	banded number of family units in household (interviewfs only)	EUL and SL
nrooms1a	number of rooms available to household grouped (interviewfs only)	EUL and SL
nroomsa	number of rooms available to household (interviewfs only)	SL only
nshare	if shares any part of accommodation (interviewfs only)	SL only
nsing	number of one-person family units in household (interviewfs only)	SL only
nssech	NS-SEC Socio-economic Classification – HRP (interviewfs only)	EUL and SL
nssecp	NS-SEC Socio-economic Classification - HRP's partner (interviewfs only)	EUL and SL
NStud	number of students in household (interviewfs only)	SL only
NUnemp	number of unemployed persons in household (interviewfs only)	SL only
nxdepch	number of non-dependent children in household (interviewfs only)	SL only
olderx	no. of people aged 60 plus who are HRP or partner	SL only
otherfam	additional families present in household	SL only
othfamlp	type of additional families in household	SL only
Owntype	type of ownership	EUL and SL
Prevten	previous Tenure (interviewfs only)	EUL and SL
pyngbx	age band of youngest person in household	EUL and SL
pyngx	age of youngest person in household	SL only
rentExS	total weekly rent excluding the cost of services	EUL and SL
rentExSflg	rent excluding services changed/imputed	SL only
rentflg	rent/housing benefit changed/imputed	SL only
rentwkx	total weekly rent payable (rent plus housing benefit)	EUL and SL
sexhrp	sex of household reference person	EUL and SL
sexprt	sex of hrp's partner	SL only
SFT	number of FT workers in HHLD (interviewfs only)	EUL and SL
sharer	if shares accommodation with other household (interviewfs only)	EUL and SL
srtentype2	type of social sector tenancy (interviewfs only)	EUL and SL
studhrp	if HRP is a full time student (interviewfs only)	SL only
Studprt	if HRPs Partner is a full time student (interviewfs only)	SL only
tenex	extended tenure of household	EUL and SL
tenure1	tenure Group 1 (interviewfs only)	SL only
tenure2	tenure Group 2 (interviewfs only)	EUL and SL
tenure3	tenure Group 3 (interviewfs only)	SL only
tenure4	tenure Group 4 (interviewfs only)	EUL and SL
totkitsa	number of unshared kitchens (interviewfs only)	SL only
workless	household with no one of working age employed - ILO defn	EUL and SL

Annex Table 5.2.2: physical13+14.sav

alltypex	dwelling age and type	EUL and SL
area3x	type of area	SL only
arnatx	nature of area	SL only
Attic	attic present in dwelling	EUL and SL
basement	basement present in dwelling	SL only
boiler	type of boiler	EUL and SL
constx	construction type	SL only
cstactbx	basic repair costs (actual)	EUL and SL
cstactcx	comprehensive repair costs (actual)	EUL and SL
cstactux	urgent repair costs (actual)	EUL and SL
cststdbx	basic repair costs (per square metre)	EUL and SL
cststdcx	comprehensive repair costs (per square metre)	EUL and SL
cststdux	urgent repair costs (per square metre)	EUL and SL
dampalf	dampness problems in one or more rooms	EUL and SL
dampcdf	serious condensation in one or more rooms	EUL and SL
damppnf	penetrating damp in one or more rooms	EUL and SL
damprsf	rising damp in one or more rooms	EUL and SL
dblglaz2	extent of double glazing	EUL and SL
dblglaz4	extent of double glazing	EUL and SL
dhcosty	cost to make decent (hhsrs 15 model)	EUL and SL
dhdisrx	decent homes repair criterion	EUL and SL
dhhhsrsx	decent homes HHSRS 15 criterion	EUL and SL
dhhhsrsy	decent homes HHSRS 26 criterion	EUL and SL
dhmodx	decent homes modern facilities criterion	EUL and SL
dhnumy	decent homes: number of criteria failed (hhsrs 15 model)	EUL and SL
dhnumz	decent homes: number of criteria failed (hhsrs 26 model)	EUL and SL
dhomesy	decent homes - HHSRS 15 model	EUL and SL
dhomesz	decent homes - HHSRS 26 model	EUL and SL
dhreasny	decent homes criterian not met (hhsrs 15 model)	EUL and SL
dhreasnz	decent homes criterian not met (hhsrs 26 model)	EUL and SL
dhtcacty	requirement to pass decent homes thermal comfort criterion	SL only
dhtcreasy	reason for failing decent homes on thermal comfort?	EUL and SL
dhthermy	decent homes thermal comfort criterion	EUL and SL
dwage4x	dwelling age	EUL and SL
dwage5x	dwelling age	EUL and SL
dwage6x	dwelling age	EUL and SL
dwage9x	dwelling age	SL only
dwtype3x	dwelling type	EUL and SL
dwtype7x	dwelling type	SL only
dwtype8x	dwelling type	EUL and SL
dwtypenx	dwelling type	EUL and SL
EPceeb12e	energy efficiency rating band (ehs SAP 2012)	EUL and SL
EPceib12e	environmental impact rating band (ehs SAP 2012)	EUL and SL
EPceir12e	environmental impact rating (ehs SAP 2012)	EUL and SL

floor5x	useable floor area - original EHS definition	EUL and SL
floor5y	useable floor area - building regulations definition	EUL and SL
floorx	useable floor area (sqm) - original EHS definition	EUL and SL
floory	useable floor area (sqm) - building regulations definition	EUL and SL
fuelx	main fuel type	EUL and SL
heat4x	main heating system	EUL and SL
heat7x	main heating system	EUL and SL
heatsec	secondary heating type	SL only
housex	dwelling type	EUL and SL
loftins4	loft insulation thickness	EUL and SL
loftins6	loft insulation thickness	EUL and SL
loftinsu	loft insulation thickness with unknowns	EUL and SL
loftinsx	loft insulation thickness	EUL and SL
loftu4	loft insulation thickness with unknowns	EUL and SL
lv1upkpx	poor quality environment - upkeep problems	EUL and SL
lv2trafx	poor quality environment - traffic problems	EUL and SL
lv3utilx	poor quality environment - utilisation problems	EUL and SL
lvanyx	poor quality environment	EUL and SL
lvnumx	number of liveability problems present	EUL and SL
mainfuel	main heating fuel	SL only
neivisx	appearance of area	EUL and SL
parking	parking provision of survey dwelling	EUL and SL
pcavwallx	percentage of external wall area that is cavity masonry	EUL and SL
rdsap09	reduced data energy efficiency rating (SAP 2009 based)	EUL and SL
sap12	energy efficiency (SAP12) rating	EUL and SL
sap412	energy efficiency (SAP12) rating	EUL and SL
secure	secure windows and doors	EUL and SL
storeyx	number of floors above ground	EUL and SL
sysage	age of heating system	EUL and SL
typercov	predominant type of roof covering	SL only
typerstr	predominant type of roof stucture	SL only
typewfin	predominant type of wall finish	SL only
typewin	predominant type of window	SL only
typewstr2	predominant type of wall stucture	SL only
wallcavy	type of wall	EUL and SL
wallinsy	type of wall and insulation	EUL and SL
watersys	water heating system	EUL and SL
wins90x	type of wall - post 1990 assumption	EUL and SL

Annex Table 5.2.3: general13+14.sav and generalfs14.sav

aagfh14	household weight (2014-15) (generalfs only)	EUL and SL
aagpd1314	dwell weight, paired cases 2013/14 and 2014/15 (paired general only)	EUL and SL
aapgh1314	hhld weight, paired cases 2013/14 and 2014/15 (paired general only)	EUL and SL
fmonth	fieldwork month (generalfs only)	EUL and SL
Fqtr	fieldwork quarter (generalfs only)	EUL and SL
fyear	fieldwork year (generalfs only)	EUL and SL
GorEHCS	government office region	SL only
GorEHS	government office region - EHS version	EUL and SL
govreg1	government office Region, grouped (generalfs only)	EUL and SL
imd1010	IMD 2010 decile ranking of areas (lower layer SOA)	SL only
paired	whether paired sample case (generalfs only)	EUL and SL
region3x	overall region of England	EUL and SL
rucombin	rurality classification - combined (COA)	SL only
rucontxt	rurality classification - context (COA)	SL only
rumorph	rurality classification - morphology (COA)	SL only
tenure2x	tenure	EUL and SL
tenure4x	tenure	EUL and SL
tenure8x	tenure	EUL and SL
vacantx	type of vacancy (paired general only)	EUL and SL
vaclngth	length of vacancy (paired general only)	SL only

Annex 5.3: **Accessibility indicators**

5.34   The EHS collects a good deal of information on whether dwellings possess certain features or attributes to make them more accessible and useable for people with disabilities. In reporting, it focuses on the four aspects that form the basis of the requirements in part M of the Building Regulations, although the EHS cannot exactly mirror the detailed requirements:

- **Level access to main entrance:** there are no steps between the pavement (or any gate) and the entrance door. The path also has a gradient of less than 1:20. Includes level access to the entrance of the survey module for flats with common areas. Level access is analysed for dwellings with a private or shared plot.

- **Flush threshold to main entrance:** the threshold to the main entrance door has no obstruction greater than 15mm. This prevents the threshold from being a trip hazard and allows a wheelchair user to easily enter through the main door.

- **Width of internal doorways and circulation space conforms to Part M**: complies with requirements of Building Regulations.

- **WC at entrance level:** any WC at entrance level as EHS does not indicate whether it is wheelchair accessible.

5.35   A home is considered to be fully 'visitable' if it has all of the four features listed above. All these features are assessed directly by the surveyors during the physical survey according to a set of detailed guidelines which are detailed in Annex Table 5.3.1.

Annex Table 5.3.1: Four visitability features

Criterion	Definition
Level access to main entrance	Surveyors record the number of steps from the front gate/ pavement to the entrance to the dwelling. A 'step' is any planned change in level, excluding the width of the cill at the bottom of the door. Surveyors will only record level access where there are no steps between the gate / pavement and the entrance door to the dwelling for a wheelchair to negotiate. The path must also have a gradient of less than 1 in 20.
Flush threshold	This is only recorded as present if a wheelchair can be wheeled straight into a dwelling with no step to negotiate or obstruction higher than 15mm. For houses, this will usually be a specified adaptation. For flats, it is the entrance doorway into the flat itself that is assessed. Purpose-built flats are much more likely to have been built with a flush threshold to the entrance door or the flat. Flats on upper or basement floors can be assessed as having a flush threshold if the journey from the entrance to the module to the inside of the dwelling can be negotiated using a suitable lift and there is no step or obstruction higher than 15mm. If the lift is not working, the flat will still have a flush threshold.
The width of internal doorways and hallways conforms to Part M	This is only recorded as satisfactory if the doors and circulation space serving habitable rooms, kitchen, bathroom or WC comply with Part M regulations, as follows: Doorway clear opening width (mm) / Corridor/passageway width (mm): 750 or wider — 900 (when approach head-on) 750 — 1200 (when approach not head-on) 775 — 1050 (when approach not head-on) 800 — 900 (when approach not head-on)
WC at entrance level	The WC must be located on the same level as the entrance to the house or flat and must be located inside the dwelling.

5.36 The survey also collects a range of additional data, which can be modelled to provide additional information on the accessibility of the dwelling, for example:

- living room at ground floor or entrance level or space to provide one

- bedroom at ground floor or entrance level or space to provide one

- space for turning wheelchairs in kitchens, dining areas and living rooms

- bath/shower at entrance level

5.37 A detailed report on the accessibility of the housing stock and its ease of adaptability for independent living can be found in the EHCS 2007 Annual Report and further technical details can be found in Chapter 11 of the EHCS 2007 Technical Report: (http://webarchive.nationalarchives.gov.uk/20120919132719/www.communities.gov.uk/publications/housing/ehcstechnicalreport2007).

Annex 5.4: **Household derived indicators**

5.38   This Annex focuses on the more complex derived household variables created using EHS interview survey data where the home is occupied and covers the following variables:

- income
- equivalised income
- rents and housing related benefits
- modelling of mortgage repayments
- equity
- household composition

5.39   These complex derived household variables, along with more straight forward household variables e.g. household composition, age of the household reference person (HRP) etc, are used throughout the EHS Reports.

5.40   Checks are made on the derived variables to ensure as far as possible that the data values are reasonable and that missing data have been assigned correctly. Implausible values are investigated and only when it is as certain as possible that the data are incorrect is a change made. To assist in analysis, changes made to the data are flagged in the derived EHS interview variable dataset indicating the nature and extent of any imputation.

5.41   The EHS datasets containing these household variables are available to users via the UK Data Archive www.data-archive.ac.uk/

Income

5.42   The EHS Reports present household/housing related characteristics in relation to various income indicators.

5.43   The income indicators used within the EHS Reports are based on the annual income of the HRP and their partner from wages, pensions, savings, and state benefits. The interview survey collects information on the main components of income for the HRP and their partner. These include:

- earnings from regular employment (including government training scheme income) or as self-employed
- income from occupational and private pensions
- income from other private sources such as rent from lodgers, student loans, maintenance payments etc
- state benefits including state pensions

- income from savings and investments

5.44 The income data are thoroughly checked for inconsistencies and errors to make sure as far as possible that the data are reasonable and that missing data has been imputed correctly. Implausible values are interrogated and only changed when it is almost certain that the data are incorrect. Any changes made are flagged indicating the nature and extent of any imputation (variable hhincflg).

5.45 Where respondents report receipt of private income sources, e.g. employment, self-employment income, but are unable/refuse to specify an amount, then an estimated amount is assigned according to the methods outlined in Annex Table 5.4.1.

Annex Table 5.4.1: Imputation procedure for private sources

	Type of missing data	Method of imputation
Self-employed	Amount missing	Uses data from the Annual Survey of Hours and Earnings (ASHE) based on age, sex, part-time/full-time, social economic group and geographical location
Regular employment	Amount missing	
Occupational pension	Amount missing	Sample median based on sex and social economic group
Private pension	Amount missing	
Other private sources	Amount missing	Sample median based on working status

5.46 Average values are based on the sample median rather than the sample mean as use of median values better reflects the characteristics of skewed distributions such as are common with income data.

5.47 Where respondents state receipt of particular types of benefits but are unable/refuse to specify an amount, an estimate is inserted based on their theoretical entitlement to the particular benefit. The EHS interview survey incorporates checks on the missing benefit amounts to ascertain whether this were due to the inclusion of the missing amounts with other specified benefits. Use of this data is incorporated into the assessment of missing benefit incomes to avoid double counting of benefit income where this looks probable. Only households that state they are in receipt of benefits are allocated income from benefits. If they are entitled to other benefits but are not claiming them, then estimates for these are not included.

5.48   Information is also collected on savings of the HRP and partner. Where the amount of savings/investment has not been provided, a method based on CHAID analysis is used to estimate the combined savings/investment of the HRP and any partner using predictor variables such as tenure, age/sex of HRP, number of jobs (HRP plus any partner) etc.

5.49   When the annual net income measure needs to be derived, Income Tax and National Insurance payable for the HRP and their partner are calculated where applicable according to Income Tax and National Insurance rates and allowances and deducted to give the total net annual income of the HRP and partner.

5.50   Low incomes in the dataset are uplifted, the justification being that it is likely the respondent under reported their income, either deliberately or by mistake. Where the calculated income of the HRP and any partner is lower than the household's calculated basic theoretical income support/pension credit entitlement, the income amount is changed as follows. Households in receipt of one or more of the main benefits (excluding child benefit) and with an income below their theoretical income support/pension credit entitlement are allocated their basic income support/pension credit level plus any disability premiums that they might qualify for. Households that are not in receipt of any of the main benefits and with an income below their theoretical income support/pension credit entitlement have their income initially set to missing as it was assumed key components of income had been missed or seriously under-reported. An imputed value is then derived – see below.

5.51   Households where the total HRP and partner income is missing have this estimated using the median income for households as defined by working status, social economic group and whether a partner of the HRP is present in the household.

5.52   There are two versions of the variable for the annual income of the HRP and any partner. One variable is in terms of gross income i.e. income before tax and National Insurance deductions (labelled JOINTINCx) and the other in terms of net income i.e. with the deduction of Tax and National Insurance where applicable (labelled hhincx). It should be noted that these two income variables do not include any housing related benefits/allowances.

5.53   In addition, a variable giving the gross income of the HRP and partner has been created that includes housing related benefits (i.e. Housing Benefit, Local Housing Allowance (LHA) and Universal Credit payments towards rent) as income (labelled 'ALLincx'). This variable is derived by simply adding together the annual gross income of the HRP and partner (JOINTINCx) and an annualised housing related benefit amount (amthbenx * 52). See the section on 'Rents and housing related benefits' for the calculation of housing related benefits using EHS data.

5.54   There is also a further gross income variable available, labelled HYEARGRx which is an extension of the gross income of the HRP and any partner. This variable represents the household gross income of the HRP and any partner but also includes the gross income of other adults living within the household

that are not part of the primary benefit unit[10] e.g. a grown-up child living with their parents or two or more unrelated individuals sharing a house. Note that this income variable does not include any housing related benefits/allowances.

5.55   The EHS Reports tend to refer to income in terms of the gross income of the HRP and partner. This is used throughout the Households Report (and associated tables) to relate household income to factors such as tenure and housing related benefit receipt. An 'equivalised' income measure is also used on occasion within the EHS Reports. This is an extension of the net income measure outlined in this section and is discussed in detail below.

Equivalised income

5.56   A measure known as 'in poverty' is reported on in the EHS Reports and associated tables. This is based upon an income measure that is 'equivalised' before housing costs are taken into account. All analysis makes clear the precise measures being used.

5.57   The purpose of income equivalisation is based on the concept that the cost of living varies according to size and type of household. It recognises that, for example, a household of three people requires a higher income than a one person household to achieve the same standard of living. Accordingly an equivalence scale (the modified OECD[11] scale) is employed, taking each household's size and composition into account, to make sensible comparisons.

5.58   Equivalised income measures have been constructed for the EHS in order to assess the relationship between relative poverty and housing conditions and amenities, not to provide estimates of poverty as such. Across Government, poverty is assessed principally through the Households Below Average Income (HBAI)[12] series. Information on household incomes is not collected in as much detail by the EHS as it is by the Family Resources Survey (the data source for the HBAI series). Therefore there are some limitations to which components can be included in the income measures produced for the EHS. Annex Tables 5.4.2, 5.4.3, 5.4.4 list the HBAI components of the Before Housing Costs (BHC) and After Housing Costs (AHC) measures and describe how the information is addressed through the EHS.

5.59   The HBAI report uses two different equivalised income measures: Before Housing Costs (BHC) and After Housing Costs (AHC). The income components that make up the EHS equivalised BHC income variable include: net income of the HRP and any partner, net income from additional adults in the household, modelled winter fuel payment and the addition of council tax support and housing related benefits. For each household the BHC income

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[10] Additional adult household members reported during the EHS interview survey to be living in halls of residence are excluded from the analysis and their income is not considered to be part of the household.

[11] Organisation for Economic Co-operation and Development

[12] http://statistics.dwp.gov.uk/asd/index.php?page=hbai

measure adds up the income from these specified sources and then deducts the amount of council tax payable. These income sources are outlined in Annex Table 5.4.5 together with the method of calculating each income component. The AHC is derived by deducting rent and mortgage payments from the BHC measure, as outlined in Annex Table 5.4.6.

Annex Table 5.4.2: BHC Income components in HBAI and EHS

HBAI Income component	Treatment in the EHS
Income from all household members	The EHS collects income data for the Primary Benefit Unit from the respondent (HRP or any partner). Income data for any additional adult household members is also collected.
Net earnings from employment	Collected
Profit or loss from self-employment	Self-employment income is collected in the EHS and it is included as an income component. The EHS does not collect information on negative self-employment income amounts (i.e. if the respondent experienced a self-employment loss) and thus income losses are not included.
Social security benefits and Tax Credits	Collected for the HRP and any partner
Income from occupational and private pensions	Asked about explicitly in EHS interview
Investment income	Collected
Maintenance payments	Would only be picked up as an 'other' source of income
Income from educational grants and scholarships	Would only be picked up as an 'other' source of income
Cash value of certain forms of income in kind	Not collected

Annex Table 5.4.3: BHC deductions in HBAI and EHS

HBAI BHC Income deduction	Treatment in the EHS
Income tax payments	Deducted using standard rules
National Insurance contributions	Deducted using standard rules
Council tax	Deducted based on information from the council tax band for the property and the council tax rate from the local authority
Contributions to occupational pension	Not collected
Insurance premium payments made in case of sudden loss of earnings	Not collected
Maintenance and child support payments	Not included
Parental contributions to students living away from home	Not collected
Student loan repayments	Not collected

Annex Table 5.4.4: AHC deductions in HBAI and EHS

HBAI AHC Income deduction	Treatment in the EHS
Rent	Collected
Water rates, community or council water charges	Not collected
Mortgage interest payments	Total mortgage repayments used as a proxy.
Structural insurance premiums	Not collected
Ground rent and service charges	Not included

Annex Table 5.4.5: Income components of the BHC equivalised income

Components of the BHC income measure	Method of calculating the income component
Net income of the HRP and any partner	The income variable hhincx is used. See the section above on 'Income'.
Net income from additional adults in the household	The EHS interview survey collects income data at a basic level for all household members that are 16 or over which is converted to a net amount by deducting the applicable Income Tax and National Insurance
Winter Fuel Payment	The applicable amount of WFP for the household is modelled based on the number of household members that have reached the qualifying age for WFP
Council tax support	The BHC income measure includes income from council tax support. The EHS interview survey collects information on council tax support receipt of the HRP and any partner. Council tax support is assigned based on this information combined with knowledge of theoretical eligibility (for partial payments) and the amount of council tax due.
Housing related benefits i.e. Housing Benefit, Local Housing Allowance (LHA) and Universal Credit payments towards rent	The BHC income measure includes income from housing related benefits. See the section on 'Rents and housing related benefits' for the calculation of housing related benefits using EHS data. The derived variable amthbenx is used.
Deduction of council tax payable	The BHC income measure deducts council tax paid by the household. The amount of council tax paid by the household is modelled using the council tax band of the dwelling and information about charges in the relevant local authority area. The council tax band for each dwelling is collected via a data matching exercise undertaken by the Valuation Office Agency. The council tax band information is only for use in the production of statistics.

Annex Table 5.4.6: Income components of the AHC equivalised income

Components of the AHC income measure	Method of calculating the income component
Deduction of rent	The AHC income measure deducts the amount of rent paid by the household (if applicable). See the section on 'Rents and housing related benefits' for the calculation of rent using EHS data. The derived variable rentExS is used.
Deduction of mortgage payment	The AHC income measure deducts the mortgage payments paid by the household (if applicable). See the section on 'Mortgage Payment' for the calculation of mortgage payments using EHS data. The derived variable mortwkx is used.

5.60   The HBAI series and poverty estimates are based on a modified OECD scale (modified so that a couple with no children is considered the reference point and has an equivalence factor equal to unity). The EHS follows this approach and determines the number of 'first' adults (i.e. HRP), other adults, children aged 14 years and over and children under 14 for each sample case in the dataset. This provides the necessary information to be able to apply the OECD equivalisation factors in order to produce an equivalised income, Annex Table 5.4.7.

Annex Table 5.4.7: OECD equivalisation factors

Equivalence scales	Modified OECD scaled to couple without children = 1	
	BHC	AHC
First adult	0.67	0.58
Spouse	0.33	0.42
Subsequent adults	0.33	0.42
Children aged under 14 years	0.20	0.20
Children aged over 14 years	0.33	0.42

Note: additional adult household members reported during the EHS interview survey to be living in Halls of Residence are excluded from the analysis.

5.61   The measured household income is divided by this equivalisation factor so that any household with a factor of less than one (e.g. a single person household) will have their income inflated, reflecting the fact that they are relatively better off than a larger household with the same income. Households with a factor greater than one have their incomes reduced,

reflecting the fact that they are relatively worse off than a smaller household. The incomes of households containing two adults without children will not change.

5.62   On occasions, the EHS Reports use the BHC equivalised weekly income measure ranked and grouped into five equal sized categories. Thus the first quintile relates to the households with the lowest 20% of BHC equivalised weekly incomes and the fifth quintile relates to the households with the highest 20% of BHC equivalised weekly incomes. As previously mentioned, a term referred to as 'in poverty' is also used in the EHS Reports. Households are defined to be 'in poverty' if their equivalised income is below 60% of the median household income before housing costs (BHC) are taken into account.

Rents and housing related benefits

5.63   Information on rents and housing related benefits are presented in detail in the EHS Households Report in analysis of social and private renters. The amount of rent and housing related benefits also feeds into the calculation of Equivalised income (see above).

5.64   Household rents and housing related benefit receipt are collected in the EHS interview survey and apply only to households that rent their own home or households in a shared ownership scheme. Renting households that live rent-free are not asked the series of rent and housing related benefit questions in the interview survey. For rent-free cases the rent and housing related benefit amounts are set to zero.

5.65   The total weekly rent payable for the property (variables rentwkx) includes the rent paid by the householder plus any housing related benefits received towards the rent payment i.e. housing benefit, Local Housing Allowance (LHA) and Universal Credit payment intended towards the rent (variable amthbenx). These variables are calculated based on the householder's response to the set of detailed rent and housing related benefit questions asked in the EHS interview. For households with a rent holiday, an adjustment is made so that the actual total amount of rent/housing related benefit paid over the course of the year (over n weeks) is averaged out over the full year (as if paid over 52 weeks).

5.66   Households that pay rent but do not provide an amount for their rent/housing related benefit, because the amount was either unknown or refused, are assigned an estimated total weekly guide rent amount. This is based on tenure, number of bedrooms and area where they live, (for private renters variables such as the type of landlord and level of furnishing are also used in the imputation), using the sources of rent data outlined in Annex Table 5.4.8. For these cases, the estimated total weekly rent payable (rentwkx) is calculated by adding the total weekly guide rent to the estimated modelled amount for services e.g. heating and regular meals etc. that are included in the rent (where applicable as specified by the householder). More information on services is detailed in the paragraphs below.

5.67 **Annex Table 5.4.8: Data sources used for missing rent amounts**

Tenure of the renting household	Type of missing data	Rent data source for missing values
Local authority	Rent amount missing	DCLG Local Authority Housing Statistics is used in conjunction with EHS data using the year in question and modelled accordingly
Housing association and shared owners	Rent amount missing	Two successive years of data is drawn from the Statistical Data Return submitted by Private Registered Providers (to reflect a mid-year rent value)
Private renters	Rent amount missing	EHS data using the year in question and modelled accordingly

5.68 Households that receive housing related benefits towards their rent payment but do not provide an amount or households that do not know if they receive housing related benefits are assigned an estimated benefit amount as follows:

- If the household states that they are in receipt of full housing related benefits then the weekly housing benefit amount is set to their theoretical guide rent amount (as opposed to the assigned total weekly rent payable, since housing related benefits do not cover the cost of services such as heating and regular meals).

- If the household states that they are in receipt of partial housing related benefits or if they do not know if their housing related benefits cover all or some of their rent, an amount of housing related benefits is imputed based on their total rent amount payable and their theoretical entitlement to Housing Benefit, incorporating the social housing under occupation charge for social tenants.

5.69 An extension of the derived variable for total weekly rent payable for the property (labelled rentwkx) is the total weekly rent payable for the property excluding the cost of services e.g. heating, council tax etc (labelled rentExS). The EHS interview survey asks the householder if the rent amount included any of the following services:

- Council tax
- heating
- water and sewerage

- lighting
- hot water
- fuel for cooking
- regular meals
- TV licence

5.70   If the amount of rent the householder provided does not include any of these services, then the total weekly rent payable for the property is the same as the total weekly rent payable for the property excluding the cost of services i.e. rentwkx equals rentExS.

5.71   If the rent amount provided by the householder does include one or more of the services stated above then the householder is asked to provide a rent value excluding the selected services. Based on this rent information, an amount is calculated for total weekly rent payable for the property, excluding the cost of services. If a rent amount excluding services is not provided by the householder then an estimated amount for the selected services is modelled according to the methods shown in Annex Table 5.4.9 in order to derive a rent amount excluding the cost of services.

5.72   The EHS Households Report mainly focuses on the weekly rent amount payable for the property, excluding the cost of services, e.g. heating, council tax etc. Between the 2007-08 and 2008-9 data there were some methodological changes to the way in which rent data were processed in the EHS compared to the previous Survey of English Housing (SEH). These changes are detailed in the EHS Households Report 2008-09 where an assessment of the impact of the methodological changes between 2007-08 and 2008-09 on the private rent estimates and further details of the changes to the calculation of social rents are provided.

Annex Table 5.4.9: Imputation procedure for service amounts

Service	Method of imputation
Council tax	The amount is derived using the council tax band information for the property and the council tax rate from the local authority. For any cases where the respondent selects that council tax is included in their rent but also selected full housing related benefits then the amount is set to 0.
Water and sewerage	This is calculated using the mean average water and sewerage rate for a household in England for the given year multiplied by a dwelling factor (that reflects the size/type of property) multiplied by a factor for that geographical area

Heating	Amounts are calculated based on DWP deductions from rent (as used in the assessment of housing benefit)
Lighting	
Hot-water	
Fuel for cooking	
Regular meals	
TV license	Based on the cost of a colour TV license (the TV license fee is set to zero where the HRP/partner is 75 years or over)

5.73 The rent and housing related benefit amounts are thoroughly checked for inconsistencies and errors to make sure as far as possible that the data is reasonable and that missing data has been imputed correctly. Implausible values are interrogated and only changed when almost certain that the data is incorrect. Any changes made are flagged indicating the nature and extent of any imputation (variables rentflg and rentExSflg).

Modelling of mortgage repayments

5.74 Mortgage repayments are calculated from raw data collected from respondents on payments for all mortgages/loans secured on the dwelling, deducting any notional amounts for building and contents insurance, mortgage protection, and other insurance payments where they have been accidentally included. Endowment policy premiums are included in repayments. Information collected is converted to weekly amounts (variable mortwkx).

5.75 Where repayment amounts are unknown or missing, data is imputed. Where alternative data is available, using the formula below for monthly mortgage repayment:

$$\frac{(\text{value of current main mortgage} \times \text{annual interest rate}/12)}{(1-1/((1+\text{annual interest rate}/12)^{(\text{length of main mortgage in months})}))}$$

5.76 The 'current main mortgage' refers to the highest value mortgage if there is more than one loan secured on the property. Where the value of the current main mortgage is not provided, it is derived from original purchase price minus deposit paid, if these data are available. The purchase price is imputed if unknown, based on current market value, year dwelling bought (if available) and DCLG annual house price inflation indices for each area. From 2010, the EHS ceased collecting current market valuations on a regular basis from the Valuation Office Agency (VOA) for all households participating in the interview survey who had a physical inspection of their dwelling. In the interview survey, households are now asked to provide a recent (in last 12 months) valuation of their dwelling, and, if not available, their own estimate of the market value.

This valuation/estimate is now used in the modelling as a proxy for current market value. Any missing values are imputed using data from the Regulated Mortgage Survey based on dwelling type and geographical area. Valuations are checked for outliers, which are reviewed and corrected if necessary and possible, based on other information on the property. Payments for other loans secured on the property are not included in this imputation process.

5.77   If the length of the main mortgage is unknown, it is modelled where data are available, based on the age of HRP and when the main mortgage was taken out (or if missing, when the dwelling was bought), assuming a maximum mortgage length of 25 years and that it will be paid off when the HRP is 60 years old.

5.78   The annual interest rate is taken from monthly data provided by the council of mortgage lenders (CML). An average is calculated for the period covered by the EHS survey.

5.79   Monthly mortgage payments are set to not applicable (-9) for tenancies. If the owner owns the dwelling outright, payments are zero. All shared owners are treated as owners and mortgage payments are derived as above and where necessary adjusted for the proportion of ownership if data imputed. Flexible/all in one/offset mortgages are also derived as above. Payments for equity release mortgages are imputed and are modelled as above.

5.80   Monthly repayment amounts are then converted to weekly payments. The data are thoroughly checked for inconsistencies, outliers and errors although data are only corrected where deemed totally implausible and it is possible to determine an alternative more reliable imputed value.

5.81   It should be noted that the weekly mortgage variable contains amounts for a mixture of mortgage types for example repayment and interest only cases, when the information was provided by the household. However, all imputed cases, irrespective of the mortgage type (for example, interest only mortgages) are calculated as repayment mortgages (interest and capital).

Equity

5.82   The value of a household's equity in their property is calculated for all owner occupied (including shared owner) households who participate in the interview survey. It is based on the current market value of the property minus the amount of mortgage outstanding (for shared owners this is checked and adjusted where necessary to ensure their equity is calculated in proportion to their ownership).

ie. Equity = current market value – amount of mortgage outstanding
including other loans on the property

5.83   All owner occupiers are asked in the interview for an estimated current valuation of their property. This is used to derive an approximate equity value as detailed above (variables 'equityr' and 'equityr5').
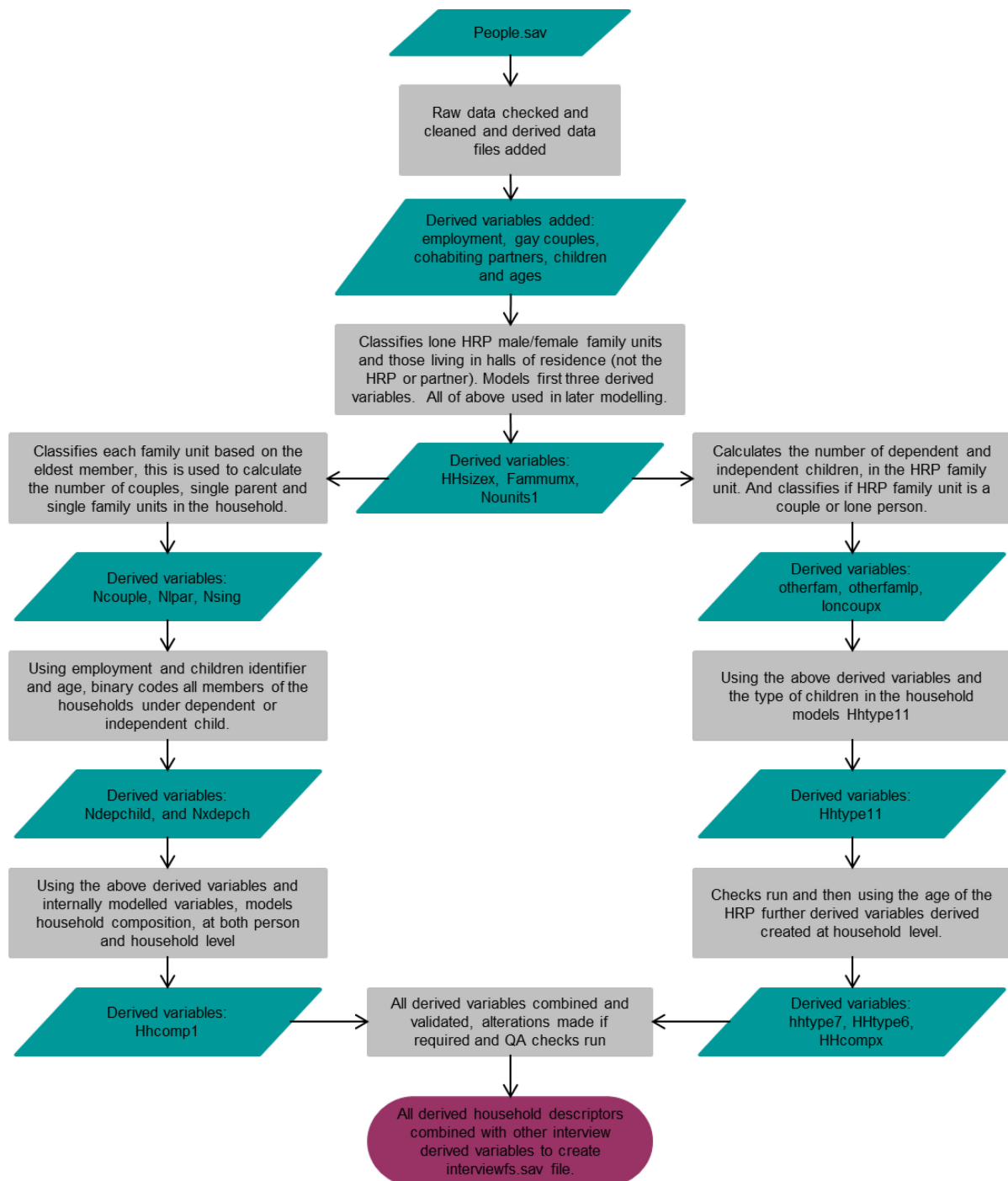
5.84   Research conducted on the EHS 2008 data demonstrated that owner occupiers are more likely to overestimate the value of their homes than underestimate it, and only 40% of household estimates are within 10% of the VOA valuation. Those who moved in just over a year ago, who are on the highest incomes or in the highest value properties are most likely to overestimate value. Those homes most likely to be underestimated in value contain singletons and couples aged over 60 and those resident for at least 20 years. As a result of respondents tending to overestimate property value, equity based on this source of market value ('equityr' and 'equityr5') is likely to be an overestimate.

5.85   Missing equity valuations are imputed using data from the regulated mortgage survey based on dwelling type and area. Valuations are checked for outliers and corrected if it is possible to determine a more reliable imputed value.

5.86   Where data used in the above formula is not available, equity is set to unknown (-88888888) or not applicable (-99999999) for tenancies.

Household composition

5.87   Each year, English Housing Survey (EHS) data is used to create a number of household typologies. These descriptors are a way of classifying households according to the relationships between the household members and are used throughout the EHS reports to provide context on household circumstances and characteristics.

5.88   The current EHS household survey is the result of the 2008 merger of the Survey of English Housing (SEH) and the English House Condition Survey (EHCS). Both these surveys collected similar information and modelled some similar household derived descriptors, however their methods and assumptions were not always the same for deriving these similar classifications. A key difference was that SEH modelled its descriptors based on the eldest person in the household whereas the EHCS used the Household Reference Person (HRP). For the majority of the simple derived descriptors this made no difference or only minor changes were required to harmonise them, however some descriptors are still not derived from the same assumptions. This has the potential to cause confusion when they are combined in analysis. This report aims to clarify the modelling assumptions of these conflicting cases. It will outline how the simpler derived variables (Annex Table 5.4.10) feed into the more complex ones (Annex Table 5.4.11 and Annex Table 5.4.12).

5.89   The flow chart below (Figure 5.4.1) outlines the modelling process of the household descriptors. As part of the modelling, the raw data is cleaned to correct any inconsistent relationship data mainly relating to the family unit. This is done within the modelling only and the raw data files remain unchanged. For this reason, although correct, there may be inconsistency between some derived descriptors and the raw data. The derived indicators are considered to be correct and in line with all guidance for classifying individuals and family units. It is these variables that are used for reporting.

5.90 Many of the simpler derived variables are either directly related to the HRP, for example Cohabhrp or Cohabprt, or derive the quantity of a particular type of household member or household type within the household, for example the number of couples in the household (ncouple). These simple derived variables are listed in Annex Table 5.4.10, which highlights both the modelling key issues and recoding and the potential data conflicts which may cause a descriptor to be at odds with another descriptor.

5.91 Some of these simpler derived variables and raw data are used to model the more complex final household composition descriptors, hhtype11, hhytype7, hhtype6, hhcompx (originating from the EHCS) and Hhcomp1 (originating from the SEH). This can be seen in the flowchart (Figure 5.4.1) as well Annex Table 5.4.11 and Annex Table 5.4.12.

Figure 5.4.1: Simple flowchart of the modelling of the derived household

People.sav

Raw data checked and cleaned and derived data files added

Derived variables added: employment, gay couples, cohabiting partners, children and ages

Classifies lone HRP male/female family units and those living in halls of residence (not the HRP or partner). Models first three derived variables. All of above used in later modelling.

Derived variables: HHsizex, Fammumx, Nounits1

Classifies each family unit based on the eldest member, this is used to calculate the number of couples, single parent and single family units in the household.

Calculates the number of dependent and independent children, in the HRP family unit. And classifies if HRP family unit is a couple or lone person.

Derived variables: Ncouple, Nlpar, Nsing

Derived variables: otherfam, otherfamlp, loncoupx

Using employment and children identifier and age, binary codes all members of the households under dependent or independent child.

Using the above derived variables and the type of children in the household models Hhtype11

Derived variables: Ndepchild, and Nxdepch

Derived variables: Hhtype11

Using the above derived variables and internally modelled variables, models household composition, at both person and household level

Checks run and then using the age of the HRP further derived variables derived created at household level.

Derived variables: Hhcomp1

All derived variables combined and validated, alterations made if required and QA checks run

Derived variables: hhtype7, HHtype6, HHcompx

All derived household descriptors combined with other interview derived variables to create interviewfs.sav file.

Annex Table 5.4.10: Simple household descriptors

Derived descriptor	Descriptor variable label	Modelling key issues	Data conflict issues
Cohabhrp	If HRP is cohabiting	Includes same sex couples, even if they are not in the same family unit as the HRP	May conflict with hhcomp1 which is not based on HRP. Also may conflict with other descriptors such as fanmumx, NoUnits1, otherfam and othfamlp if it is a same sex couple
Cohabprt	If HRP partner is cohabiting	Includes same sex couples, even if they are not in the same family unit as the HRP	May conflict with hhcomp1 which is not based on HRP. Also may conflict with other descriptors such as fanmumx, NoUnits1, otherfam and othfamlp if it is a same sex couple
Hhsizex	Number of persons in the household	Excluding those aged 16+ living away in halls of residence/boarding school, who are not the HRP or partner.	-
Famnumx	Number of family units in household	The number of family units in the household, excludes those age 16+ living in halls of residence who are not the HRP or partner (unlike old SEH definition). Also, same sex couples are counted as separate family units, despite being treated as a couple living together in other variables (e.g. 'loncoupx', 'hhcompx'). Originates from EHCS.	May conflict with other descriptors due to some same sex couples being recoded as a couple, but in different family units.
NoUnits1	Banded number of family units in household	Famnumx banded, see above for modelling issues.	See above

Derived descriptor	Descriptor variable label	Modelling key issues	Data conflict issues
Nlpar	Number of lone parent families in household	For some household that state they are married or cohabitating (Xmarsta2), but there is no partner in the household, they are recoded from ncouple to nlpar if there are children in the same family unit in the household. For consistency with EHCS. Excludes those aged 16+ that in halls of residence who at not the HRP or partner.	-
Ncouple	Number of couples in household	Some cases in the data set, that state they are married (under Xmarsta2) and have children but there is no partner in the household, these are recoded to lone parents. Excludes those aged 16+ that in halls of residence who at not the HRP or partner.	Same sex couples not in a civil partnership/married may conflict with other descriptors such as famnumx, NoUnits1, as they are in separate family units.
Nsing	Number of one-person family units in household	Same sex couples are recoded from nsing to couples, this is a model issue. Excludes those age 16+ that live in halls of residence who are not the HRP or partner.	It is possible to be a single family household under nsing and a dependent or independent child, for example dependent foster children.
Ndepchild	Number of dependent children in household	All dependent children are those under age 16 or those aged 16 to 18 that are in full time education. This based on all children in the household, irrespective of which family unit they are in, but not those living in halls or residence.	All children in the home, not just the main family unit, if other family units are present in the household. It is possible to be a dependent child and a single family household under nsing for example in the case of non-relatives and foster children. This variable will not always match with EHCS household composition descriptors as they are modelled based on the children in the HRP family unit only. The modelling does not consider other children in the household.

Derived descriptor	Descriptor variable label	Modelling key issues	Data conflict issues
Nxdepch	Number of non-dependent children in household	All children age 16+ that not in full time education or children that aged 19 or older. (Children aged 16-18 in full time education are considered dependent). Excludes those living in halls of residence.	All children in the home, not just the main family unit, if other family units are present in the household. It is possible to be an independent child and be coded against nlpar, nsing and ncouple, if the parents of the adult child live in the same household. This variable will not always match with EHCS household composition descriptors as they are modelled based on the children in the HRP family unit only. The modelling does not consider other children in the household.
Otherfam	Additional families present in household	Based on the recoding on famnumx, the number of separate family units. Excludes those aged 16+ that in halls of residence who at not the HRP or partner.	May conflict with other ncouple due to some same sex couples being recoded under couples.
Othfamlp	Type of additional families in household	Based on otherfam and the size of each family unit. Excludes those aged 16+ that in halls of residence who at not the HRP or partner.	May conflict with other ncouple due to some same sex couples being recoded under couples.
Loncoupx	Single householder or with partner	Based on HRP household only, will include same sex couples even if they are not in the same family unit as the HRP	May conflict with other famnumx, NoUnits1 otherfam and othfamlp due to HRP same sex couples.

5.92   Although the modelling of the household composition descriptors is, by and large, not complicated, the difference in assumptions is important; and not always clear. For the majority of households, where the household consists of just one family unit, the derived descriptors are consistent. Complications arise when there is more than one family unit in the household or where the HRP is an independent child within the sole family unit.

5.93   Annex Table 5.4.11 shows the household composition descriptors that originate from the EHCS. It illustrates how the descriptors are derived, the key modelling assumptions and any recoding that takes place to deal with modelling difficulties and to harmonise the descriptors. The EHCS household composition descriptors are modelled based on the HRP family unit by firstly, defining the HRP family unit and then, if present, any additional family units in the household. For this reason, dependent children that are not part of the

main family unit are not considered children in the household, but as separate family units coded as an independent single person. Hhtype11 is the first derivation of these four derived household composition descriptors. The other three, hhtype7, hhtype6 and hcompx, are all derived from hhtype11 and the age of the HRP for the more detailed classifications. Understanding the derivation of hhtype11 should explain the coding of the other variables.

5.94 This model assumes:

- Same sex couples are treated as couples,

- Those in halls of residences that are not the HRP or partner are not included in the modelling.

- Dependent children are all those under 16 or aged between 16 and 18 and in full time education and part of the main family unit i.e. the family unit of the HRP and partner.

- Couple households with only independent children are classed as couples, and single parent households with independent children only are classed as other multi-person households.

Annex Table 5.4.11: Household composition descriptors that originate from the EHCS

Hhtype11 - Household type - full 11 categories			Hhtype7 (recoded from hhtype11) - **Household type - 7 categories**	Hhtype6 (recoded from hhtype7 using age of HRP) - **Household type - 6 categories**	Hhcompx (recoded from Hhtype6 using age of HRP) - **Household composition**
Variable code and value label	**Modelling key issues**	**Recoding or possible data conflict issues**	**Variable code and value label**	**Variable code and value label**	**Variable code and value label**
1. Couple no child(ren)	All in the same family unit, but possible to have one person single family unit only	Possible to have an additional single family unit if not HRP	1 .Couple no dependent child(ren)	1 .Couple no dependent child(ren)	Becomes: 1. couple, no dependent child(ren) under 60 or 2. couple, no dependent child(ren) aged 60 or over

Hhtype11 - Household type - full 11 categories			Hhtype7 (recoded from hhtype11) - Household type - 7 categories	Hhtype6 (recoded from hhtype7 using age of HRP) - Household type - 6 categories	Hhcompx (recoded from Hhtype6 using age of HRP) - Household composition
Variable code and value label	Modelling key issues	Recoding or possible data conflict issues	Variable code and value label	Variable code and value label	Variable code and value label
2. Couple dependent child(ren) only	All in the same family unit, but possible to have a lone person single family unit in the household as well.	Possible to have an additional single family unit if not HRP	2. Couple with dependent child(ren)	2. Couple with dependent child(ren)	3. Couple with dependent child(ren)
3. Couple with dependent and independent children	All in the same family unit, but possible to have a lone person single family unit in the household as well.	Possible to have an additional single family unit if not HRP	2. Couple with dependent child(ren)	2. Couple with dependent child(ren)	3. Couple with dependent child(ren)
4. Couple with independent child(ren) only	All in the same family unit, but possible to have a lone person single family unit in the household as well.	Possible to have an additional single family unit if not HRP	1 .Couple no dependent child(ren)	1 .Couple no dependent child(ren)	Becomes: 1. couple, no dependent child(ren) under 60 or 2. couple, no dependent child(ren) aged 60 or over
5. Lone parent with dependent child(ren) only	All in the same family unit, but possible to have a lone person single family unit in the household as well.	Possible to have an additional single family unit if not HRP	3. Lone parent with dependent child(ren)	3. lone parent with dependent child(ren)	4. Lone parent with dependent child(ren)

Hhtype11 - Household type - full 11 categories			Hhtype7 (recoded from hhtype11) - Household type - 7 categories	Hhtype6 (recoded from hhtype7 using age of HRP) - Household type - 6 categories	Hhcompx (recoded from Hhtype6 using age of HRP) - Household composition
Variable code and value label	Modelling key issues	Recoding or possible data conflict issues	Variable code and value label	Variable code and value label	Variable code and value label
6. Lone parent with dependent and independent children only	All in the same family unit, but possible to have a lone person single family unit in the household as well.	Possible to have an additional single family unit if not HRP	3. Lone parent with dependent child(ren)	3. Lone parent with dependent child(ren)	4. Lone parent with dependent child(ren)
7. Lone parent with independent child(ren) only	All in the same family unit, but possible to have a lone person single family unit in the household as well.	Possible to have an additional single family unit if not HRP	4. Other multi-person households	4. Other multi-person households	5. Other multi-person households
8. Two or more families	Other additional families, the second family units need to contain 2 or more people in it, the HRP family unit can be a single person	If the HRP is a single person and lives with a couple or another family unit 2+people it will be coded 8 however this will not be the case for HHcomp1 (coded 1 see modelling explanation below).	4. Other multi-person households	4. Other multi-person households	5. Other multi-person households
9. Lone person sharing with other lone persons	More than one family unit in the household, but with only one person in each of them	-	4. Other multi-person households	4. Other multi-person households	5. Other multi-person households

Hhtype11 - Household type - full 11 categories			Hhtype7 (recoded from hhtype11) - **Household type - 7 categories**	Hhtype6 (recoded from hhtype7 using age of HRP) - **Household type - 6 categories**	Hhcompx (recoded from Hhtype6 using age of HRP) - **Household composition**
Variable code and value label	**Modelling key issues**	**Recoding or possible data conflict issues**	**Variable code and value label**	**Variable code and value label**	**Variable code and value label**
10. One male	One person family households	-	5. One male	Becomes: 5. one person under 60 or 6. one person aged 60 or over	Becomes: 6. one person under 60 or 7. one person aged 60 or over
11. One female	One person family households	-	6. One female	Becomes: 5. one person under 60 or 6. one person aged 60 or over	Becomes: 6. one person under 60 or 7. one person aged 60 or over

Note: The variable hhtype7 does have a seventh category 'one person (sex unknown)' but this category is currently redundant due to no missing EHS data on the gender of individuals.

5.95   It is important to note that there are a few households that are not derived based on the HRP, to provide better consistency with the SEH. These households are where the HRP is a young unmarried adult child living with their parents in the household. Under EHCS rules, if an adult child is single and they don't have children of their own they should be part of the main family unit, with their parent/s (not in a separate family unit as the raw data suggests). So where there is a 'normal' family set up for example a couple with two children where one is the HRP, the household composition of these cases is recoded based on the overall composition of the family unit. If the data is not recoded, the household is coded 8 'as two or more families' which is not in accordance with the guidance. Usually this is just effects a few households in the data set each year.

5.96   Annex Table 5.4.12 shows the SEH household composition descriptor (hhcomp1), its coding, key modelling issues and recoding or potential data conflicts. This descriptor is derived firstly based on the eldest person in the household, however in the modelling, additional family units of couples and single parents will over-ride the eldest person in the household if they are a single person family unit. This means that households that may have been coded two or more families under EHCS method, can be coded as married/cohabiting couple or a lone parent (male or female) under the SEH method.

Annex Table 5.4.12: Household composition descriptors that originate from the SEH

Hhcomp1 - Household composition		
Variable code and value label	**Modelling key issues**	**Recoding or possible data conflict issues**
1. Married / cohabiting couple	A married/cohabiting with or without children (independent or dependent). There can be additional single person family units in the household. Note - couples households over-ride the eldest household if the eldest household is a single household.	Some cases are recoded to lone parent, because modelled on married status, and there are some households that state they are married but there is no partner in the household, so these are recoded to match hhtype11 that codes these cases as single parents. (Also ncouple and nsing are recoded see above). This may not fit with the derived variables based on an HRP profile, for example Cohabhrp.
2. Lone parent, male HRP	A lone parent with child(ren) dependent or independent or both with a male HRP. There can be additional single person family units in the household. Single parent households over-ride single households if they are the eldest household.	Could be coded as two or more families under hhtype11, if there is an additional single family unit who is the HRP. If this is the case the HRP might not be the lone parent.
3. Lone parent, female HRP	A lone parent with child(ren) dependent or independent or both with a female HRP. There can be additional single person family units in the household. Single parent households over-ride single households if they are the eldest household.	Could be coded as two or more families under hhtype11, if there is an additional single family unit who is the HRP. If this is the case the HRP might not be the lone parent.
4. Multi family household, male HRP	Has at least two family units and it is either made up of: at least a couple family unit and single parent family unit or 2 couples or 2 single parents family units or 2 or more single people in their own family unit. It is not possible to have a single family unit with a family unit of 2 or more people in this derivation; these will be code 1 to 3 above.	-

Hhcomp1 - Household composition		
Variable code and value label	**Modelling key issues**	**Recoding or possible data conflict issues**
5. Multi family household, female HRP	Has at least two family units and it is either made up of: at least a couple family unit and single parent family unit or 2 couples or 2 single parents family units or 2 or more single people in their own family unit. It is not possible to have a single family unit with a family unit of 2 or more people in this derivation; these will be code 1 to 3 above.	-
6. One male	One person households - single family unit	**-**
7. One female	One person households - single family unit	**-**

5.97 Although, the majority households derived descriptors are consistent with the raw data and one another there are circumstances where these may conflict. In the first instance, any conflict between the derived household descriptors and the raw data, the derived descriptors would be correct (following the guidance for classifying individuals and households) and the household raw data inconsistent. Once the descriptors are modelled, a few households are recoded which means they are not consistent with the original modelling rules, but this has to be done to reduce data conflict between key descriptors. Even so, there are still some household descriptors which will still conflict with others. The key areas of conflict are:

- Number of dependent children in the household (ndepchild) with hhtype11, hhtype7 hhtype6 and hhcompx, where it's possible to be coded as a household with no dependent children in it, when in fact the household contains dependents in separate family unit to the HRP.

- Hhcomp1 can conflict with hhtype11, hhtype7, hhtype6 and hhcompx, these are due to the treatment of additional single person households, depending on modelling assumptions of either an EHCS or SEH based descriptor.

- Hhcomp1 may conflict with Cohabhrp and Cohabprt as it is not modelled based on the HRP.

- Ncouple, loncoupx, Cohabhrp and Cohabprt may conflict with due to the modelling of cohabiting same sex couples otherfam, othfamlp famnumx and NoUnits1; although these are not easy to identify through top level analysis.

Annex 5.5: **Housing conditions**

5.98 The EHS collects very detailed information about the overall condition and quality of the housing stock using a detailed physical inspection by trained surveyors. A number of the measures and indicators e.g. presence of damp problems, electrical safety etc. are derived almost directly from what the surveyor has entered on the physical survey form and in that sense are straightforward and are covered in the glossary to the main reports. For other measures, the judgements that the surveyors have to make can be complex and the modelling has to combine several of these into a composite indicator. This section provides more information regarding three more complex housing condition measures:

- the Housing Health and Safety Rating System (HHSRS)
- decent homes
- disrepair (repair costs)

5.99 The complexity of derived variables relating to these three housing condition indicators varies by degree and nature. For the HHSRS, the most complex aspect relates to the surveyor assessments at the survey dwelling, which are underpinned by their extensive training and support to help ensure their HHSRS assessments are consistent and robust.

5.100 In contrast, the creation of the repairs costs relies in part on the outputs from the complex dimensions modelling (see annex 7 of this Chapter), and further, but less complex, modelling of data collected through the surveyor observations on the level of disrepair and suggested treatment to remedy any disrepair at the survey dwelling. These observations are also supported by extensive training and support.

5.101 The assessment of whether the survey dwelling meets the decent homes standard is not assessed directly by the surveyor but is modelled post fieldwork using both outputs from the repair cost and HHSRS modelling and additional data collected by the surveyor.

Housing Health and Safety Rating System

5.102 This section presents an overview of the Housing Health and Safety Rating System (HHSRS) and how the various hazards are measured and modelled using data from the EHS. It is divided into three sections:

- what is the HHSRS?

- how does the EHS measure and model Category 1 hazards?

- data quality and reliability

What is the HHSRS?

5.103 The HHSRS is the government's evidence based risk assessment procedure for residential properties. It replaced the Housing Fitness Regime on the 6 April 2006 in England. The HHSRS also replaces the Fitness Standard as an element of the Decent Homes Standard. The HHSRS is a means of identifying defects in dwellings and of evaluating the potential effect of any defects on the health and safety of occupants, visitors, neighbours and passers-by. The system provides a means of rating the seriousness of any hazard so that it is possible to differentiate between minor hazards and those where there is an imminent threat of major harm or even death. The emphasis is placed on the potential effect of any defects on the health and safety of occupants, visitors, and particularly vulnerable people. Altogether 29 hazards are included, Annex Table 5.5.1.

Annex Table 5.5.1: The 29 hazards covered by HHSRS

Physiological requirements
- dampness and mould growth
- excess cold
- excess heat
- asbestos (and MMF)
- biocides
- carbon monoxide and fuel combustion products
- lead
- radiation
- uncombusted fuel gas
- volatile organic compounds

Psychological requirements
- crowding and space
- entry by intruders
- lighting
- noise

Protection against infection
- domestic hygiene, pests and refuse
- food safety
- personal hygiene, sanitation and drainage
- water supply

Protection against accidents
- falls associated with baths etc
- falling on level surfaces
- falling on stairs etc
- falling between levels
- electrical safety
- fire
- flames, hot surfaces etc
- collision and entrapment
- explosions
- position and operability of amenities etc
- structural collapse and falling elements

5.104 The HHSRS scoring procedure uses a formula to generate a numerical hazard score for each of the hazards identified at the property – the higher the score, the greater the severity of that hazard. Potential hazards are assessed in relation to the most vulnerable class of person who might typically occupy or visit the dwelling. For example, for falls on stairs and falls on the level, the vulnerable group is defined as persons over 60 years, and for falls between levels it is children under 5 years old.

5.105 The hazard score formula requires the HHSRS inspector to make two judgements.

- the likelihood of an occurrence which could result in harm to a vulnerable person over the following 12 months. The likelihood is to be given as a ratio – e.g., 1 in 100, 1 in 500, etc.

- the likely health outcomes or harms which would result from the occurrence. From any occurrence there may be a most likely outcome, and other possible ones which may be more or less severe. For example, a fall from a second floor window could result in a 60% chance of a severe concussion, but there may also be a 30% chance of a more serious injury and a 10% chance of something less serious. The four classes of harms and the weightings given to them are listed in Annex Table 5.5.2.

Annex Table 5.5.2: Classes of harms and weightings used in the HHSRS

Class	Examples	Weightings
Class I	Death, permanent paralysis below the neck, malignant lung tumour, regular severe pneumonia, permanent loss of consciousness, and 80% burn injuries.	10,000
Class II	Chronic confusion, mild strokes, regular severe fever, loss of a hand or foot, serious fractures, very serious burns and loss of consciousness for days.	1,000
Class III	Chronic severe stress, mild heart attack, regular and persistent dermatitis, malignant but treatable skin cancer, loss of a finger, fractured skull, severe concussion, serious puncture wounds to head or body, severe burns to hands, serious strain or sprain injuries and regular and severe migraine.	300
Class IV	Occasional severe discomfort, chronic or regular skin irritation, benign tumours, occasional mild pneumonia, a broken finger, sprained hip, slight concussion, moderate cuts to face or body, severe bruising to body, 10% burns and regular serious coughs or colds.	10

5.106 From the judgements made by the HHSRS inspector, a hazard score can be generated for each hazard, Annex Table 5.5.3.

Annex Table 5.5.3: Calculation of HHSRS hazard score

Class of Harm	Weighting		Likelihood 1 in		Spread of Harm (%)		
I	10,000	÷	100	X	0	=	0
II	1,000	÷	100	X	10	=	100
III	300	÷	100	X	30	=	90
IV	10	÷	100	X	60	=	6
					Hazard Score	=	196

5.107 To provide a simple means for handling and comparing the potentially wide range of scores and avoid placing too much emphasis on the exact numbers, a series of ten hazard score bands have been devised, Annex Table 5.5.4. Bands A, B, and C are the most serious and grouped together as presenting a Category 1 hazard; local authorities have a statutory duty to consider some form of action where these are present.

Annex Table 5.5.4: HHSRS hazard score bands

Band	Equivalent Hazard Scores
A	5,000 or more
B	2,000 – 4,999
C	1,000 –1,999
D	500 – 999
E	200 – 499
F	100 – 199
G	50 – 99
H	20 – 49
I	10 – 19
J	9 or less

5.108 DCLG, and others, have published a number of guidance documents for HHSRS practitioners and private landlords. For guidance published by DCLG see:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/15810/142631.pdf

How does EHS measure and model Category 1 hazards?

5.109 For the EHS, surveyors are required to collect a wide range of information in what is a relatively short and non-intrusive property inspection. The survey cannot therefore replicate in full the HHSRS assessment that would be carried out by a local authority environmental health practitioner. The approach used has been developed by the Building Research Establishment working in close co-operation with experts from the University of Warwick who were involved in the development of the HHSRS methodology.

5.110 Of the 29 HHSRS hazards only three (which occur very rarely in the stock) are not assessed by the EHS. These are asbestos (and manufactured mineral fibres), biocides and volatile organic compounds.

5.111 The EHS uses three different methods to assess whether any of the 26 Category 1 hazards exist in dwellings:

- Fully measured hazards as part of the physical survey for the most common types of hazards. The surveyor first assesses whether the risks presented for each of these hazards are significantly worse than average for the age and type of dwelling concerned. If this is the case, they then score both a likelihood of an incident occurring and the expected range of outcomes. An actual HHSRS score is not computed in the field but where risks are assessed as significantly worse than average surveyors obtain this score later during validation of their survey data prior to submission. From April 2012, EHS surveyors fully measured six hazards.

- Hazards flagged only when an 'extreme' risk is found as part of the physical survey. This approach is used for some of the rarer hazards where surveyors are instructed that 'extreme risk' equates to a Category 1 hazard. From April 2012, EHS surveyors assessed 16 hazards by this approach.

- Four hazards modelled post fieldwork from other data collected on the physical survey form. This approach is used where the surveyor is less able to directly assess the risk from these hazards.

5.112 Annex Figure 5.5.5 shows a worked example of HHSRS assessment. In making their HHSRS assessments surveyors are instructed to ignore the current occupancy and assume a member of the group most vulnerable to the particular hazard occupies the property. Annex Table 5.5.6 shows how information on each hazard is collected.

Annex Figure 5.5.5: Worked example of HHSRS assessment

FALLS ON STAIRS ETC

HHSRS VERSION 2

Vulnerable group	Persons aged 60 years or over	Multiple locations	Yes	No
Related hazards	None	Secondary hazards	Yes	No

A) Front door steps

A/B) Plan

B) Main stairs

C) Steps at gate

e/u
l/v
B) i
b
^ up
hall ii
w
x iii
a
n
h
j i
k ^ up
o
A) d c
y z i

DESCRIPTION OF HAZARD/S

Dwelling: 1930s, Semi-detached house

A) **Front door steps:** These are of smooth painted concrete and have no top 'landing'. The bottom riser is high and uneven (300 mm max). There is a wobbly tubular steel handrail on one side but no guarding at all, despite the narrow width. There is no external porch light and little street lighting.

B) **Main stair:** The main internal stairs have two winders at the top and are moderately steep. There is a handrail only along the outside wall of the straight flight. There is a projecting radiator in the small hall and some glass in the front door close to the foot of the stairs.

C) **Steps at gate:** The steps close to the front gate are of rough spalling concrete. They have high uneven risers and a narrow tread. There is a crude rotten timber handrail but no guarding.

LIST OF RELEVANT MATTERS

LIKELIHOOD		A	B	C		OUTCOMES		A	B	C
a	Tread lengths	1	1	2		a	Length of flight	-	1	-
b	Riser heights	3	1	2		b	Pitch of stairs	-	2	-
c	Variation in T&Rs	3	1	2		c	Projections etc #	-	2	3
d	Nosing length	-	-	-		d	Hard surfaces #	2	1	2
e	Poor friction quality	3	-	1		e	Construction/repair	2	-	3
f	Openings - in stairs	-	-	-		f	Thermal efficiency	3	-	2
g	Alternating treads	-	-	-						
h-i	Lack/height handrails	3	2	2		# Secondary hazards		A	B	C
j-l	Lack/height guarding	3	-	1		i	Concrete kerb	2	-	-
m	Stair width	2	-	-		ii	Projecting radiator	-	2	-
n	Length of flight	-	1	-		iii	Glass in front door	-	1	-
o-q	Inadequate lighting etc	3	-	3		iv	Condition of paths	3	-	2
r	Door/s onto stairs	-	-	-						
s	Inadequate landing	3	-	-						
t	Construction/repair	2	-	3		Key	3 Seriously defective	1	Not satisfactory	
u	Thermal efficiency	2	-	1			2 Defective	-	Satisfactory/NA	

COMPLETION OF SECTION 22 OF EHS FORM

LIKELIHOOD

Falling on stairs etc.		Significantly higher than average	Y N				Average Pre 1919	Average					
Likelihood of a person over 60 having a fall leading to harm				1800	1000	560	320	180	100	56	32	18	6	2

Justification — The main stairs are assessed as giving the same likelihood of a major fall as the average for inter-war houses, (i.e. around 1 in 320), the limited handrail provision cancelling out any benefits of the broad winders. However, the added presence of the front access steps - particularly dangerous in icy weather and at night - substantially increases the overall annual probability of such a fall - to 1 in 18.

OUTCOMES

Likely outcome if a person over 60 should fall	Class 1 Extreme %	0.1	0.2	0.5	1	2.2	4.6	10	21.5	31.6	46.4	100
	Class 2 Severe %	0.1	0.2	0.5	1	2.2	4.6	10	21.5	31.6	46.4	100
Action required	Class 3 Serious %	0.1	0.2	0.5	1	2.2	4.6	10	21.5	31.6	46.4	100

Justification — The stairs are designed to be carpeted but the resulting lower harms are offset by the small hall, projecting radiator and single glazing in the door, albeit this is not at low level. However, the presence of the external front door steps and steps near the front gate, both flanked by rough tarmac and a concrete kerb, significantly increase the risk of a fatal or severe fall occurring, particularly in cold weather or at night.

Likelihood Class 1 Outcome	1 in 1800	1 in 1000	1 in 560	1 in 320	1 in 180	1 in 100	1 in 56	1 in 32	1 in 18	1 in 6	1 in 2
0.1%							E	D	C	B	A
0.2%						E-	E	D	C	B	A
0.5%						E	E	D	C	B	A
1.0%						E	E+	D	C	A-	A
2.2%				F	E-	E	D	C	B	A	A
4.6%				E-	E	D	C	B-	B	A	A
10.0%			E-	E	D	C	B-	B	A	A	A
21.5%		E	E	D	C	B	B	A	A	A	A
31.6%		E	D	C	C	B	A	A	A	A	A
46.4%	E	E	D	C	B	B	A	A	A	A	A
100%	D	C-	C	B	A	A	A	A	A	A	A

ACTION REQUIRED

Justification — Replacing the steps to the front door and at the gate will be picked up under Section 18. This will bring the property's rating back to average for its age and type.

Action required?	Action	Coded elsewhere?		Quantity	
Y	Install handrail	Y	N	Metres:	
Y	Install balustrade	Y	N	Metres:	
Y	Cover dangerous balustrade/guarding	Y	N	Metres:	
Y	Repair/replace internal staircase (S5)	Y			
Y	Redesign internal, common or external staircase (design, not condition)		N	Number:	
Y	Repair/replace external/common staircase (S9)	Y			
Y	Repair/replace external steps (S11, S18)	Y	N	Number:	
Y	Cover slippery stairs	Y	N	Flights:	
Y	Repair/replace/provide additional lighting (S5, S9, S11)	Y	N	Number:	
Y	Remove obstacle		N	Number:	

Annex Table 5.5.6: Summary of how EHS collects and models information about HHSRS hazards

Hazard	How assessed	Average HHSRS score	Specified vulnerable age group
Excess cold*	Modelled	926	Age 65 or over
Falling on level surfaces*	Fully measured	181	Age 60 or over
Falling on stairs etc*	Fully measured	134	Age 60 or over
Radiation*	Modelled	91	None
Collision and entrapment	Flagged if an extreme risk	57	Age under 5
Flames, hot surfaces etc*	Fully measured	42	Age under 5
Crowding and space*	Modelled	19	None
Fire*	Fully measured	17	Age 60 or over
Dampness and mould growth*	Fully measured	11	Age under 14
Entry by intruders	Flagged if an extreme risk	11	None
Falls associated with baths	Flagged if an extreme risk	7	Age 60 or over
Noise*	Flagged if an extreme risk	6	None
Falling between levels*	Fully measured	4	Age under 5
Food safety	Flagged if an extreme risk	2	None
Electrical safety*	Flagged if an extreme risk	2	Age under 5
Carbon monoxide and fuel combustion products*	Flagged if an extreme risk	1	Age 65 or over
Personal hygiene, sanitation and drainage*.	Flagged if an extreme risk	1	Age under 5
Explosions	Flagged if an extreme risk	1	None
Position and operability of amenities etc	Flagged if an extreme risk	1	Age 60 or over
Structural collapse and falling elements	Flagged if an extreme risk	1	None
Excess heat	Flagged if an extreme risk	0	Age 65 or over
Asbestos (and MMF)	Not assessed	0	None
Biocides	Not assessed	0	None
Lead*	Modelled	0	Age under 3
Uncombusted fuel gas	Flagged if an extreme risk	0	None
Volatile organic compounds	Not assessed	0	None

Lighting	Flagged if an extreme risk	0	None
Domestic hygiene pests and refuse.*	Flagged if an extreme risk	0	None
Water supply	Flagged if an extreme risk	0	None

Notes:

1) average scores are for all dwellings and taken from Version 2 of the HHSRS guidance. The averages have been calculated for the age range of the population most vulnerable to each type of hazard.
2) the 15 hazards which were scored or modelled for 2006 and 2007 are identified by an asterisk. This group is still used in the current reporting of the 'Decent Homes' HHSRS criterion.

5.113 In the 2006 and 2007 English House Condition Survey (EHCS), fewer hazards were fully scored and some of the hazards that are now measured or flagged were modelled using other data (see the EHCS technical report from 2007 for full details: http://webarchive.nationalarchives.gov.uk/20120919132719/www.communities.gov.uk/publications/housing/ehcstechnicalreport2007).

5.114 From 2008, reporting of HHSRS covers all of the 26 hazards covered by EHS so figures are not strictly comparable with the 2006 and 2007 HHSRS data. Reporting on decent homes (see decent homes section later in this note), continues to use the 'old' (15 hazards) version of HHSRS for continuity over time. Annex Table 5.5.7 summarises the assumptions and data used for the 4 hazards that are modelled from other data.

Annex Table 5.5.7: Modelling HHSRS hazards using EHS data

Hazard	Category 1 hazard defined as:
Excess Cold	Estimates the number of households living in homes with a threat to health arising from sub-optimal indoor temperatures using the Standard Assessment Procedure (SAP) [13]. This hazard is based on dwellings with an energy efficiency rating of less than 35 based using the original SAP 2001 methodology. The updated SAP 2009 methodology, used for the 2010-2012 EHS reports, recalculated the comparable threshold to be 35.79. From 2013, the EHS report has used the updated SAP 2012 methodology and the comparable excess cold threshold was recalculated to 33.52. This approach ensured that the number and % of dwellings failing on excess cold would be the same under both the SAP09 and SAP12methodology for the 2013 (and following) data sets
Radiation	The dwelling is located in one of the critical 16 post code sectors, based on a radon exposure map of England AND the dwelling was built before 1980.
Lead	The dwelling is located in one of 4 post codes with very soft water (based on the drinking water quality map of England) AND built

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[13] SAP is the Governments standard procedure for Energy ratings of dwellings.

	before 1945 AND with lead piping present either before or after the mains stop cock.
Crowding and space	The occupants per habitable room ratio is calculated. If this exceeds 2 the dwelling has a category 1 hazard regardless of size. If it is equal to 2 and the number of habitable rooms is 2 or more the dwelling also has category 1 hazard.

Data quality and reliability

5.115 Surveyors working on the EHS have received extensive training and support to help ensure their HHSRS assessments are consistent and robust. This includes residential training involving classroom and field exercises together with e-learning exercises. Refresher programmes are provided annually, together with manuals providing benchmark examples for reference when making their judgements. New surveyors are accompanied in the field and there is on-going close supervision throughout fieldwork. Calibration exercises are being implemented to monitor variability in surveyors' HHSRS assessments over time.

5.116 While these measures ensure a good level of consistency in judgements, some surveyor variability is to be expected. The EHS approach to the HHSRS provides surveyors with a systematic approach with which to make these judgements.

Decent homes

5.117 This section gives a detailed definition of the four criteria that a dwelling is required to meet to be considered 'decent' under the Decent Homes Standard, and explains how they are applied to the EHS data. A dwelling must meet all of the four criteria listed below to be classed as decent:

A)   it meets the current statutory minimum standard for housing

B)   it is in a reasonable state of repair

C)   it provides reasonably modern facilities and services

D)   it provides a reasonable degree of thermal comfort

Criterion A: the dwelling meets the current statutory minimum standard for housing

5.118 The current statutory minimum standard for housing is the HHSRS. To be decent, the dwelling must be free from Category 1 hazards (see previous section).

5.119 The presence of Category 1 hazards is assessed as described in the previous section. For this criterion only the 15 hazards which have been assessed since 2006 are included to ensure consistency over time.

Criterion B: the dwelling is in a reasonable state of repair

5.120 A dwelling satisfies this criterion unless:

- one or more key building components are old and, because of their condition, need replacing or major repair; or

- two or more other building components are old and, because of their condition, need replacement or major repair.

5.121 Key building components are those which, if in poor condition, could have an immediate impact on the integrity of the building and cause further deterioration in other components. If any of these components are old, and need replacing or require immediate major repair, then the dwelling is not in a reasonable state of repair. They are the external components plus internal components that have potential safety implications and include:

- external walls

- roof structure and covering

- windows/doors

- chimneys

- central heating boilers

- electrics

5.122 Other building components are those that have a less immediate impact on the integrity of the dwelling. Their combined effect is therefore considered, with a dwelling not in a reasonable state of repair if two or more are old and need replacing or require immediate major repair. Such components include kitchen and bathroom amenities, central heating distribution and storage heating.

5.123 The terms 'old' and 'in poor condition' are also quite tightly defined as below:

- **old**: the component is older than its expected or standard lifetime. The component lifetimes are listed in Annex Table 5.5.8

- **in poor condition**: the component needs major work, either full replacement or major repair. The definitions used for different components are as listed in Annex Table 5.5.9

5.124 Establishing whether dwellings surveyed in the EHS meet this criterion depends on the assessment both of the ages of key and other building components and of their condition.

5.125 The EHS surveyors record their assessment of the ages of the main external building elements together with key services and amenities. They are also given the shortcut option of recording whether elements are original i.e. the same as the building itself. Where the age of a component cannot be

assessed, it is assumed to be original i.e. the same age as the dwelling. In the relatively small proportion of cases where components are recorded as the 'same age as dwelling', it is necessary to calculate the probability that they have exceeded their lifetime. This is because age of dwelling is recorded in relatively wide bands rather than as a single year.

5.126 For example, for houses, windows are assumed to have exceeded their lifetime if they are more than 40 years old (for flats, the windows lifetime is 30 years old). Where houses were built between 1965 and 1974 and still had the original windows, many of these would have windows that were over 40 years old. A simple and robust approach is used, assuming that roughly equal numbers of dwellings were built in each year of this age band. Houses built between 1965 and 1973 (are over 40 years old and) represent 9 years out of the 10 year age band, so all original windows in houses built in 1965-1974 are given a probability of 0.9 of being over 40 years old.

5.127 For most dwellings, the assessment of whether or not they satisfy the disrepair criterion is clear cut. For the remainder, for each building component which is in poor condition, the probabilities of being beyond the normal lifetime are combined to give a total probability, taking into account the split into major and minor elements. If this total is greater than 0.5, the dwelling is classed as non-decent due to disrepair.

5.128 Annex Table 5.5.8 shows the lifetimes of building components used to assess whether the components are 'old' in the terms of the disrepair criterion. These lifetimes are used to construct the national estimates of the number of dwellings that are decent and those that fail.

Annex Table 5.5.8: Component lifetimes used in the disrepair criterion

Building components (key components marked *)	Houses and bungalows	All flats in blocks of below 6 storeys	All flats in blocks of 6 or more storeys
Wall structure*	80	80	80
Lintels*	60	60	60
Brickwork (spalling)*	30	30	30
Wall finish*	60	60	30
Roof structure *	50	30	30
Roof finish *	50	30	30
Chimney *	50	50	N/A
Windows *	40	30	30
External doors *	40	30	30
Kitchen	30	30	30
Bathrooms	40	40	40
Heating – central heating gas boiler *	15	15	15
Heating – central heating distribution system	40	40	40
Heating – other	30	30	30
Electrical system *	Modern	Modern	modern

5.129 As age of electrical system is not collected in the EHS, it is considered to be 'old' if it is not modern, i.e. it has lead or rubber covered wiring, there are separate fuse boxes for each circuit, or earthing wires are unsheathed/green covered.

5.130 Annex Table 5.5.9 sets out the definitions used within the disrepair criterion to identify whether building components are 'in poor condition'. For more detailed information on how surveyors are instructed to record disrepair, see the repair costs section of this note.

Annex Table 5.5.9: definition of 'poor condition' used in disrepair criterion

	Definition of 'in poor condition' used in EHS
Wall structure	Replace 10% or more, or repair 30% or more
Wall finish	Replace/ repoint/ renew 50% or more
Chimneys	1 chimney needing partial rebuilding or more
Roof structure	Replace 10% or more or strengthen 30% or more
Roof covering	Replace or isolated repairs to 50% or more
Windows	Replace at least one window or repair/ replace sash or member to at least two (excluding easing sashes, reglazing, painting)
External doors	Replace at least one
Kitchen	Major repair or replace 3 or more items out of 6 (cold water drinking supply, hot water, sink, cooking provision, cupboards, worktop)
Bathroom	Major repair or replace 2 or more items (bath, wash hand basin, WC)
Electrical system	Replace or major repair to system
Central heating boiler	Replace or major repair
Central heating distribution	Replace or major repair
Storage heaters	Replace or major repair

Criterion C: The dwelling has reasonably modern facilities and services

5.131 A dwelling is considered not to meet this criterion if it lacks three or more of the following facilities:

- a kitchen which is 20 years old or less

- a kitchen with adequate space and layout

- a bathroom which is 30 years old or less

- an appropriately located bathroom and WC

- adequate noise insulation

- adequate size and layout of common entrance areas for blocks of flats

5.132 The ages used to define the 'modern' kitchen and bathroom are lower than those for the disrepair criterion. This is to take account of the modernity of kitchens and bathrooms, as well as their functionality and condition.

5.133 There is some flexibility inherent in this criterion, in that a dwelling has to fail on three of these tests to be regarded as failing the modernisation criterion itself. Such a dwelling does not have to be fully modernised for this criterion to be passed: it would be sufficient in many cases to deal with only one or two of the facilities that are contributing to the failure.

5.134 The two tests for age of bathroom and kitchen are relatively straightforward to apply using EHS data. The method of assigning age probabilities described above is also used to determine whether kitchens and bathrooms have exceeded their lifetimes as specified in the modernisation criterion. The probabilities of being non-decent on these two components are added to results on the other modernisation measures in order to determine whether the dwelling should be classed as non-decent.

5.135 There is some ambiguity inherent in terms such as 'adequate' and 'appropriate' used for the other four criteria. The EHS (and its predecessor the EHCS) defines these operationally as follows:

- A kitchen failing on adequate space and layout would be one that was too small to contain all the required items (sink, cupboards, cooker space, worktops etc) appropriate to the size of the dwelling.

- An inappropriately located bathroom or WC is one where the main bathroom or WC is located in a bedroom or accessed through a bedroom (unless the bedroom is not used or the dwelling is for a single person). A dwelling would also fail if the main WC is external or located on a different floor to the nearest wash hand basin, or if a WC without a

wash hand basin opens on to a kitchen in an inappropriate area, for example next to the food preparation area.

- Inadequate insulation from external airborne noise would occur where there are problems with traffic (rail, road or aeroplanes) noise. Reasonable insulation from these problems should be ensured through installation of double glazing.

- Inadequate size and layout of common entrance areas for blocks of flats would occur where there is insufficient room to manoeuvre easily, for example where there are narrow access ways with awkward corners and turnings, steep staircases, inadequate landings, absence of handrails, low headroom etc.

Criterion D: the dwelling provides a reasonable degree of thermal comfort

5.136 The definition requires a dwelling to have both efficient heating and effective insulation. Both of these are defined very precisely in terms of what is present rather than by the overall energy performance of the dwelling.

5.137 Under this definition, efficient heating is defined as any gas or oil programmable central heating or electric storage heaters / programmable solid fuel, or communal heating or LPG central heating or similarly efficient heating systems. Heating sources which provide less energy efficient options do not meet this criterion.

5.138 Because of the differences in efficiency between gas/oil heating systems and the other heating systems listed, the level of insulation that is appropriate also differs:

- For dwellings with gas/oil programmable heating, cavity wall insulation (if there are cavity walls that can be insulated effectively) or at least 50mm loft insulation (if there is loft space) is an effective package of insulation.

- For dwellings heated by electric storage heaters / programmable solid fuel or LPG central heating a higher specification of insulation is required to meet the same standard: at least 200mm of loft insulation (if there is a loft) and cavity wall insulation (if there are cavity walls that can be insulated effectively).

5.139 Assessing whether the EHS sample dwellings pass or fail the decent homes thermal comfort criterion is complex because it involves an array of survey information related to insulation, heating and structural properties. The data collected on the form and the modelling assumptions have been changed and refined since the original 'baseline' figures were published in 2001. For more information on how these changed from 2001 to 2007 see the EHCS 2007 Technical Report: (http://webarchive.nationalarchives.gov.uk/20120919132719/www.communitie s.gov.uk/publications/housing/ehcstechnicalreport2007).

5.140 The 2008 data experienced modelling changes in the assumptions on cavity wall insulation to incorporate the use of the summary section on cavity wall insulation newly collected on the EHS 2008 physical survey form. There were no modelling changes in 2009.

5.141 The key modelling and form changes affecting thermal comfort since 2010 are:

- Where no loft insulation information is available for a room in the roof or a flat roof, appendix S of the SAP 2012 information booklet is used in conjunction with the actual date of construction or, if it is a loft conversion, the date of the loft conversion to determine an estimated amount of loft insulation (the banded construction date is used if the actual construction date is unknown).

- Changes in assumptions on cavity wall insulation to incorporate extended use of the summary section on cavity wall insulation collected on the EHS physical survey form following a wording change to the overarching cavity wall insulation summary question.

- Homes built after 2002 with cavity walls are assumed to have full cavity wall insulation.

Repair costs

5.142 This section presents an overview of how repair costs are derived from the EHS and is divided into three sections:

- the different repair cost measures used

- what types of work are excluded and included

- an outline of how the raw data is used to generate the costs

5.143 Information about repair costs is used for two basic purposes:

- to assess how much it would cost to carry out the specified work to the dwelling to give some idea of the likely level of investment needed. This is termed 'required expenditure' or 'actual costs'.

- to assess whether parts of the stock are in a better or worse state of repair than others. This is measured through 'standardised costs'.

Required expenditure

5.144 This is an estimate of what the specified work to the individual dwelling would actually cost. These costs therefore take account of variations in prices across the country and assume different project sizes depending on each dwelling's type and tenure. In the owner occupied and private rented sector, the contract size for work to houses is taken to be one. In the social rented sector, the

contract size is taken as the number of dwellings on the estate unless the house is not on an estate and therefore assumed to be a street property with a contract size of one. For flats, the contract size for exterior works is the size of the block regardless of tenure. This measure assumes that all work is carried out by contractors who operate in accordance with health and safety regulations. The costs do not include any VAT or mark up for profit. These costs should not be used for assessing differences in condition between different tenures or dwelling types because they vary according to dwelling size, tenure and location (note: on the EHS database these costs are shown as 'actual costs'). When making such comparisons among different dwelling characteristics, it would be more appropriate to use 'standardised repair costs' as explained below.

Standardised repair costs

5.145 This is an index of disrepair that expresses costs in pounds per square metre ($£/m^2$) based on prices for a mid-point in the range of prices in England. The same assumptions about contract size are made for houses in all tenures (contract size = 5 dwellings) and are then divided by the total floor area of the dwelling. The resulting index can be used to compare the relative levels of disrepair for dwellings of different sizes, in different tenures and different locations.

5.146 The extent of work required to a dwelling depends on the judgements made by the surveyor about the urgency of that work. The two different measures of required expenditure and standardised costs are therefore presented with reference to three different time scales:

Urgent repairs

5.147 This is a measure of serious and immediate problems in the dwelling, and includes all interior work. Where surveyors record that work is needed to an exterior building element, they indicate whether work specified was urgent. To be classed as 'urgent', the ***problem must meet at least one of the following criteria:***

- it threatens the immediate safety of occupants or passers-by or is a health hazard

- it is currently promoting noticeable and rapid deterioration in other parts of the building

- it is at present causing difficulty or discomfort to the occupants (or would do so if the dwelling were occupied)

- the security of the building is threatened

    (*variables on database = cstactux and cststdux*)

Basic repairs

5.149 These cover all works that the surveyor has identified as necessary to carry out within five years, including any urgent work as described above. These do not include replacement of building elements nearing the end of their life where the surveyor has recorded that this action could be delayed by more than five years, often by short term patch repairs. *(variables on data base= cstactbx and cststdbx)*

Comprehensive repairs

5.150 These cover all repairs as specified above together with any replacements that the surveyor has assessed as being needed in the next 10 years. For all exterior elements, whether repairs are needed or not, surveyors record the number of years before the element needs replacing either following specified repair work or simply as the remaining life expectancy. This measure provides a better basis for identifying work which would form part of a planned programme of repair by landlords. *(variables on data base = cstactcx and cststdcx)*

What types of work are included and excluded?
5.151 The costs described above include all of the following types of work:

- all work to the external fabric of the building: chimneys, roof, roof and soil drainage, windows, doors, dormers, bays, porches, balconies, damp proof course and treatment of inappropriate gradients/levels of ground adjacent to the dwelling

- additional work to deal with structural instability: e.g. underpinning, tying in of walls, treatment of fungal or insect infestation, replacement of cavity wall ties, etc

- work to the internal fabric: ceilings, floors, internal and partition wall surfaces, internal doors and stairs

- work to amenities and services inside the dwelling: kitchen, bathroom, WC, electrical wiring, plumbing, gas pipes, heating, and water heating

- work to common areas and access ways in blocks of flats: floors, walls, ceilings, doors, screens, windows, lighting and balustrades

- work to shared facilities on estates: stores and common rooms, communal parking facilities, surfaces and fences and common services. Note that this only covers any shared facilities that might be used by the occupants of the survey dwelling and which, for large estates, are located within 100 metres of the survey module.

5.152 The costs **exclude**:

- work to fences and boundary walls

- work to underground drainage

- hidden work to structure or foundations

- work to plant associated with shared facilities, e.g. lift motors, communal boilers, washing machines in laundry rooms, etc.

- shared facilities not used/useable by the dwelling itself

- VAT, professional fees, overheads or profit.

5.153 It is also important to remember that repair costs are based on a snapshot of the housing stock at the time of the survey and no provision is made for any routine regular maintenance that would (or should) be carried out e.g. servicing of boilers, lifts etc. or clearing of gutters.

Calculating repair costs
5.154 The EHS uses four types of information to calculate base repair costs:

- The surveyors' assessments of the type of repair needed and its extent.

- The surveyor's description of the materials from which the element is constructed (for external elements only).

- Building dimensions and configuration derived from surveyors' measurements and observations.

- Unit prices for different types of job from the 1996 National Schedule of Rates (NSR), adjusted for inflation using the Building Cost Information Service (BCIS) national price index. The BCIS data is used to convert basic standardised repair costs (£/m²) to 2014 prices so that the level of disrepair over time can be examined.

  For the on-going time series analysis in the annual EHS reports, repair costs for previous surveys were rebased to 2014 prices

5.155 The surveyor assesses each element in turn: usually surveying the interior first, and then the exterior of the dwelling. Internally an assessment of the main rooms is made (the main living room, main bedroom plus hall, kitchen and bathroom. The work identified as needed in the sample of rooms is scaled up to reflect the total number of rooms in the dwelling. All of the internal amenities and services are surveyed individually.

5.156 For the common areas in blocks of flats, surveyors select only part of the common areas to survey – the main entrance, stairway and corridor/deck used by the survey dwelling. These are assumed to be representative of the whole of the common areas and scaled up accordingly.

5.157 Externally the surveyor assesses each element in turn, looking at the building from two vantage points ('views') which between them encompass the whole building.

5.158 In assessing the type and extent of work needed, surveyors follow a sequence of decisions that are made explicit on the survey form:

- identify whether there is a fault

- determine the nature of the action

- determine the scale of the action

- determine the timing of the action (for exterior elements only)

5.159 These assessments will depend on a large number of factors. What standard of repair should be aimed for? Will the work be spread over time or is it all to be done straightaway? How long must the building remain in good condition once the work is done? How much is it worth spending on the building? According to how these questions are answered, the final repair cost can vary considerably. EHS therefore sets fairly stringent ground rules and assumptions for surveyors to follow.

5.160 In making their assessments, surveyors are instructed to assume that dwellings have an indefinite life – repairs are recorded even where it is felt to be uneconomic.

5.161 When determining the nature of the action required, they are instructed to treat the work as a programme of actions stretching into the future which means to repair rather than replace unless:

- this is impracticable

- it means that the element will still need replacing within 5 years

- the element needs replacing for other reasons, e.g. it is unsuitable for its intended purpose. Here, the standard of work should result in the element being fully functional without any allowance for modernisation, upgrading or purely cosmetic improvements.

5.162 In deciding how much of the element requires the specified action, they are instructed not to employ economies of scale. The quantity of work required is recorded in different ways for different types of elements:

- in tenths, for elements treated as areas, e.g. walls, roofs, or lengths e.g. roof features. The building measurements and other information enable us to calculate the total number of square metres of each element in each view or room e.g. external walling at the rear, ceiling in the kitchen etc. and these are then multiplied by the proportions indicated by the surveyor to obtain an actual quantity

- in number of units needing work, for elements which can be treated as individual entities, e.g. doors, windows, baths

- in square or linear metres for work to elements where there is insufficient data to estimate the total quantity within the building e.g. flooring in common areas

5.163 For the last two, the quantity given is multiplied by the unit cost for the job specified. For elements where the work is specified as a proportion, this is first converted to a quantity (m^2 or linear metres) from the dimensions taken of the dwelling/building and then this quantity is multiplied by the unit price (per m^2 or per m) for the type of work specified. In all cases it is assumed that a like for like replacement is undertaken and the costs selected reflect the materials from which the element is currently constructed, e.g. a slate roof is always replaced with a slate roof.

5.164 The cost calculated is for the individual dwelling. Therefore for flats the cost of works to the common areas and exterior, recorded for the whole building, is divided by the number of flats and this is added on to the interior, amenities and services costs for the individual dwelling.

Dealing with missing data

5.165 The cases included in the physical survey database are those where a full survey was conducted, but even where the form was completed fully the surveyor may have omitted to provide some information needed to calculate repair costs. Such omissions are, however, increasingly rare, particularly after the introduction of the digital pen technology.

5.166 Where data is missing costs are imputed using data for dwellings of a similar age and type:

- if the surveyor has clearly indicated that repairs are needed to an element, but not what those repairs are, then an average cost for that element is taken from dwellings of a similar age and type where repairs are needed to that same element.

- if the surveyor has not indicated whether repairs are needed to an element, then an average cost for that element is taken from all dwellings of a similar age and type.

Add-ons, uplifts, preliminaries and modifications to base costs

5.167 Once the 'base' costs have been calculated as above, additional sums are added to account for preliminaries and access equipment:

- preliminaries: items required before the work can commence e.g. site hut, security fencing

- access equipment: includes the costs for scaffolding, cradles and other equipment needed to work safely at height.

5.168 There are also factors added to account for 'uplifts' or economies of scale which are calculated differently for the 'required expenditure' and 'standardised costs' versions as described above. Finally, the country is divided into nine continuous geographic areas possessing a broad level of cultural homogeneity each of which is assigned a separate price factor to represent the differing costs of labour and materials in that area. These price factors are then are used to further refine the 'required expenditure' costs.

5.169 It is important to remember that costs do not include any VAT, professional fees, overheads or profit.

Annex 5.6: **Energy Efficiency**

5.170   The English Housing Survey (EHS) collects a large amount of detailed information relating to building construction, heating and insulation. This provides a detailed profile of the energy performance and carbon emissions of the existing housing stock and how far these could be improved using different types of measures. This note sets out:

- **Main components of energy efficiency** – how the individual components contributing to overall efficiency are defined and modelled.

- **Standard Assessment Procedure (SAP) of buildings energy performance** – the methods and assumptions used to calculate SAP (energy efficiency) ratings and carbon dioxide emissions.

- **Energy performance certificates (EPC)** – how an assessment is made of what measures could be installed to improve energy efficiency and reduce carbon emissions, and what the impact of installing these possible improvements would be. It also briefly discusses households' awareness of EPCs and the improvements they suggest.

- **Barriers to improving insulation** – classifying the ease of installation or specific barriers to loft, cavity and solid wall insulation.

Main components of energy efficiency

Primary heating systems

5.171   The EHS records up to two forms of space heating system and all water heating systems present in each dwelling. Where two types of space heating system are present, the EHS designates the one that covers the largest proportion of the dwelling as the primary heating system and collects detailed information on its overall type, the fuel used, boiler details (where relevant) and heating controls. The primary space heating type is classified as central heating system, storage heaters or room heaters.

Central heating system

5.172   This is most commonly a system with a gas fired boiler and radiators, distributing heat throughout the dwelling. Also included in this definition are warm air systems, communal heating and electric ceiling/underfloor heating, (included in 'other systems' in the 2012 dataset). Central heating is generally considered to be a cost effective and relatively efficient method of heating a

dwelling, although the cost effectiveness and level of carbon dioxide (CO_2) emissions will be closely linked to the type of fuel.

Storage heaters

5.173 These are predominately used in dwellings that have an off-peak electricity tariff. Storage heaters use off-peak electricity to store heat in clay bricks or a ceramic material; this heat is then released throughout the day. These are more cost effective than fixed or portable room heaters, but storage heating can prove expensive if too much on peak electricity is used during the day. Their efficiency is calculated based on their age and the type of controls present.

Room heaters

5.174 This category includes all other types of heater such as fixed electric or portable electric heaters. This type of heating is generally considered to be the least cost effective of the main systems and produces more CO_2 emissions per kWh.

Secondary heating systems

5.175 Where more than one space heating system or appliance has been recorded and the primary system identified as above, the additional appliance is coded as the secondary system and, along with the secondary fuel, used in the SAP calculation and other analysis. These systems may have been originally installed alongside the primary system, perhaps in a larger home. More often they would have been the only source of heating when the property was built, before being superseded by a new system, typically a form of central heating. The secondary space heating type is classified as follows:

- *Fixed room heaters:* the majority of secondary systems fall into this category, which includes various types of mains gas fires, solid fuel fires and stoves, and direct acting electric panels and radiators which are wired into the mains electricity.

- *Storage radiators:* individual storage heaters which are subsidiary to the main heating system are included here.

- *Portable heaters:* where the only secondary heating is through a portable electric or paraffin heater. This includes cases where the SAP methodology has concluded that the main fixed heating is insufficient to heat the dwelling to a satisfactory level, so a portable secondary system is imputed to allow an energy efficiency rating to be calculated.

Boilers

5.176 Where the heating system has a boiler, the EHS collects basic information on its generic type. The EHS also collects information about the make and model of the boiler and its age so that an accurate estimate of its overall fuel efficiency can be derived. There are four main types of boilers:

- *Standard boiler:* these provide hot water or warm air for space heating, with the former also providing hot water via a separate storage cylinder.

- *Back boiler:* these older models are located behind room heaters and feed hot water to a separate storage cylinder. They are generally less efficient than other boiler types.

- *Combination boiler:* provides hot water or warm air for space heating and can provide hot water on demand, thus negating the need for a storage cylinder and therefore requiring less room.

- *Condensing boiler:* standard and combination boilers can also be condensing. A condensing boiler uses a larger, or dual, heat exchanger to obtain more heat from burning fuel than an ordinary boiler, and is generally the most efficient boiler type. Changes to Building Regulations have seen an increase in condensing boilers as they have become mandatory for all replacements.

Water heating

5.177 All existing water heating systems are recorded by the surveyor. Where more than one water heating system is present, the system used for analysis and modelling is selected in the order of the categories below. The categories of water heating systems used in the report are:

- *With central heating:* the water is primarily heated by the same system as the primary space heating, usually a standard boiler with a separate storage cylinder or a combination boiler heating water on demand.

- *Dedicated water boiler:* a separate boiler to the space heating system, possibly using a different fuel, provides the hot water.

- *Immersion heater:* hot water is provided by a single or dual electric immersion heater in the storage cylinder. These are less energy efficient than central or separate boilers, but are often found as a 'top-up' system for other systems.

- *Instantaneous water heater:* the least energy efficient water heating appliances heat small amounts of water on demand in a similar way to a kettle and distribute the hot water to one or more points.

Wall types and wall insulation

5.178 The construction of the external walls and whether they contain any additional insulation is an important determinant of heat loss. The EHS collects detailed information on the overall construction type, age of the building, added wall insulation and what proportion of the external walls consists of different types.

Cavity walls

5.179 A cavity wall is one constructed of two brick or block walls separated by a cavity that is at least 50mm wide. They are generally found in houses dating from about 1930 onwards, although some older examples exist. Many dwellings (especially older private sector homes) have a mix of wall types because they have had one or more extensions added at different times.

5.180 Dwellings are only classed as 'cavity wall' where at least 50% of the total external wall area is cavity brickwork. This means that a small house built with solid 9" brick walls in 1900 which had a cavity brickwork extension that was larger than the original building added in 1960 would be classed as having 'cavity walls'.

5.181 Dwellings with cavity walls can have none, part or all of the cavity wall area insulated. The insulation can be built into the original wall construction or installed later and can reduce fuel costs by up to 15%.

Post-1990 dwellings

5.182 In addition to cases which have been identified as cavity insulated and cavity uninsulated, annual EHS reports since 2010 have used a third category for post-1990 dwellings with predominantly cavity walls but no evidence of cavity wall insulation. It is likely that these dwellings had insulation installed when built, but this can not necessarily be assumed since the 1990 and 1994 Building Regulations both specify an external wall U-value, which could be achieved through other mechanisms as an alternative to cavity fill.

5.183 Further, in the 1994 Building Regulations the 'Target U-value' method was introduced as an alternative method of showing compliance. The requirement would be met if the calculated average U-value of the dwelling did not exceed the Target U-value, corrected for the proposed method of heating. This allowed a greater flexibility in selecting the insulation levels of individual elements in the building's thermal envelope[14]. For example, 1994 Building Regulations specify an external wall U-value of 0.45 $W/m^2/K$. Using the Target U-value approach in the 1994 Building Regulations meant that the external wall U-values could be greater than 0.45 $W/m^2/K$ but to compensate the U-values of the other external elements had to reduce below the specified U-

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[14] The thermal envelope of the dwelling is the physical barrier between the warm interior and the cold air outside or in unheated spaces such as a loft for example.

values, or as the Target U-value approach was based upon a central heating system of 72%, installation of a more efficient heating system meant that the specified insulation levels in the Building Regulations could be relaxed[15].

Solid walls

5.184 Where dwellings do not have cavity walls, external or internal wall insulation can be installed to improve energy efficiency where the thermal properties of the external walls are poor. Where a surveyor has recorded that external wall insulation had been applied to at least 50% of a non-cavity walled dwelling, or that at least 50% of the measured rooms have had internal insulation applied, it was classed as having an insulated solid wall.

Loft insulation

5.185 Adequate loft insulation can make significant savings to both heating costs and CO_2 emissions, making this a cost effective method of insulation. It involves fitting insulating foam or fibre between the joists or rafters in a loft, which prevents the rising heated air from escaping through the roof.

5.186 The EHS physical survey involves an inspection of the loft where the surveyor notes whether insulation is present and measures its thickness. The collection of loft insulation data was changed after the 2001 English House Condition Survey (EHCS), so analysis of data from 2003 onwards cannot be directly compared to previous data (see the EHCS 2003 technical report for details). In cases where surveyors are unable to access lofts or where the dwelling is a house or top-floor flat with a flat or shallow pitched roof, the amount of insulation in the dwelling was classed as unknown in the Energy Efficiency of English Housing Report. However for the purpose of calculating a SAP rating, an amount was imputed using the mean value for dwellings of that age, tenure and broad geographical area. These classifications were used because earlier regression analysis indicated that these factors were the main determinants of the amount of loft insulation present.

Low energy lighting and conservatories

5.187 Analysis in the 2011 Homes Report examined headline figures for homes which predominantly use low energy lighting and those with conservatories. This used the interior section to calculate the proportion of surveyed rooms with low energy lights at the time of survey, whist data relating to the size, glazing type and heating of conservatories was also taken from the raw physical survey data. This data has not been re-analysed in subsequent EHS reports, but these areas may be re-visited in future.

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[15] For examples of the Target U-value methodology see Appendix F of the 1994 Building Regulations Part L1 A. http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADL_1995.pdf

Renewable energy measures

5.188 Since 2009, EHS surveyors have recorded the presence of solar photovoltaic panels and domestic wind turbines for electricity generation, whilst the presence of solar hot water panels has been collected since 2001. Since 2011 EHS reports have included analysis of any observed renewable energy technologies.

5.189 In the full SAP methodology a calculation is used to determine the electricity production of PV panels, using peak power of the type of PV panel multiplied by factors such as dwelling orientation and overshading. Prior to 2014, this level of detail was not collected, so an assumed peak power of 2.5kWh was applied to each case. From the 2014-15 survey year onwards, the area of PV panels has been collected, which allows peak power to be calculated more accurately for each dwelling, using the equation: (Peak power (kWh) = 0.12 x PV area), in line with rdsap conventions.

5.190 Prior to 2014, detailed information on biomass heating fuels was not available, so biomass heating systems were assumed to use wooden logs as their primary heating fuel. From the 2014-15 survey onwards, an update to the EHS form allows for more detailed information on the type of biomass heating fuel to be collected. This allows heating systems with renewable heating fuels to be modelled more effectively.

Standard Assessment Procedure (SAP) of buildings energy performance

SAP ratings

5.191 The Standard Assessment Procedure (SAP) is the Government's recommended system for home energy ratings. SAP ratings allow comparisons of energy efficiency between different dwellings to be made. The SAP rating is expressed on a logarithmic scale, which normally runs from 1 (very inefficient) to 100, where 100 represents zero energy cost. The rating can be greater than 100 for dwellings that are net exporters of energy; however these are extremely rare in the existing dwelling stock. In extremely inefficient cases the formula that defines the rating can result in negative values, but values less than one are coded to a SAP of one.

5.192 The Building Regulations require a SAP assessment to be carried out for all new dwellings and conversions. Local authorities, housing associations, and other landlords also use SAP ratings to estimate the energy efficiency of existing housing. The version of SAP used in the survey is currently SAP 2012. This version is used in the current EHS dataset (employed retrospectively to provide a consistent measure from 1996 to the most recent

survey year). EHS reports dating from 2010 to 2012 used the previous (SAP 2009) version of SAP.

5.193 The 2012 changes in the SAP methodology are far less reaching than those which occurred following the move from SAP05 to SAP09 in 2010. Differences in SAP ratings calculated under SAP2009 and SAP2012 mainly occur for dwellings using solid fuel; for further details see The Government's Standard Assessment Procedure for Energy Rating of Dwellings 2012 edition (SAP worksheet Table 15 p.231), http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012_9-92.pdf

5.194 The SAP ratings give a measure of the annual unit energy cost of space and water heating for the dwelling under a set heating regime which assumes specific heating patterns and room temperatures. The fuel prices used are averaged over the previous three years across the different areas of the UK. The SAP rating takes into account a range of factors that contribute to energy efficiency, which include:

- thermal insulation of the building fabric

- the shape and exposed surfaces of the dwelling

- materials used for construction of the dwelling

- efficiency and control of the heating system

- the fuel used for space and water heating, ventilation and lighting

- ventilation and solar gain characteristics of the dwelling

- renewable energy technologies

5.195 SAP is not affected by the individual characteristics of the household occupying the dwelling, nor by its geographical location. The calculation is based on a fixed heating pattern of 21°C in the main living area and 18°C elsewhere. It is also based on standard occupancy assumptions with the household size correlating with the total floor area of the dwelling.

5.196 The EHS uses a computerised version of the SAP methodology to calculate the SAP rating for each dwelling included in the physical survey sample. Most of the data required to calculate SAP are available from the survey, either directly from the questions asked or as a result of further modelling. Those data items that are not collected have very little impact on the final calculated rating. Where data items are missing these are dealt with using default information based on information from dwellings of the same age, built form, tenure, number of floors and size.

5.197 The Energy Efficiency Rating (EER) is derived by translating the SAP ratings into an A to G banding system where band A represents low energy costs and band G represents high energy costs, Annex Table 5.6.1.

Annex Table 5.6.1: SAP rating and Energy Efficiency Rating (EER) bands

SAP rating	EER band
1 to 20	G
21 to 38	F
39 to 54	E
55 to 68	D
69 to 80	C
81 to 91	B
92 or more	A

Carbon dioxide emissions

5.198 The carbon dioxide (CO_2) emissions are calculated using the same SAP document and method as for the SAP rating except that it uses CO_2 emissions factors for each fuel in place of unit prices to derive the CO_2 emissions rate per m^2 of floor area. The same logarithmic scale as used for SAP converts the CO_2 emissions rate into the Environmental Impact Rating (EIR), which also runs on a 1–100 scale where 1 represents very high emissions per m^2 and 100 is achieved at zero net emissions. The EIR can rise above 100 if the dwelling is a net exporter of energy.

Comparison with actual energy data

5.199 The SAP methodology that is used to calculate both energy efficiency and CO_2 emissions tends to provide higher estimates of energy requirements and associated emissions for heating, lighting and ventilating dwellings than estimates derived from actual household energy consumption. This is primarily because the assumed heating regime (achieving a temperature of 21°C in the living area of the dwelling and 18°C in the rest of the dwelling for a standard number of hours), and the assumed hot water and lighting requirements (depending on a level of occupancy determined by the floor area of the home rather than actual occupancy) are more likely to result in an overall over estimation than under estimation of actual energy consumption for most dwellings. However, such standardised assumptions are necessary in order to compare the energy performance of one part of the housing stock with another and over time.

Energy performance certificates (EPC)

Energy performance certificate (EPC) improvement measures

5.200 Following the implementation of the European Energy Performance of Buildings Directive in 2007, all homes are required to have an Energy Performance Certificate (EPC) when they are sold or let. The EPC provides an overall assessment of the current energy performance of the property and makes recommendations regarding a range of lower and higher cost heating, insulation and lighting upgrades that would improve its energy performance. The EHS is able to provide a whole stock assessment of homes that could benefit from a subset of these measures.

5.201 Details of the upgrade measures recommended on an EPC are provided in Appendix T of the SAP 2009 specification, available at: http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf. These have been reduced to a set of measures that can be assessed using EHS data, Annex Table 5.6.2. It should be noted that the hot water cylinder thermostat upgrade was originally classed as a higher cost measure in SAP 2005 and has been kept as such for consistency in EHS improvement modelling and reporting.

Annex Table 5.6.2: EPC measures assessed using EHS

EPC low cost measures (under £500)	EPC higher cost measures (more than £500)
Install cavity wall insulation where the wall is of cavity construction	Upgrade central heating controls - typically to a stage where a room thermostat, a central programmer and thermostatic radiator valves (TRV's) have been installed
Install or upgrade loft insulation where there is a loft that is not a full conversion to a habitable room and has 150mm or less of loft insulation	Upgrade to a class A condensing boiler using the same fuel (mains gas, LPG or fuel oil). This is not applied to communal heating systems.
Install or upgrade hot water cylinder insulation to a level matching a 160mm jacket. This is only recommended where the current level is less than 25mm of spray foam or a jacket that is less than 100mm thick.	Upgrade existing storage radiators (or other electric heating) to more modern, fan-assisted storage heaters
	Install a hot water cylinder thermostat where there is a cylinder without a thermostat
	Replace warm-air units that are over 20 years old with a fan-assisted flue
	Install a manual feed biomass boiler or wood pellet stove where the current system uses non-biomass solid fuel.

5.202 In the method used in the EHS, measures are only recommended for implementation if that measure alone would result in the SAP rating increasing by at least 0.95 SAP points. The suggested measures do not necessarily imply that current measures in place in the home are defective nor that the home is deficient in terms of any particular standard.

5.203 The EHS does not include all of the possible EPC measures. This is because some would only be recommended in a small number of dwellings or because the survey is unable to assess how effective they would be in improving the performance of individual dwellings. Annex Table 5.6.3 lists the measures that are not included in the EHS analysis.

Table 5.6.3: EPC measures not covered in EHS modelling of improvement potential

EPC low cost measures (under £500)	EPC higher cost measures
Draught proofing single glazed windows	Solar water heating
Low energy lights	Double or secondary glazing
	Solid wall insulation
	Complete change of heating system to class A condensing boiler (including fuel switching)
	Solar photovoltaic (PV) panels

5.204 The EHS also estimates the notional costs of installing the recommended measures. The costs are applied in the following way for the respective energy efficiency measures:

- *price per unit:* heating controls (room thermostat, programmer), cylinder insulation, cylinder thermostat, boiler upgrade (separate prices for combination/non-combination boilers), biomass boiler upgrade, storage radiator upgrade, warm air heating upgrade;

- *price per habitable room:* heating controls (Thermostatic Radiator Valves);

- *price per m^2:* cavity wall insulation, loft insulation.

Post improvement performance and costs

5.205 The EHS also estimates the SAP rating carbon dioxide emissions and fuel costs after any recommended improvements have been installed. It is also important to emphasise that these are *notional* estimates based on standard assumptions about occupancy and consumption patterns. What improvements would be realised in practice will depend critically on actual occupancy and consumption patterns.

Household awareness of energy performance certificates

5.206 Since October 2008 it has been a requirement for those selling or renting out dwellings to provide the new or potential occupants with an EPC. The 2011 EHS Stock Report, using information collected in the 2011-12 household

interview survey, explored the impact of the EPC on those households that saw it. This area may be re-visited in future EHS reports.

Barriers to improving insulation

5.207 A chapter in the 2013 Energy Efficiency of English Housing Report examined the potential to install loft, cavity wall and solid wall insulation, and explored the practical and other barriers to actual installation that can occur, in order to provide a more realistic indication of the potential for carrying out these improvements. Categories classifying the ease of installation or specific barriers for each insulation type were created from EHS physical data on dwelling fabric and shape. For the 2014 Energy report, the underlying data for ease of installing insulation have been provided in the Annex Tables only. This area may be re-visited in more detail in future EHS reports.

Loft insulation

5.208 Categories for the ease of installing or topping up loft insulation were as follows. All lofts that were not designated as non-problematic were classed as hard to treat:

- *Non-problematic:* these were identified as potentially upgradeable under the EPC improvement measure analysis and in these cases installation would be straightforward with no barriers.

- *More problematic:* these were identified as potentially upgradeable under the EPC improvement measure analysis but where the loft was fully boarded across the joists, which would lead to extra work and expense.

- *Room in roof:* these cases may already have sufficient insulation installed when built or during the loft conversion, but if insulation needed to be added between the rafters very extensive work and considerable expense would be involved.

- *Flat or shallow pitched roof:* again, these cases may already have sufficient insulation installed when built but otherwise it is not feasible to install loft insulation as there is no access into the loft or no loft space.

Cavity wall insulation

5.209 For the 2012 report onwards, the classification and analysis for the 'fillability' of cavity walls differed from the approach used in the 2010 and 2011 EHS Stock Profile Reports. The new methodology aims, as far as possible, to provide a count of hard to treat cavity walls consistent with the Energy Companies Obligation (ECO) definition, although the EHS is unable to fully replicate this, https://www.ofgem.gov.uk/ofgem-publications/84197/ecosupplementaryguidanceonhard-treatcavitywallinsulation.pdf

5.210 Categories for the 'fillability' of uninsulated cavity walls were created using information on the area of external wall finish as surveyed and other factors such as the presence of external features such as conservatories and the dwelling type. All cavity walls that were not designated as non-problematic were classed as hard to treat.

5.211 *Standard fillable:* With these cases, no compelling physical barrier to installation exists. These are typically houses with masonry cavity walls and masonry pointing or rendered finishes and no conservatory attached.

5.212 *Hard to treat cavity walls:* These are homes with cavity walls that could in theory be filled, but which exhibit at least one of the following difficulties.

- They are in a building with 3 or more storeys, where each storey has cavity walls. The need for scaffolding to install insulation in these higher buildings would contribute to the complication and cost of improving these homes.

- The gap found in the cavity wall is found to be narrower than in standard walls, typically less than 50mm. Although an attempt could be made to insulate these homes by injecting foam, the limited cavity space may lead to an uneven spread of the insulating material, resulting in substandard thermal properties.

- The dwelling is of predominantly prefabricated concrete, metal or timber frame construction. Although more recent examples of these homes will have had insulation applied during construction, these are generally unsuitable for retrospective treatment. In the case of timber frame construction, the industry recommendation is not to inject insulation as this can hamper ventilation between the frame and the external wall that may lead to rot in the timber frame.

- The cavity wall includes one or both leaves formed of natural stone, or has an outer leaf finished predominantly with tiles or cladding. Natural stone can give an uneven cavity, causing difficulties when injecting insulation, whilst non-masonry finishes can also make the process more difficult.

Solid wall insulation

5.213 Categories for the ease of installing external solid wall insulation were created using information on the area of external wall finish as surveyed and other factors such as the presence of external features such as conservatories, porches and bays and the dwelling type. All solid walls that were not designated as non-problematic were classed as hard to treat:

- *Non-problematic:* no serious barriers.

- *Masonry-walled dwellings with attached conservatories or other features:* these are otherwise non-problematic, but fixing the insulation round any projections like conservatories, porches or bays requires additional work and therefore additional expense.

- *Dwellings with a predominant rendered finish:* although dwellings with a rendered finish can be treated with external solid wall insulation, this may add to the costs of the work as the render may need to be removed, repaired or treated before the insulation can be installed.

- *Dwellings with a predominant non-masonry wall finish:* improving dwellings with wall finishes such as stone cladding, tile, timber or metal panels would either add to the cost of the work or even preclude external solid wall insulation where the wall structure itself is stone or timber.

- *Flats:* if the dwelling is a flat, then this treatment can be problematic for two reasons. Firstly, there are likely to be issues related to dealing with multiple leaseholders (getting their agreement and financial contribution to the work). Secondly, the height of the module for high-rise flats would present significant complications in applying external solid wall insulation.

Annex 5.7 **Dimensions**

5.214 Once all EHS physical surveys have been submitted by the surveyors for the survey year the data are converted into a series of raw physical survey SPSS files. The first complex model to run using the raw physical survey EHS data is the Quantities (or "Dimensions") model.

5.215 The purpose of this model is to take a series of observations and measurements recorded by the EHS surveyors carrying out the physical survey and convert these into all of the required dimensions e.g. floor area, external wall area, window area, roof area, etc. These dimensions are then used as inputs into a number of processes, including costing of repairs and energy modelling.

5.216 In the process of running the Dimensions model, BRE staff undertake a number of consistency and plausibility checks on the raw physical survey data. The purpose of these checks is to firstly detect and eliminate certain logical inconsistencies that could not be processed by the Dimensions model and secondly to identify highly implausible answers from the Dimensions model outputs which, if deemed necessary after detailed investigation, can lead to correction of the EHS raw physical survey data.

5.217 The EHS raw physical survey data are stored in an SPSS database format and, after edits due to HMO and data comparison validation are applied, the dataset is used as the input into the dimensions modelling process.

Raw physical file checks

Wall thickness

5.218 The 'wall structure' section of the EHS 2013/14 form included a new variable 'Wall thickness (cm)' (*Fexws1wt, Fexws2wt*) for which surveyors were asked to measure the wall thickness for each wall type (eight types possible) recorded on the front and back views. This new information is used within the Dimensions model in the calculation of the floor area, replacing the previous default wall thickness assumption of 0.2m.

5.219 A flag is created for cases with a warning for wall thickness, front view and back view; these are cases where the wall thickness is not typical of the wall type selected. Each case is investigated by looking at the physical survey form in detail in conjunction with the photos/surveyor comments and a note is made for each case of what is likely to have caused the warning on the form. Based upon the information gained, the action is decided upon for each case. This could be no action required or it could be that the physical survey data

looks incorrect, either the wall thickness value or the way the surveyor has coded something as wall that should not be counted as wall. The spreadsheet is passed to a second analyst to quality assure the outcomes. The appropriate modifications are applied to the raw physical survey data. In 2014, 108 cases were flagged and investigated with 5 cases subsequently being edited.

5.220 An average wall thickness is calculated, by multiplying the thickness of each wall type by its area (in tenths) and dividing by 10. The resulting values are rounded to the nearest whole number to maintain the level of accuracy present in the original data. The variable is used as an input into the Dimensions model for the conversion of dimensions from external measurements to internal measurements.

Levels

5.221 A series of checks, written in SPSS syntax, are performed in order to identify possible logical inconsistencies in the raw data associated with the number of storeys in the building and the floor occupied by the dwelling. If the inconsistencies were left unchanged it would result in problems in the running of the Dimensions model.

5.222 The EHS uses the British system of denoting floor levels, where the ground floor is designated G, then the next level 1, then 2, 3, etc. Therefore a dwelling with 3 storeys should only have rooms, flats, or measured levels on floors G, 1, and 2. The most common type of error relating to floors is one where the surveyor switches to the American designation and uses 1 to indicate the ground floor. Other types of error linked to floor levels include failure to identify an attic as habitable and failure to include the basement in the count of the number of storeys. The level checks for inconsistency include:

- a room on a level that does not exist (e.g. 3rd floor of a three storey module)

- a room on a level that is not part of the flat (e.g. room on the 3rd floor but flat on the 2nd floor)

- a measured level that is not part of the module (e.g. dimensions for 3rd floor when the dwelling only has three storeys)

- a flat on a level that does not exist (e.g. flat on the 3rd floor when the module only has three storeys)

5.223 All cases that are identified as having inconsistencies are manually examined by inspecting the EHS physical survey form and surveyor photographs in order to determine why the error has occurred and how the data should be changed. The cause of the error and the actions required to resolve the issue are then documented. In 2014 77 cases were flagged as having possible inconsistencies. Of these, 24 were found to have an error and were therefore corrected. The majority of the flagged cases came from an additional type of

validation check introduced in 2014, which looked at dwellings in which the additional part appeared to start on a higher storey than the main part of the dwelling. However, only a handful of these were found to require data edits.

5.224 When it is established that there is an error in the raw data, SPSS syntax is used to alter the required variable/s. The altered physical files are then saved in a new location. The levels checks are repeated in order to confirm that all issues have been resolved.

Dimensions calculations

5.225 The Dimensions calculation engine takes the altered physical files and uses the data to compute all the required dimensions e.g. floor area, external wall area, window area, roof area, etc. as outlined in flow chart, Figure 5.7.1.

5.226 The model begins by taking the surveyor measurements for the floors measured by the surveyor and then extrapolates from these the size of any unmeasured floors. Once a plan of each floor has been calculated the ceiling heights can be used to calculate or extrapolate (depending on the location of the five measured rooms within the building) the overall height of each floor. This in turn can be used as the basis for an overall wall area.

5.227 Wall areas are complex as there is the potential for additions beyond the surveyor's initial measurements (through base walls, gables and the like) and reductions brought about by attachment to other properties. It is also necessary at this stage to consider the location of the additional part, which may affect the size of the dwelling envelope[16].

5.228 With the areas of the walls calculated for each face of the dwelling the level of fenestration on each face is assessed by using the fenestration ratio (the proportion of the gross surface area of the external wall which is given over to windows, voids and wall) as recorded by the surveyor with reference to the exposed area of the face.

5.229 The area of the roof is calculated by taking the area of each floor and comparing it to the floor above. Where the latter is smaller the difference is considered to be exposed roof. This is then increased to allow for an eaves overhang, and then the results are summed across all levels up to the top floor, creating a total roof area that will typically be larger than the footprint of the dwelling. The same piece of code is also used to look at the amount of eaves perimeter on each level and total these across all levels.

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[16] The envelope in this context relates to the design and construction of the exterior of the dwelling and consists of its roof, sub floor, exterior doors, windows and exterior walls.

Figure 5.7.1: Dimension model process

5.230 In the event that the dwelling is a flat a number of additional algorithms are used to separate out the interior dimensions of the flat itself, and the exterior dimensions which relate to the "module". It is important for the energy modelling that dimensions relate to the flat itself, but for repair costs the overall cost of repairs to the module must be shared among all dwellings within the envelope, and therefore external dimensions should apply to the module.

5.231 The preliminary results are stored in SPSS database format.

Data completeness checks

5.232 In previous years, some cases were not processed by the Dimensions model due to missing data for the flat floor level. In these instances, the missing information was added, the model rerun and a new validation check was added to the EHS online validation system. The validation check ensured that no cases were subject to this problem in 2014.

Outlier (sense) checks

5.233 A number of checks are then performed on the derived dimensions to validate the outputs. The checks are designed to identify:

   a) implausible wall areas

   b) implausible floor areas

   c) implausible window areas

   d) incorrect number of flats

   e) incorrect roof type

5.234 A statistical function written in SPSS syntax is used to identify outlying cases in terms of floor, wall and window area. Cases that have unusually large or small areas given the dwelling's size (in terms of the number of rooms) are flagged up. The survey form and photographs of each outlying case are manually examined to determine whether the outlier is genuie, or the result of an error. Errors can occur where key data have not been entered (such as an integral garage), dimensions mis-measured (such as entering 72 instead of 7.2) or features over- or underestimated. BRE defer to the surveyors judgement unless convinced the data are incorrect (i.e. the evidence from the photographs). If an error in the raw data is identified, the cause of the error and the actions required to resolve it are recorded. For 2014 over 400 cases were identified as outliers for floor, wall or window areas, and of these 23 cases were found to have an error of some kind.

5.235 For the check on the number of flats, the dimensions of the surveyed flat are checked against the total floor area of the module to determine whether the number of flats per module seems realistic. Where it does not, BRE staff will examine the floor plans and photographs in an attempt to understand the surveyor's error, which usually stems from the module definition, and to determine the correct number of flats.

5.236 Certain roof types (Chalet and Mansard) can only occur where the dwelling has an attic. On occasion surveyors may mistake steep pitched roofs for chalet roofs. In this situation, the data for pitched and chalet roofs is swapped over.

Alterations to physical data

5.237 In relation to the above checks, where there is missing information, BRE will attempt to fill in the missing data or otherwise resolve the error. For the applicable cases, the alterations syntax is updated to alter the required variable/s and the new altered physical files replace those created following the levels checks. If necessary, the EHS validation system may also be altered to help avoid similar issues occurring in future years. The Dimensions model is then rerun using the altered physical files.

Alterations to dimensions model code

5.238 Occasionally, the data completeness checks and the sense checks highlight amendments that are required to the Dimensions model code. Where necessary, the code is altered and tested to ensure it is working correctly.

5.239 The Dimensions model is rerun using the altered physical files and a series of first run 'final' dimensions files are created in SPSS database format.

5.240 The above procedure is repeated when the 'second run' of the EHS raw physical data is available (post-HMO edits, post-comparison edits, core EHS cases only) and once the dimensions file has been run through the first run of the energy model.

5.241 Basic checks are performed on the final derived dataset from the Dimensions model ('DimensionsXX.sav') using the previous year's dataset as a template e.g. a check that all variables are present and labelled correctly, that all variable values are present (via a frequency check) and that all missing values are set as missing following the EHS conventions.

5.242 On delivery of the single year paired sample grossing factor, timeseries analysis is carried out using the EHS floor area variables (*floorx and floory*) cross referenced by a number of dwelling characteristics to look at the trends over time and to put the data in context with previous EHS data. Further investigation would take place should the weighted results highlight an unexpected change in the data.

5.243 The Dimensions modelling is complete. The 'DimensionsXX.sav' is used to derive the original EHS floor area variable (*floorx*) and the new Building Regulations floor area variable (*floory*) which are added to the derived physicalXX.sav dataset. The altered physical files are then delivered to DCLG along with the 'DimensionsXX.sav' and these datasets are used internally as an input into the repair cost model and the energy model. Please see the data dictionary for 'DimensionsXX.sav' which explains explains more about the derivation of the individual variables.

Annex 5.8: **Poor quality environments**

5.244 Although analysis on local environments is not included in the annual EHS 2014 reports this information is designed to assist for users accessing the EHS datasets.

5.245 'Neighbourhood' or 'local environment' problems from the survey are based on the professional surveyors' assessments of problems in the immediate environment of the home on a scale of 1 ('no problems') to 5 ('major problems'). These assessments are based on observed problems (in some cases verified with the resident) rather than any specialised measurement instruments or recourse to other environmental data.

5.246 The survey assesses three types of problems contributing to a poor quality environment:

- Upkeep: the upkeep, management or misuse of the private and public space and buildings (specifically, the presence of: scruffy or neglected buildings; poor condition housing; graffiti; scruffy gardens or landscaping; litter, rubbish or dumping; vandalism; dog or other excrement; nuisance from street parking; condition of road/pavements and street furniture);

- Traffic and transport: road traffic and other forms of transport (specifically the presence of: intrusive motorways and main roads; railway or aircraft noise; heavy traffic; and ambient air quality);

- Utilisation: abandonment or non-residential use of property (specifically, vacant sites; vacant or boarded up buildings; intrusive industry; or non-conforming use of a residential area).

5.247 A home is regarded as having a significant problem of a given type if it is assessed to have codes 4 or 5 on the scale in respect of any of the specific environmental problems assessed and grouped under that type.

Chapter 6
Weighting

The English Housing Survey (EHS) is weighted to take account of the over-sampling of the less prevalent tenure groups and differential non-response, in order to provide unbiased national estimates. This chapter provides details of the weighting methodology and gives advice on which sets of weights to use when conducting analysis using EHS data.

Overview

6.1   The following weights have been calculated for the 2014-15 EHS data:

- Household weights for the full sample interview survey 2014-15 - aagfh14

- Average dwelling weights for cases in 2013-14 and 2014-15 that had both the interview and physical survey conducted (paired cases) [17] - aagpd1314

- Average household weights for cases in 2013-14 and 2014-15 that had both the interview and physical survey conducted (paired cases) [1] - aagph1314

6.2   These weights adjust the sample to correct for the over-sampling of the less prevalent tenure groups and reduce the bias from differential non-response. The resulting weights sum to estimated population totals, enabling the survey to provide estimates of the total population of dwellings and households in England.

6.3   The weighting of the 2014-15 EHS data was undertaken by NatCen who managed the survey on behalf of the Department for Communities and Local Government (DCLG).

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[17] Cases which were eligible for PS (the paired sample) included addresses which the interviewers had determined to be vacant and where a physical survey had also been achieved.

Application of weights during analysis

6.4   The EHS comes with its own weights covering the household and dwelling sample of cases. The weights for the household sample can be found in the file generalfs14.sav and is called agfh14. This should be used for any analysis for which the aim is to provide estimates of households, based on the IS data.

6.5   The weights covering the dwelling sample of cases can be found in the file general 13+14.sav. Aagpd1314 should be used for any analysis in which the aim is to provide estimates of dwellings and that includes physical survey data (e.g. percentage of non-decent dwellings) while aagph1314 should be used for any analysis in which the aim is to provide estimates of households and that includes interview survey data (e.g. percentage of households in non-decent dwellings). The weights can only be used on the full 2-year dataset. They cannot be used on the data split into separate years.

6.6   The recommended application of weights is summarised in Table 6.1.

Table 6.1: Application of weights during analysis

Weight	Description	Base
aagfh14	Household weights for the full sample interview survey 2014-15	13,174
aagpd1314	Average dwelling weights for cases in 2013-14 and 2014-15 that had both the interview and physical survey conducted (paired cases)	12,297
aagph1314	Average household weights for cases in 2013-14 and 2014-15 that had both the interview and physical survey conducted (paired cases)	11,851

Summary of weighting methodology

6.7   The weighting methodology[18] used a sequence of stages[19] described below. Some stages correct for the disproportionate sampling by tenure; others for the differential non-response in the Interview Survey (IS) and Physical Survey (PS) response process.

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[18] The current weighting methodology was introduced in 2013-14 as a result of a weighting review which was carried out after the 2012-13 survey. The results of the review are published here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/406771/EHS_2013-14_weighting_methodology_paper_FINAL.pdf.

[19] To avoid confusion with the numbering of stages under the previous methodology and for consistency with the weighting review report, the prefix "N" is used to describe the stages.

6.8   The following stages were applied to both the full household sample and the dwelling sample:

- Stage N1: Calculating the probability of selection for addresses

- Stage N2a: Adjusting for not-worked cases

- Stage N2: Filtering out office refusals

- Stage N3: Contact at IS

- Stage N4: Cooperation at IS

- Stage N5: Deriving address-to-dwelling ratios to correct for the selection of one dwelling until at the sampled address

- Stage N6: Deriving dwelling-to-household ratios to correct for the selection of one household at the selected dwelling

6.9   The following stage was applied to the full household sample:

- Stage N7: Calibration weighting for IS (full household weights)

6.10   The following stages were applied to the dwelling sample:

- Stage N8: Sub-sampling by tenure for PS

- Stage N9: Cooperation at PS

- Stage N10: Calibration weighting for PS

- Stage N11: Adjustment for new build (final paired dwelling weights)

- Stage N12: Creation of final paired household weights

6.11   Stages N1 to N6, N8 to N9 and N12 were implemented using a set of SPSS syntax scripts in combination with the specialist SPSS module AnswerTree. Stages N7, N10 and N11 used a combination of SPSS syntax and STATA's calibration command.

6.12   The weighting stages are described in more detail below.

Weighting the full household sample

6.13   Stage N1 generated the selection weights for the issued sample of addresses. This had two components: a grossing constant equal to the total number of delivery points on the Postcode Address File (PAF) divided by the number of delivery points sampled; and, to allow for the under-sampling of properties

that were likely to be owner-occupiers, a correction factor to account for the unequal selection of addresses within each predicted tenure type (within each quarter). That correction factor was equal to the number predicted to be tenure X in the PAF divided by the number selected in predicted tenure X.

6.14   A very small number of the addresses sampled were not issued to interviewers for operational reasons. Not-worked addresses were filtered out at stage N2a by applying an adjustment to the Stage N1 weights so that the distribution of the weighted worked addresses by region matched that based on all the issued addresses.

6.15   Non-response at the key fieldwork stages (refusal to co-operate prior to the interview, non-contact at the interview and refusal to co-operate at the interview) do not happen completely at random and the factors associated with each of these three processes may differ. Stages N2, N3, and N4 made a series of adjustments for non-participation. The adjustments were made using weighting classes (groups of cases) generated by the CHAID[20] algorithm of the SPSS AnswerTree software. The models generated from the algorithm were developed to identify the factors (or predictor variables) that were significantly associated with each of the three causes of non-response. These classes were derived at each stage using an unweighted CHAID model at address level which partitioned the sample of occupied dwellings based on predictor variables significantly associated with the propensity to respond at each of the key fieldwork stages above. Typical predictor variables for stage N2 included geographical area, predominant tenure, dwelling age and dwelling type in the area, and urban/rural classification; for subsequent stages, information collected by the interviewer was also used.

6.16   Once the classes had been generated, the adjustment within each class was made based on the weighted estimates (using the combined weights up to that stage). The main reason for doing the correction in stages was to use any additional information available at each stage.

6.17   The EHS analyses are concerned with dwellings and households rather than addresses, and there is not always a one-to-one relationship between an address, a dwelling, and a household[21]. Usually there is only one dwelling at each address sampled from the PAF, but addresses are occasionally found to cover more than one dwelling (for example if a house has been converted into self-contained flats) or only part of a dwelling (for example a bedsit which shares facilities with a household at a separate postal address). As only one dwelling was selected at these addresses and one household was selected at dwellings that contain more than one household, weights were required.

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[20] Chi-squared Automatic Interaction Detector
[21] For the purposes of the survey, a dwelling is defined as 'a self-contained unit of accommodation where the occupants of that accommodation have sole use of all the rooms and facilities'.

6.18   Where an address refers to more/less than one dwelling, each dwelling at that address would have a lower/higher chance of selection. Similarly, when a dwelling contains more than one household, each household at that dwelling would have a lower chance of selection. Stages N5 and N6 corrected for the selection of one dwelling unit at the sampled address and one household at the selected dwelling by deriving address-to-dwelling and dwelling-to-household ratios designed to be applied with the weights developed further downstream to derive the final weight. The address-to-dwelling[22] and dwelling-to-household ratios were averaged (smoothed) within weighting (smoothing) classes defined by tenure and region to remove large peaks and troughs within the classes.

6.19   The previous stages account for the sampling and response probabilities. Applying the weights derived from Stages N1 to N5 to the household-level data would provide a preliminary survey estimate of the total number of households in England. However, this will differ from the true value because of sampling error, under-coverage of the frame and inability of the model-based process to allow for all the factors associated with non-response. Estimates for subgroups such as tenures will differ from their true values for the same reason. These differences in the survey estimates can be reduced by calibrating the weights.

6.20   Calibration takes an initial set of weights (e.g. the composite weights from stages N1 to N5) and then adjusts (or calibrates) it to given control totals. The control totals are usually a population count of a specific attribute or set of characteristic derived from a source external to the survey. The process generates weights which produces survey estimates that exactly match the population for the specific characteristics (the control totals) used in the adjustment.

6.21   The calibration of the interview sample was carried out on the part of the sample that contained occupied dwellings only. That section of the sample was first weighted by the composite weights from stages N1 to N5 and then calibrated to the control totals below.

- population proportions for age/sex based on ONS population projections (for dwellings with more than one household, the household counts were adjusted using the dwelling-to-household ratio from Stage N6);

- counts of occupied dwellings by tenure for each region (these control totals were estimated by adjusting the DCLG dwelling counts, which include both occupied and vacant dwellings, using

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[22] Apart from occupied dwellings, the address-to-dwelling ratio was also computed for vacant dwellings as this was needed for the sub-sampling stage (stage N8).

estimates of the proportion of dwellings that are occupied from the current and four previous years of the EHS).

The control totals were measured as at 1 October 2014.

6.22 The calibration weights from Stage N7 were combined with the dwelling-to-household ratio from stage N6 to give the weights for the full household sample.

Weighting the dwelling sample

6.23 A lot of analyses using the EHS data are carried out using the dwelling as the unit of analysis. These analyses usually make use of cases containing both the interview and physical survey data (or cases in the paired sample). Cases which were eligible for PS (the paired sample) included addresses which the interviewers had determined to be vacant and where a physical survey had also been achieved. The inclusion of vacant addresses was thus necessary for the production of the final paired dwelling weights.

6.24 The weighting process started by using stages N1 to N5 as described above.

6.25 The PS sample included a disproportionately larger number of dwellings from renting tenure groups to enable detailed analysis of these. This was achieved by under-sampling of properties likely to be owner occupied (sub-sampling rates varied by quarter). Stage N8 calculated selection weights to take account of the under-sampling of owner occupied properties.

6.26 Stage N9 adjusted for non-response to PS using weighting classes generated from a CHAID model designed to identify the factors significantly associated with non-response to the physical survey. Data collected during the interview survey (for occupied dwellings only) were also used to help determine the weighting classes. Vacant cases were treated using a separate CHAID model because the process of participation for vacant dwellings is generally different from that for occupied dwellings and this needed to be reflected in the weights.

6.27 The occupied paired sample (i.e. cases with both IS and PS) was weighted by the composite weights from stages N1 to N5 and N8 to N9. The vacant sample (i.e. vacant addresses at PS) was weighted by the composite weights from stages N1, N2a, N5, N8, and N9. This gives the initial weights for dwellings.

6.28 At stage N10, both the occupied and vacant samples were then combined and calibrated to:

- population proportions for age/sex (for dwellings with more than one household, the household counts were adjusted using the dwelling-to-household ratio from Stage N6; for vacant dwellings the household counts were all zero);

- DCLG counts of all dwellings (occupied + vacant) by tenure for each region;

- counts of vacant dwellings by tenure (RSL and LA collapsed) for each region (these control totals were estimated by adjusting the DCLG dwelling counts using estimates of vacancy rates from the current and four previous years of the EHS).

6.29   The achieved sample of dwellings did not include any dwellings built since the sample was drawn; stage N11 adjusted the weights to allow for those new dwellings. Because of the small number of recently-built dwellings in the survey, the weights of all cases with a construction date of 1990 onwards were weighted-up to cover for new addresses on the PAF by re-calibrating to the same overall control totals, but with re-estimated counts of post-1990 build. This was carried out separately for areas with a high/low rate of new build, and for private/social sector housing (excluding local authority housing because the rate of new building in this sector is negligible).This process generated the final paired sample dwelling weights.

6.30   At Stage N12, the final paired dwelling weights from Stage N11 (after removing the vacant dwellings) were adjusted using the dwelling-to-household ratio from stage N6 to generate the final paired sample household weights.

Calculating two year weights

6.31   Because of the smaller annual sample sizes involved, analysis of the dwelling sample is normally carried out using 2 years' weighted data. This section sets out how the combined weights were calculated.

6.32   The individual year (2013-14 and 2014-15) datasets with the dwelling weights after the PS cooperation stage N9 were merged together and two-year dwelling weights were created by dividing each year's weights by 2, so that each dataset has equal influence on the weighting process.

6.33   The two-year dwelling weights were calibrated by repeating stages N10 and N11 of the annual weighting[23]. This process generated the final two-year paired sample dwelling weights.

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[23] The reference date for the 2-year weights was 1st April 2014, therefore the estimated DCLG dwelling counts used as control totals were adjusted accordingly.

6.34   Similar to stage N12 of the annual weighting, the final two-year paired dwelling weights (after removing the vacant dwellings) were adjusted using the dwelling-to-household ratio to generate the final two-year paired sample household weights.

Chapter 7
Standard errors

All survey estimates are subject to sampling error because they are derived from a sample of a population rather from the whole population. This chapter describes how the sampling errors of the key 2014-15 EHS variables were calculated. The sampling errors of the key 2014-15 EHS variables are available as a separate document on Gov.uk.[24]

Overview

7.1   The sampling errors associated with survey estimates are expressed in terms of standard errors which measure the uncertainty around survey estimates. Standard errors for the 2014-15 EHS were calculated on weighted data using the statistical package Stata. The variance of survey estimates is affected by features of the survey or sample design such as weighting, clustering and stratification. The effect of those features on the standard errors of the estimates from the 2014-15 EHS has been taken account of in the calculation of the standard errors.

Sources of error in surveys

7.2   The total error in a survey estimate is the difference between the estimate derived from the data collected and the true value for the population. Survey estimates are subject to various sources of error; the two main types of error are systematic and random error.

Systematic error

7.3   Systematic error, or bias, covers those sources of error which will not average to zero over repeats of the survey. Bias may occur, for example, if a certain section of the population is excluded from the sampling frame, because non-respondents to the survey have different characteristics to respondents, or if interviewers systematically influence responses in one way or another. When carrying out a survey, substantial efforts are put into the avoidance of systematic errors but it is possible that some may still occur.

Random error

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[24] The sampling errors of the key 2014-15 EHS variables are available from
https://www.gov.uk/government/collections/english-housing-survey-technical-advice.

7.4   The most important component of random error is sampling error, which is the error that arises because the estimate is based on a random sample rather than a full census of the population. The results obtained for any single sample may, by chance, vary from the true values for the population but the variation would be expected to average to zero over a number of repeats of the survey. The extent of the variation from the population value depends on the size of the sample, the sample design and the weighting methodology.

7.5   Random errors may also result from other sources such as variations in respondents' interpretation of the questions, or variations in the way different interviewers ask the questions. The effect of these can be minimised through pilot work and interviewer training.

Standard errors for complex sample designs

7.6   Key features of the design of a survey such as weighting, clustering and stratification can have an impact on standard errors. The effect of those complex design features has to be taken into account when assessing the reliability of estimates. Standard errors calculated on the basis of a simple random sample design will not reflect the true variation because the effect of the complex sample design has not been taken into account.

7.7   The sample design features of the EHS that has an impact on standard errors are the use of a two-stage stratified sample design to select a clustered sample and differential sampling probabilities. The methodology used to weight the data also affects the standard errors.

7.8   The two-stage sample selection process described in Chapter 1 can lead to an increase in standard error if the households or people within individual primary sampling units (PSUs) are relatively homogenous but the mix of households or people between PSUs differ from one another. As each year's EHS sample covers half of the PSUs in England, the loss in precision from clustering should be fairly small. In addition, half the PSUs in England are included in the survey in one year and the other half in the following year, so the sample combining two years of data is, in fact, unclustered. Stratification, on the other hand, tends to reduce standard error and is most advantageous where the stratification factor is related to the characteristics of interest on the survey.

7.9   In order to obtain a sufficiently large number of cases for detailed analysis, households in the rented sector are given a higher probability of selection compared with owner occupiers. The methodology used to weight the data to adjust for differential sampling probabilities will increase the standard errors. On the other hand, the use of population totals to control for differential non-response tends to lead to a small reduction in sampling errors.

Design factors

7.10   The design factor, or deft, is the ratio of the standard error of an estimate from a complex sample to the standard error that would have resulted had the survey design been a simple random sample of the same size. The size of the design factor depends on the degree to which a characteristic is clustered within PSUs, varies across the strata and is correlated with the weights. Design factors below 1.0 show that adopting the complex sample design has improved the reliability of the estimate compared with using a simple random sample design, probably due to the benefits of stratification. Design factors greater than 1.0 show that, due to the effects of clustering, weighting or other design features, the complex sample design has resulted in less reliable estimates than might be gained from a simple random sample.

7.11   The design factors for selected survey estimates are shown with the corresponding sampling errors in the tables released on Gov.uk. These can be used to estimate likely sampling errors for other variables on the basis of their similarity to one of the variables presented. As shown in the formulas below, the standard error (se) of a proportion (p) based on a simple random sample (srs) multiplied by the deft gives the standard error of a complex design.

$$se(p) = deft \times se(p)_{srs}$$

where:

$$se(p)_{srs} = \sqrt{\frac{p \times (100 - p)}{n}} \text{ [25]}$$

7.12   The formula to calculate the standard error of the difference between two percentages for a complex sample design is:

$$se(p_1 - p_2) = \sqrt{\frac{deft_1^2 \times (p_1 \times (100 - p_1))}{n_1} + \frac{deft_2^2 \times (p_2 \times (100 - p_2))}{n_2}}$$

Where p_1 and p_2 are observed percentages for the two subsamples and n_1 and n_2 are the subsample sizes.

Confidence intervals

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[25] The precise formula uses *n-1* as the denominator but this equates to *n* in large samples.

7.13 Although an estimate produced from a sample survey will rarely be identical to the population value, statistical theory allows us to measure the accuracy of any survey result. The standard error can be estimated from the values obtained from the sample and allows the calculation of confidence intervals, which indicate the range of random variation in the survey estimates.

7.14 It is common, when quoting confidence intervals, to refer to the 95% confidence interval around a survey estimate. This is calculated at 1.96 times the standard error on either side of the estimated percentage or mean since, under a normal distribution, 95% of values lie within 1.96 standard errors of the mean value. If it were possible to repeat the survey under the same conditions many times, 95% of these confidence intervals would contain the population values.

7.15 The 95% confidence interval for the difference between two percentages is given by:

$$ p_1 - p_2 \pm 1.96 \times se(p_1 - p_2) $$

7.16 If this confidence interval includes zero then the hypothesis that the two proportions are the same and the observed difference is due to chance alone is not rejected. If the interval does not include zero then it is unlikely (less than five per cent probability) that the observed difference could have occurred by chance and this constitutes a 'significant difference' at the 95% confidence level.

Sampling errors of the 2014-15 EHS estimates

7.17 The sampling errors of the key 2014-15 EHS variables are released on Gov.uk. Weighted data were used to calculate the standard errors so that the values of the percentages and means are the same as those in the EHS annual reports. The method used to calculate the sampling errors correctly allows for the inflation in the sampling errors caused by the sample design and weighting methodology except for the positive effects of using population totals to control for differential nonresponse. As a result, the standard errors and design factors (defts) presented in the tables released on Gov.uk are likely to be slight over-estimates.

The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and Signifying compliance with the Code of Practice for Official Statistics.

Designation can be broadly interpreted to mean that the statistics:
- meet identified user needs;
- are well explained and readily accessible;
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest.

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.