



Ministry of Housing,
Communities &
Local Government



English Housing Survey

Technical Report, 2023-24



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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. In its current form, it was first 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. It is one of the longest standing surveys in government, with 2017 marking the 50th anniversary since the first survey in 1967. The 2023-24 EHS was conducted by the National Centre for Social Research (NatCen) in partnership with the Building Research Establishment (BRE) and CADS Housing Surveys on behalf of the Ministry of Housing, Communities and Local Government (MHCLG), formerly Department of Levelling Up, Housing and Communities (DLUHC).
2. The EHS consists of two main elements: an interview survey about housing and related topics, and a physical inspection of the condition of a random sample of the housing stock.
3. This report describes the key technical features of the 2023-24 EHS. Each chapter of the report covers a specific aspect of the survey and is designed to be read as a standalone document.

Methodology changes in response to the COVID-19 pandemic

4. The survey was originally set up as a face-to-face survey. The EHS approach was amended for 2020-21 and 2021-22 to allow for fieldwork within the social distancing restrictions introduced in response to the pandemic (mainly via a telephone interview survey and an external only physical survey). With the relaxation of social distancing restrictions, the 2022-23 and subsequently 2023-24 EHS carried out the interview and physical survey via our traditional methods, with the addition of a telephone interview option. A letter was sent out to sampled addresses explaining the purpose of the survey and informing respondents that an interviewer would call at their address. Interviewers visited the sampled addresses in person to seek consent to the interview and carry out that interview face-to-face, or if a face-to-face interview was not possible to collect the respondents' contact details and arrange an appointment for a telephone interview. For the physical survey a full visual inspection of the interior and exterior of the property was carried out in person by the surveyor.
5. For more information on changes to data collection during the COVID-19 pandemic, please refer to the EHS 2020-21 to EHS 2022-23 Technical Reports.

Chapter 1

Sampling

- 1.1 The English Housing Survey (EHS) consists of two main elements: an interview survey and a follow up physical inspection of the dwelling. In previous years, the interview survey included approximately 13,300 households, and the physical inspection covered around 6,000 occupied households and a further 200 vacant dwellings. This was increased in 2023-24 to a target of 16,308 interviews, 7,584 physical surveys, and 200 surveys of vacant dwellings.
- 1.2 In 2023-24, the EHS was conducted face-to-face in respondents' homes with a telephone option for those unwilling or unable to take part face-to-face. The interview fieldwork period ran between March 2023 and March 2024.
- 1.3 This chapter provides information on how the household and dwelling samples were selected for inclusion in the interview and physical inspection elements of the 2023-24 EHS.

Overview

- 1.4 As in previous years, addresses for the initial 2023-24 EHS sample were selected using a systematic random sample design. Interviews were attempted at the majority of these addresses. This is referred to throughout this report as the 'interview survey sample'.
- 1.5 The design delivers a representative sample of households in England for 2023-24, with the sample being unclustered when combined with the 2022-23 sample.
- 1.6 In addition to the interview survey sample, a sub-sample of addresses were selected for physical inspection. This sub-sample included both occupied and vacant dwellings and is referred to as the 'physical survey sample'.
- 1.7 To ensure that a sufficient number of rented properties were included in the physical survey sample, all rented properties were selected for physical inspection while 93.6% of owner-occupied dwellings were randomly selected for a physical inspection (the percentage selected varied each wave, ranging from 77.7% to 100%).
- 1.8 In 2023-24, 55,631 addresses were issued. A small proportion of these (1,734 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 A further 5,409 (9.7%) of the sampled addresses were not issued to interviewers because of challenges with fieldwork allocation.

- 1.9 Productive interviews were achieved at 15,846 of the eligible addresses. Of these 96.5% (15,284) were passed to surveyors, and physical surveys were achieved at 7,312 of these occupied properties. A further 184 physical surveys were achieved at vacant or derelict addresses. In total, 7,496 physical surveys were completed in 2023-24.

Interview survey sample

- 1.10 The target for the 2023-24 EHS was to achieve 16,308 interviews (compared to the usual 13,300) across the four housing tenure types (i.e. owner-occupied, private rented and social rented (local authority and housing association)).

Initial sample

- 1.11 To achieve these interviews, an initial sample of 95,000 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.
- 1.12 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) 2001 census 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).
- 1.13 The 1,808 clusters were stratified using 2001 census estimates, first by region, then the percentage of dwellings in the cluster that are owner occupied (in tertiles within region) and then the exact percentage of owner occupied dwellings (for the tertile with the highest percentage of owner occupied dwellings) and the percentage of households with a Household Reference Person (HRP) who works in non-manual occupations (for the other two tertiles).
- 1.14 The clusters were then randomly allocated to years, by assigning them in pairs going down the list, and then randomly (and independently) allocating

¹ These categories of ineligible cases are those that do not fall within the scope of the English Housing Survey - second homes, demolished addresses, commercial addresses or instances where the address is not found. When calculating ineligible cases for the purpose of response rates we additionally include cases that fall within the scope of the EHS, i.e. cases with an identifiable primary residential address, but that 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 ineligible for interview/survey.

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 has been fixed since 2012-13, “Year 1” clusters were used for that year, and it has alternated between “Year 1” and “Year 2” since. 2023-24 used “Year 2”.

- 1.15 At the second stage of sampling, all addresses in the PAF in the 904 clusters selected for the 2023-24 sample were stratified using 2011 census estimates, first by cluster, then LSOA ordered by the percentage of owner-occupied dwellings, census output area and postcode. Then a systematic random sample of 95,000 addresses was selected. To maintain a manageable workload for interviewers, each of the 904 clusters was split north/south in half and a total of 1,808 points were issued to interviewers.
- 1.16 The advantage of using a two-stage approach involving the clusters is that it reduces the fieldwork area to half of 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 loss² in statistical efficiency. However, when analysing any two years of survey data, the combined sample is entirely unclustered.

Issued sample

- 1.17 To ensure that there is a sufficiently large sample of renters for analysis, owner occupied addresses are usually sub-sampled at a higher rate compared to rented addresses before being issued to interviewers. Sub-sampling is 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 is identified using Experian’s Residata³ classifications and attached to the address records.
- 1.18 Sub-sampling was carried out by grouping the addresses into the four housing tenure types and sub-sampling at the rates of 36.0% for owner occupied, 98.6% for private rented and 98.7% for social rented (local authority and housing association renters). That process produced 55,631 issued addresses, Table 1.1.

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.

Table 1.1: Sub-sampling of PAF addresses, 2023-24

	PAF sample	sub-sampling rate	issued EHS sample
	<i>addresses</i>	<i>percentages</i>	<i>addresses</i>
predominant tenure			
owner occupied	60,789	36.0%	21,873
private rented	17,514	98.6%	17,275
social rented	16,382	98.7%	16,168
unknown tenure	315	100.0%	315
all tenures	95,000	58.6%	55,631

1.19 Interviews were achieved at 15,846 households, Table 1.2.

Table 1.2: Number of interviews achieved, 2023-24

tenure	
	<i>households</i>
owner occupiers	8,362
private sector	3,157
local authority	1,754
housing association	2,573
all tenures	15,846

Physical survey sample

1.20 The initial aim for EHS 2023-24 was to achieve 7,584 physical surveys across the four housing tenures.

1.21 To ensure 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 are included by under-sampling owner-occupied dwellings, Table 1.3.⁴

⁴ The “national stock” figures are based on MHCLG counts of all dwellings (occupied + vacant) by tenure for each region adjusted to reflect the reference date of the EHS 2023-24 (1 October 2023).

Table 1.3: Tenure distribution of achieved physical survey sample compared with the national stock, 2023-24

		achieved sample	national stock
	<i> dwellings</i>		<i> percentages</i>
tenure			
owner occupied	3,823	51.0%	64.3%
private rented	1,313	17.5%	19.4%
local authority	976	13.0%	6.2%
housing association	1,384	18.5%	10.1%
all tenures	7,496	100.0%	100.0%

- 1.22 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.
- 1.23 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.
- 1.24 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 2023-24 are shown in Table 1.4.

Table 1.4: Sub-sampling rates for physical survey, 2023-24

	sub-sample rates				
	quarter 1	quarter 2	quarter 3	quarter 4	
				wave 7	wave 8 ¹
	percentages				
tenure					
owner occupied	77.7%	100.0%	100.0%	100.0%	91.5%
private rented	100.0%	100.0%	100.0%	100.0%	100.0%
local authority	100.0%	100.0%	100.0%	100.0%	100.0%
housing association	100.0%	100.0%	100.0%	100.0%	100.0%

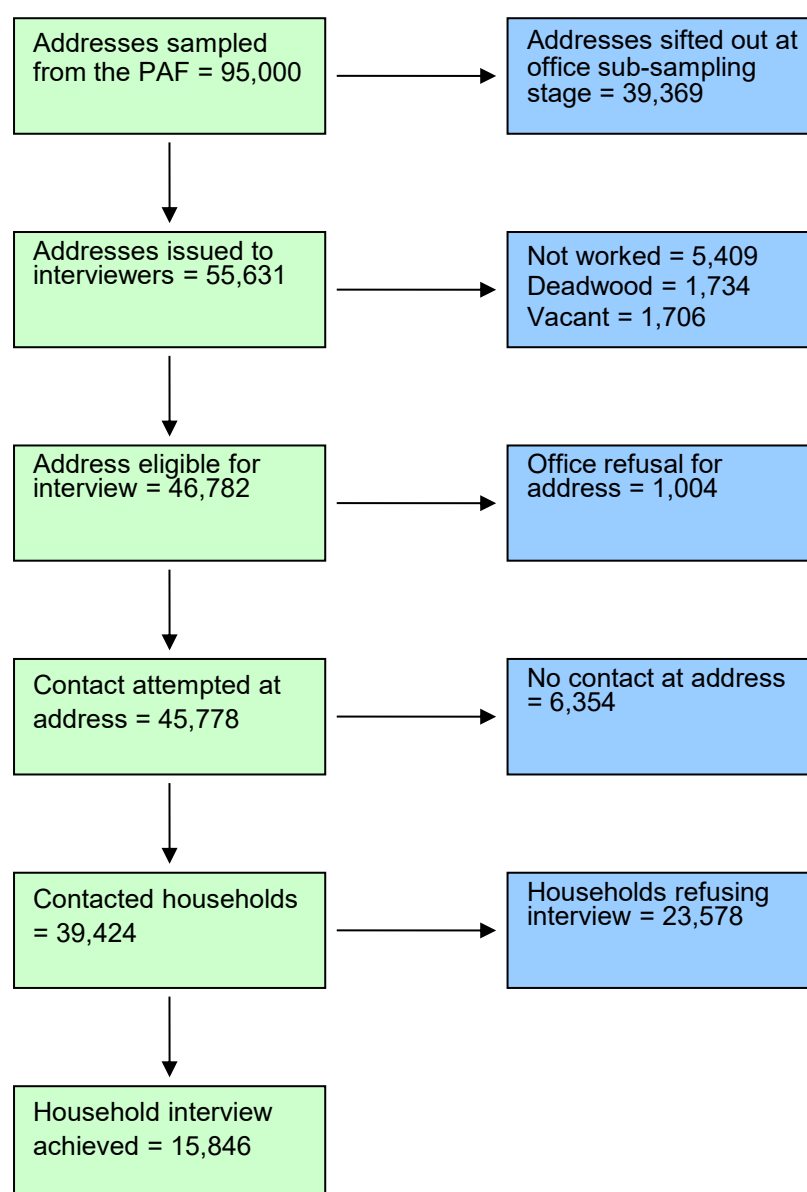
¹ Each quarter of fieldwork can be further divided into two waves, usually subsampling is done by quarter, but the final wave (Wave 8) is sometimes subsampled separately to meet targets.

- 1.25 To ensure there were roughly equal number of surveys across the waves to reduce the impact of seasonality (for example, damp problems are more likely to be identified in the winter), the sub-sampling rate was adjusted accordingly after taking account of differential response by tenure.⁵
- 1.26 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 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.
- 1.27 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 2023-24, surveyors managed to gain access and obtain physical surveys in 11.7% of dwellings that were unoccupied at the time fieldwork took place.
- 1.28 The 2023-24 sampling and response process is summarised in Figure 1.1.

⁵ The original issued sample allocation was not always reflected in the actual fieldwork allocation because of the difficulty of allocating points to interviewers. The sub-sampling rates shown in Table 1.4 reflect the original sample allocation by wave.

Figure 1.1: Sample structure of the EHS, 2023-24⁶

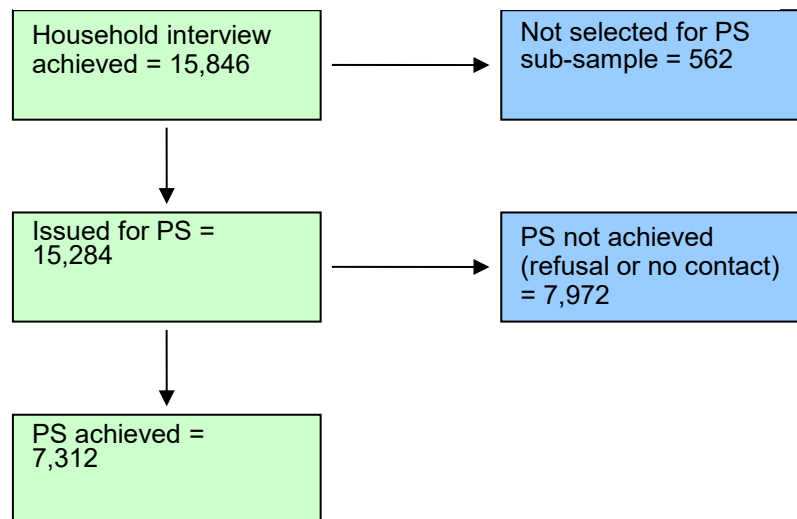
Interview survey sample



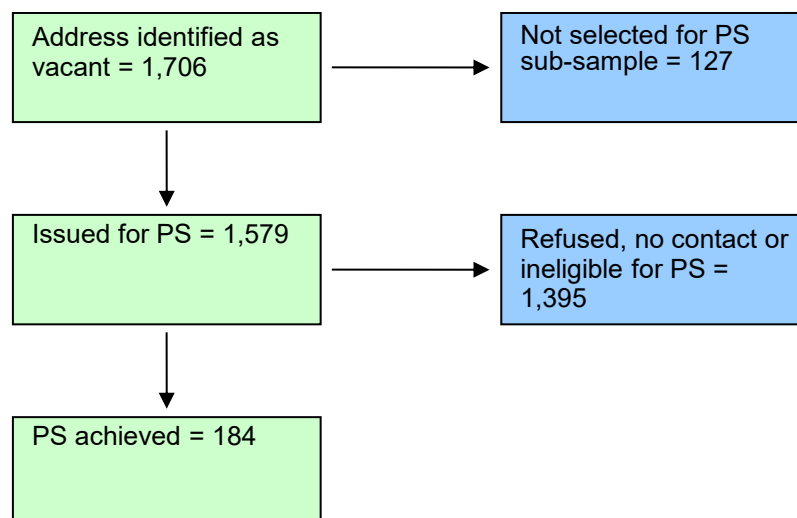
⁶ The way case outcomes are grouped for the purposes of calculating response rates is slightly different to the sampling overview presented here. See Annex Table 4.1 for details of household interview outcomes. Note:

- 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' 'away in hospital during fieldwork period' and 'respondent requested deletion'. These are treated as a separate category 'other unproductive' for the purposes of calculating response rates.

Physical survey sample: occupied dwellings



Physical survey sample: vacant dwellings



Sampling at addresses

- 1.29 Most addresses contained a single dwelling and a single household. However, at a small proportion of addresses (around 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.
- 1.30 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.

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

Chapter 2

Questionnaires

- 2.1 The English Housing Survey (EHS) collects data in two separate phases. In the first phase, an interviewer conducts an interview using 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 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

- 2.2 The Ministry of Housing, Communities and Local Government (MHCLG), in consultation with the Department for Energy Security and Net Zero (DESNZ) and other users of the survey, review the content of the interview and physical survey annually. The review revises or adds questions to cover new salient topics, to reflect technical developments in the construction and energy efficiency of homes or to improve data quality. If required, the review also removes questions if the information they elicit is no longer relevant to users' needs.
- 2.3 Compared with the physical survey form, the interview questionnaire has changed more since the launch of the EHS in 2008-09. The most radical overhaul of the interview questionnaire and physical survey form took place during the development of the 2011-12 EHS. That was driven by a significant reduction in funding and it resulted in a shortening of the average length of the interview from 50 to 30 minutes and a reduction in the data collected about Housing Health and Safety Rating System (HHSRS) hazards on the physical survey form.⁷ The interview length has now returned to 50 minutes on average and changes to the interview questionnaire and physical survey form since that time have been relatively minor.

⁷ As a result of the review, 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.

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 topics (such as marital status and ethnic group) use the questions developed by the Government Statistical Service Harmonisation Programme to allow comparison of findings across different government surveys: <https://analysisfunction.civilservice.gov.uk/government-statistical-service-and-statistician-group/gss-support/gss-harmonisation-support/harmonised-standards-and-guidance/>.

2.5 The questionnaire also contains a number of rotating question sets that come in and out of the survey on an annual, biennial or, in some cases, less frequent basis. Rotating modules ensure the interview length is manageable to reduce respondent burden, while also meeting policy requirements as it allows key topics to be covered that are not required every year. 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 overleaf outlines the topics included in the 2023-24 questionnaire. The energy efficiency (EPC), fire and fire safety and tenancy deposits modules were retained. The rotating module on second homes was rotated off and the satisfaction with the neighbourhood module was asked of half of the sampled addresses instead of the full sample. New questions were added to the energy efficiency (EPC) module.

2.7 Additionally, the access to vehicles module was reinstated and new questions on number of vehicles owned and plans to buy electric vehicles were added. Furthermore, new questions were added on: reasons for moving closer to

friends or relatives, outdoor space, saving to buy a home, timeframe and help to fund buying a new home, use of living rooms and bedrooms, plans for work to make the home more energy efficient, leaseholder complaints, damp and moisture issues and reasons for staying in the same home for several years. The full EHS 2023-24 questionnaire is published on Gov.uk.⁸

Table 2.1 Household interview questionnaire topics, 2023-24

demographics including age, sex, marital status, household reference person and household relationships
type of property
tenure
individual characteristics and perceptions including: nationality; country of birth; ethnicity; time at address; health; disability; education; wellbeing; and direct measure of loneliness
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 (reduced version)
institutional discrimination
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
tenancy deposit scheme
tenancy deposit
social renting details
experience of homelessness
rent and housing benefit including payments and arrears
number of tenancy agreements
Energy Performance Certificate (reduced version)
fire safety (reduced version)
buying aspirations
working status and job details
economic status
income and earnings
receipt of benefits
income support and mortgage interest
savings and investments

⁸https://assets.publishing.service.gov.uk/media/67484681ebabe47136b3a104/EHS_Questionnaire_documentation_2023-24.pdf

formal complaints renters have made to the landlord or letting agent
satisfaction with landlord and/or letting agent (asked of private renters only)
casual lettings

2.8 In 2023-24, the median interview length including recruitment to the physical survey was 49 minutes. This length is calculated on full interviews only; partial interviews are excluded.⁹

Physical survey

2.9 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.

2.10 The content of the physical survey has remained largely unaltered from the former English House Condition Survey (EHCS). In a typical year, surveyors 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.

2.11 Table 2.2 outlines the topics covered in the 2023-24 physical survey. The full EHS 2023-24 physical survey form is published on Gov.uk.¹⁰

Table 2.2 Physical survey topics, 2023-24

Amenities
Services, heating and energy
Construction
Measurement
Exterior and plot
Age of internal and external building elements (or components)
Internal / external defects
Structural faults
Housing health and safety rating system
Pests
Drains

⁹ 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.

¹⁰ https://assets.publishing.service.gov.uk/media/6571da6558fa300013b140b5/EHS_2023-24_Physical_Survey_Form.pdf

Common parts
Shared facilities
Flat construction and faults
Local area and environment

Chapter 3

Fieldwork

- 3.1 Fieldwork for the 2023-24 English Housing Survey (EHS) was managed on behalf of the Ministry of Housing, Communities and Local Government (MHCLG) by NatCen Social Research (NatCen). There are two parts to the EHS: the interview survey and the physical survey. This chapter provides further details of fieldwork procedures, including interviewer and surveyor training.

Overview

- 3.2 The 2023-24 survey was conducted by NatCen in consortium with Building Research Establishment (BRE) and CADS Housing Surveys. NatCen carried out the interview surveys while CADS was responsible for the field force of professional surveyors who undertook the physical survey – a visual inspection of properties for a sub-sample of the households who had taken part in the interview survey. BRE developed the physical survey questionnaire as well as the surveyor training manuals and delivered the surveyor training sessions.
- 3.3 The 2023-24 EHS carried out the interview and physical survey via our traditional face-to-face methods, with the addition of a telephone interview option. A letter was sent out to sampled addresses explaining the purpose of the survey and informing respondents that an interviewer would call at their address. Interviewers visited the sampled addresses in person to seek consent to the interview and carry out the interview face-to-face, or if a face-to-face interview was not possible to collect the respondents contact details and arrange an appointment for a telephone interview. For the physical survey a full visual inspection of the interior and exterior of the property was carried out in person by the surveyor.

Fieldwork period

- 3.4 Fieldwork took place over a 12-month period starting from March 2023. Fieldwork was carried out in eight separate waves. Each wave consisted of an eight-week interviewer and surveyor fieldwork period, with surveyor fieldwork starting four weeks after interviewer fieldwork began. Each wave started approximately six weeks after the previous wave, with a longer gap between waves four and five.

3.5 Interviewers began fieldwork on the 27th March 2023 and surveyors on the 22nd April 2023. Fieldwork dates for 2023-24 were as follows:

Fieldwork Waves	Interviewer		Surveyor	
	Start	Finish	Start	Finish
Wave 1	27 th March 2023	7 th May 2023	22 nd April 2023	14 th May 2023
Wave 2	8 th May 2023	18 th June 2023	3 rd June 2023	25 th June 2023
Wave 3	19 th June 2023	30 th July 2023	15 th July 2023	6 th August 2023
Wave 4	31 st July 2023	10 th September 2023	26 th August 2023	17 th September 2023
Wave 5	11 th September 2023	22 nd October 2023	7 th October 2023	29 th October 2023
Wave 6	23 rd October 2023	3 rd December 2023	18 th November 2023	10 th December 2023
Wave 7	2 nd January 2024	11 th February 2024	27 th January 2024	18 th February 2024
Wave 8	5 th February 2024	17 th March 2024	2 nd March 2024	24 th March 2024

Training and project briefings

Interviewers

- 3.6 Interviewers working on the EHS are drawn from the NatCen 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) for face-to-face interviewing 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 to develop their skills further and to share experiences.
- 3.7 Before starting work on the EHS, all interviewers are also required to complete a briefing on the survey.
- 3.8 Experienced EHS interviewers attend a 90 minute refresher briefing delivered remotely via Teams by NatCen. Interviewers who were new to the EHS attended a six-hour full briefing. In advance of the briefings, interviewers were required to undertake a pre-briefing exercise. This involved reading the project instructions, a guide to changes and completing a practice

questionnaire covering the main survey procedures. In total, 804 interviewers were briefed at such briefings. The briefings covered:

- the purpose of the study;
- how MHCLG uses the data and key EHS findings;
- the new fieldwork processes including how respondents were invited to take part, how they could opt in, how they would then be allocated to interviewers and how interviewers would be able to make contact with them;
- interview procedures, including a summary of the key changes made to the questionnaire;
- survey documents;
- booking appointments for the physical surveyor visit;
- field admin;
- various exercises to test their understanding of the EHS; and
- going through a practice interview with a scenario provided by research.

Surveyors

- 3.9 EHS surveyors are contracted 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.
- 3.10 New surveyors undertake a rigorous five-day residential briefing before working on their first survey. The training involves both desk-based and practical sessions in the field 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. Annex 3.1 contains full details of the training of new surveyors in March 2023.
- 3.11 Annual turnover of surveyors is low. In 2023-24, 162 surveyors (including Regional Managers) worked on the EHS, all of which had worked on the previous year's survey. No new surveyors were recruited during 2023-24.
- 3.12 Existing surveyors receive a refresher briefing every year to ensure that they are up to date with any changes in the physical survey form and survey methodology. The format of the refresher briefing varies depending on the amount of changes to the physical survey form. In 2023-24 surveyors undertook learning on the updates to the BRE EHS form and website (where data from the physical inspections are uploaded by surveyors). All surveyors that continued to work on the EHS during 2023-24 took part in the training.

Making contact with respondents

Letters inviting respondents to take part

- 3.13 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 gives reassurances about confidentiality by stating:

We will treat information you give in strictest confidence under the UK General Data Protection regulation. Your answers will be combined with those of others who take part and presented anonymously in research reports. For details of our purpose in collecting and processing the data of this survey, who is going to be able to access the data and all other privacy-related information, please visit <https://www.gov.uk/government/publications/english-housing-survey-privacy-noticefor-survey-participants>. We undertake to use and store the information you give us in accordance with the purposes and processes outlined in the privacy statement available on this website. You will not receive any junk mail or marketing as a result of doing the survey.

There are three different versions of the letter, one targeted at owner occupiers, one at private renters and a third at social renters. These letters are sent out centrally by NatCen, not by the interviewers. The interviewers carry a laminated copy of the generic version of the letter with them to aid respondents' recall of the advance letter on the doorstep. EHS 2023-24 was conducted when MHCLG were called DLUHC. Copies of the various versions of the advance letter are available at Annex 3.2.

Leaflets

- 3.14 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, provides contact details for NatCen and web addresses for MHCLG and NatCen.
- 3.15 There are three different versions of the leaflet, one targeted at owner occupiers, one at private renters and a third at social renters. Each version includes pictures and study findings considered to be particularly relevant for that tenure group. Copies of the 2023-24 interviewer leaflets are available at Annex 3.3.

Interview survey data collection

3.16 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 about the sampled address for use 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 the sample address has more than one dwelling, for example, if a house has been split into two self-contained 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 household, 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.

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

- Interviewers conduct a CAPI with the household reference person (HRP) or their partner in person (or over the telephone) and record respondents' answers onto a laptop computer;
- Interviewers upload the survey data to NatCen; and
- Interviews are checked and edited where necessary by a team of editors. For example, if a respondent has an 'other' method of payment for electricity or gas not covered in our responses, the interviewer will record their response in a follow up question and the editing team will attempt to code this to one of the existing response categories, or suggest a new response category if needed.

3.18 Every year, the EHS physical survey inspects around 200 vacant dwellings. 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 sampled on the same basis as occupied dwellings based on the last known tenure of the property.

3.19 The contents of the interview survey are reviewed annually (see Chapter 2 for more detail). NatCen and MHCLG 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 program to customise the questions; and
- checks built into the CAPI program to improve the accuracy of data collected during the interview.

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

Interviewing non-English speakers

- 3.21 NatCen employs some interviewers who can conduct the interview in a language other than English. 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 2023-24, 47 interviews were carried out in a language other than English. Of these, 19 were carried out by NatCen interviewers in a language other than English, 20 were carried out with a member of the respondent's household acting as an interpreter, four with an interpreter who was a relative or friend outside of the household and five in another way.

Maximising response

- 3.23 In 2023-24, interviews were achieved for 15,846 households. This represents 30% of sampled addresses eligible for interview. Interviewers used a range 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. The calls have to be at different times of the day and spread across the fieldwork period. At least two of the calls need to be in the evening from Monday to Thursday and two have 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 In 2023-24, all households invited to take part in the EHS were given an unconditional £5 Post Office voucher, and interviewers had up to two £25 discretionary gift cards they could issue to encourage reluctant households to take part. This incentive strategy is based on the results from the full split

sample incentive experiment run in 2017-18. More information about this experiment can be found with the other technical documents on the EHS on gov.uk: <https://www.gov.uk/government/publications/english-housing-survey-findings-from-the-2017-to-2018-incentives-experiment>.

Surveyor appointments

- 3.27 Interviewers are also responsible for gaining consent from those households eligible for the physical survey. 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 displayed on the interviewers' laptop.
- 3.28 The surveyor's availability is updated each night during the fieldwork period. Interviewers obtain current availability, plus details of any existing appointments allocated to their surveyor, each time they connect with NatCen's servers, and they are instructed to do before starting work and when finishing work each day.
- 3.29 The approach to making appointments is kept under close review to maximise the consent rate. After the information about respondents' appointment times/preferences is transferred from NatCen to the secure CADS Housing Surveys website, CADS Helpline staff assist in changing and confirming arrangements between the surveyors and respondents for the physical inspection.
- 3.30 Interviewers and surveyors are encouraged to speak to each other before interviewer fieldwork commences 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 working 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 includes:
- 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.

Physical survey data collection

3.32 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 digital photographs of the outside of the property.
- 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 and 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 the surveyors' 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.
- All cases showing errors on the validation program are checked by a single appointed regional manager and, if necessary, discussed with BRE. More information on data validation can be found in section 5.7 of Chapter 5 'Data Processing'.

3.33 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 84 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 58 full surveys in any region (a limit of 45 exists for the North East as fewer 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 2023-24, 79% of surveyors did not exceed any regional target and 96% of surveyors did not exceed the annual upper target of 84 full surveys.

- 3.34 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. 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 Gov.uk:
<https://www.gov.uk/government/publications/english-housing-survey-technical-advice>.
- 3.35 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 which was last conducted in 2014-15 involved a call-back methodology in which 300 properties were surveyed again by a second surveyor and the results were compared. More information on the SVS can be found on gov.uk:
<https://www.gov.uk/government/collections/english-housing-survey-technical-advice>.
- 3.36 In March 2019, a Surveyor Quality Study (SQS) was carried out to gauge the accuracy of the work of the surveyors against model answers compiled by CADS and BRE. The study involved all the surveyors and took place during the residential refresher briefing. Each surveyor was asked to complete a full survey on two of four test properties purposefully selected because they contained a range of house conditions and energy efficiency issues. Information on the SQS is available here:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1135176/2021-22_EHS_Quality_Report.pdf

Annex 3.1: The briefing programme for surveyors

3.37 In 2023-24, no new surveyors were recruited therefore no full surveyor briefing was carried out. When new surveyors are recruited, they undergo an intensive five day briefing on what is a highly specialised survey method. The briefing includes practical surveying exercises. The annual refresher briefing keeps surveyors up to date with any changes in the physical survey form and survey methodology.

EHS briefing programme for new surveyors

Day 0	
19.00-20.15	Dinner
20.15-20.45	Welcome/Introduction
20.45-21.30	EHS overview. S1-4 of form, Dwelling defn
21.30-22.00	Dwelling definition exercise

Day 1	
08.30-09.45	Interior, incl. selected faults & treatments
09.45-10.15	Amenities, incl. selected faults & treatments
10.15-10.30	Room definition exercise
10.30-10.45	Coffee break
10.45-13.00	Services, heating, energy
13.00-14.00	Lunch
	Group 1
14.00-15.40	Energy exercise
	Group 2
15.40-16.30	Fieldwork - interior
16.30-18.00	Fieldwork - interior
18.00-19.00	Free
19.00-20.15	Dinner
20.15-21.00	Construction, materials, improvements
21.00-	Free

Day 3	
08.30-09.30	HHSRS and the EHS
09.30-10.45	HHSRS worked examples
10.45-11.00	Coffee
11.00-11.20	Introduction to digital pen
11.20-13.00	Digital pen practice.
13.00-14.00	Lunch
14.00-18.00	Fieldwork 1 full survey including HHSRS using digital pen
18.00-18.30	Downloading survey
19.00-20.15	Dinner
20.15-21.30	Validating data from this afternoons survey
21.30-	Free

Day 5	
08.30-09.00	Check out of rooms
09.00-10.30	Full survey (Day 3) debriefing
10.30-10.45	Coffee
10.45-11.15	Validation hints and tips
11.15-12.15	Using your data
12.15-13.00	Interacting with households, HH interview Surveying, HMOs, vacant dwellings
13.00-14.00	Lunch
14.00-16.00	Survey admin/website/ external plus Coffee, Pick up packs and leave

Day 2	
08.30-09.45	Shape/measurement, views
09.45-10.15	Shapes and Views exercise
10.15-10.45	Principles of disrepair
10.45-11.00	Coffee
11.00-12.15	Exterior/plot, incl selected faults & treatments
12.15-13.00	Structural faults
13.00-14.00	Lunch
14.00-18.00	Fieldwork/debriefing Exterior of 2 dwellings
18.00-19.00	Free
19.00-20.15	Dinner
20.15-	Free

Day 4	
08.30-09.00	Module/flat surveys
09.00-10.15	Common parts, shared facilities, Incl. selected faults & treatments
10.15-10.30	Coffee
10.30-11.00	Planning flat surveys
11.00-11.45	Local area
11.45-12.30	Module definition Exercise
12.30-13.00	Free
13.00-14.00	Lunch
14.00-18.00	Fieldwork : external of 2 large blocks internal to be discussed at Radcliffe
18.00-19.00	Free
19.00-20.15	Dinner
20.15-	Free

Annex 3.2: Advance letters

Advance letter (generic version, front page)



Department for Levelling Up,
Housing & Communities



The Householder

Reference no.: P17893

Help shape the future of housing

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 your unique chance to take part in this research.

The survey will help to shape the future of housing – improving the experiences of home owners, social and private renters, reducing our carbon emissions, and helping young people get a foot on the housing ladder.



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. The interviewer will tell you more about how you can take part.



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

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. To say thank you for taking part, we have enclosed a **£5 post office voucher** for your household.

Yours sincerely,

Chauncey Glass
Head of English Housing Survey
EHS@levellingup.gov.uk

 **National Centre
for Social Research**

Gen_March 2023

Advance letter (owner occupied sector, front page)



Department for Levelling Up,
Housing & Communities



The Householder

<Address1>

<Address2>

<Address3>

<Address4>

<Address5>

<postcode>

<Post_Date>

Reference no.: P17893/<SerialNumber><CL1>

Help shape the future of housing

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 your unique chance to take part in this research.

The survey will help to shape the future of housing—improving the experiences of home owners, social and private renters, reducing our carbon emissions, and helping young people get a foot on the housing ladder.



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. The interviewer will tell you more about how you can take part.



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

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. To say thank you for taking part, we have enclosed a **£5 post office voucher** for your household.

Yours sincerely,

Chauncey Glass
Head of English Housing Survey
EHS@levellingup.gov.uk

 **National Centre
for Social Research**

Own_March 2023

Advance letter (social rented, front page)



Department for Levelling Up,
Housing & Communities



The Householder

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

<Post_Date>

Reference no.: P17893/<SerialNumber><CL1>

One chance to help improve homes and housing

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 your unique chance to take part in this research.

From giving a helping hand with fuel bills to helping improve poor housing conditions—the survey will help shape the future of housing. 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. The interviewer will tell you more about how you can take part.



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

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. To say thank you for taking part, we have enclosed a **£5 post office voucher** for your household.

Yours sincerely,

Chauncey Glass
Head of English Housing Survey
EHS@levellingup.gov.uk

 **National Centre
for Social Research**

Soc_March 2023

Advance letter (private rented, front page)



Department for Levelling Up,
Housing & Communities



The Householder

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

<Post_Date>

Reference no.: P17893/<SerialNumber><CL1>

Help improve homes for your family, friends and neighbours

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 your unique chance to take part in this research.

The survey will help to shape the future of housing—improving the experiences of home owners, social and private renters, reducing our carbon emissions, and helping young people get a foot on the housing ladder.



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. The interviewer will tell you more about how you can take part.



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

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. To say thank you for taking part, we have enclosed a **£5 post office voucher** for your household.

Yours sincerely,

Chauncey Glass
Head of English Housing Survey
EHS@levellingup.gov.uk

 **National Centre
for Social Research**

Priv_March 2023

Frequently Asked Questions

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 is the interview about?

The interview covers a range of topics including your housing circumstances, energy efficiency in your home and satisfaction with your accommodation and neighbourhood. The information you give helps to provide a clearer picture of homes and housing in England. This means the Government can make more informed decisions to shape the future of housing for everyone.

Who is carrying out the study?

NatCen Social Research carries out the study which is funded by the Department for Levelling Up, Housing and Communities (DLUHC). NatCen is independent of all government departments and political parties. For more information about NatCen visit www.natcen.ac.uk.

What will happen to any information I give?

We will treat information you give in strictest confidence under the UK General Data Protection regulation. Your answers will be combined with those of others who take part and presented anonymously in research reports. For details of our purpose in collecting and processing the data of this survey, who is going to be able to access the data and all other privacy-related information, please visit <https://www.gov.uk/government/publications/english-housing-survey-privacy-notice-for-survey-participants>. We undertake to use and store the information you give us in accordance with the purposes and processes outlined in the privacy statement available on this website. You will not receive any junk mail or marketing as a result of doing the survey.

What are my rights?

Participation in the research is voluntary. We hope that you will choose to take part as we rely on the voluntary cooperation of people invited to take part to get a clear picture of housing in England.

When we ask you for information, we will keep to the law, including the 2018 Data Protection Act and General Data Protection Regulation. You have the right to request that your data be amended if it is not accurate.

DLUHC is the data controller. You can contact the Data Protection Officer at dataprotection@levellingup.gov.uk. If you wish to lodge a complaint, you can contact NatCen at info@natcen.ac.uk or **0800 652 4572**, quoting your reference number printed on the other side of this letter. If we cannot resolve your complaint, you can contact the Information Commissioner's Office – www.ico.org.uk or phone **0303 123 1113**.

Where can I find out more?

Visit www.natcen.ac.uk/taking-part/ehs or phone us for free on **0800 652 4572**.



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 (1091766) and in Scotland (SC038454).

Annex 3.3: Leaflets

Interviewer (interview survey) leaflet

Leaflet for owner occupiers

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. With the Help to Buy scheme, first time buyers have been 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 research for 50 years. We are a non-profit organisation, independent of all government departments and political parties.
A Company Limited by Guarantee Registered in England No. 4392418
A Charity in England and Wales (1091768) and Scotland (SC038454)

National Centre for Social Research

Open, March 2023

Department for Levelling Up, Housing & Communities

ENGLISH HOUSING SURVEY

Leaflet for social 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 tenants and home owners.

- Right to Buy**
Information from this study has helped the Government develop the Right to Buy policy. This gives social tenants the legal right to buy the home they live in at a discount. Since the 1980s, more than 2 million people have bought their homes in this way.
- Health spending**
The English Housing Survey (EHS) has been used to estimate that the NHS spends around **£1.4 billion per year** on treating health problems that are directly linked to poor housing conditions.
- Fuel poverty**
There are 3.2 million households in England struggling to pay their fuel bills. This study lets government and charities know how many people are in fuel poverty and suggests ways to reduce this.

For more information

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

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National Centre for Social Research

Open, March 2023

Department for Levelling Up, Housing & Communities

ENGLISH HOUSING SURVEY

Leaflet for private 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 tenants and home owners.

- Deposits in safe hands**
The Tenancy Deposit Scheme helps private tenants protect their deposit from unscrupulous landlords. This study provided information to help set up the scheme.
- Health spending**
The English Housing Survey (EHS) has been used to estimate that the NHS spends around **£1.4 billion per year** on treating health problems that are directly linked to poor housing conditions.
- 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. With the Help to Buy scheme, first time buyers have been able to secure a special government loan to help them get a foot on the housing ladder.

For more information

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

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A Charity In England and Wales (1091768) and Scotland (SC038454)

**National Centre
for Social Research**

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Department for Levelling Up,
Housing & Communities

**ENGLISH
HOUSING
SURVEY**

WHAT'S UP YOUR STREET?
Help us to improve
homes and housing

© NatCen 2023

Interviewer (physical survey) leaflet

Members of the survey team:



Department for Levelling Up,
Housing & Communities

The Department for Levelling Up, Housing and Communities (DLUHC) 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/collections/english-housing-survey



**National Centre
for Social Research**

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/taking-part/ehs



**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.

cadsonline.com/services/english-housing-surveys

Your appointment with the surveyor is:

Date: _____

Time: _____

Name of surveyor: _____

EHS Helpline: 020 3131 3179



About the surveyor's visit



Surveyor_March 23

Thank you for taking part in the interview which was the first part of the English Housing Survey (EHS). We hope you will now agree to take part in the second phase which consists of a physical inspection of your property.

Just over half of all households where an interview has taken place are randomly selected for a follow-up physical inspection by a surveyor.

We would like to arrange a convenient time when a qualified surveyor can visit your home. The interviewer has details of when surveyors are working in your area.

? Who will conduct the physical inspection?

The EHS is conducted on behalf of the Department for Levelling Up, Housing and Communities (DLUHC). DLUHC have appointed CADS Housing Surveys to undertake the physical inspection. CADS employ professional surveyors qualified to conduct the EHS assessments.

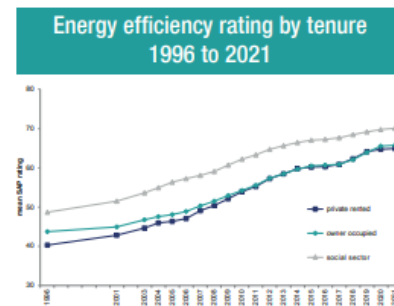
? What is the purpose of the physical inspection?

During the interview you kindly told us about your housing circumstances and aspirations, and your views on your home and neighbourhood.

To supplement this information we also need a professional assessment of your home to understand what types

of household live in the least energy efficient homes and how housing conditions vary between household groups. The information we collect helps the Government to develop policies to improve people's homes.

For example, energy efficiency of English homes has improved over the past 20 years.



Source: English Housing Survey, dwelling sample

The findings also help to highlight problem areas. For example, almost 1 in 26 homes have problems with damp.

? What will the surveyor do?

Our surveyor will call at an agreed time that is convenient to you. On arrival the surveyor will introduce themselves and show you their identity card.

The inspection is a visual one and will not involve any disruption to your home or belongings. The physical survey will take about an hour. Half of this will take place outside the home, and half will take place inside.

? Do I have to take part in the physical inspection?

As with the interview, we rely upon voluntary co-operation to make this study a success. Your home has been chosen at random to provide a balanced picture of all parts of the country and types of property and household. By taking part you help us to provide an accurate picture of housing in England.

? Should I let my landlord know I am taking part?

There is no reason to inform your landlord or freeholder of your participation unless you want to. All your responses at interview and the information collected at the physical inspection will remain confidential and will not be passed onto your landlord.

? Will I get any feedback after the physical inspection?

While the EHS is designed to provide government with a reliable assessment of the energy efficiency and condition of the housing stock it is not as detailed as a survey that you would pay to have

conducted yourself. We are not therefore able to provide any feedback on your home unless the surveyor identifies any issues which they consider to be an imminent risk to you or your family. In this situation they will alert you to the problem and advise you to take immediate action.

? Is the physical inspection confidential?

Yes. The information collected at both the interview and physical inspection stages of the study is handled in the strictest confidence by DLUHC, NatCen Social Research, and their appointed contractors as directed by the Code of Practice for Statistics, the Data Protection Act and General Data Protection Regulations. It will be used to produce statistics that will not identify you or anyone in your household. These anonymous statistics are analysed by researchers in government and other approved organisations such as universities and charities.

Thank you for agreeing to take part in this important national study.

Chapter 4

Response rates

- 4.1 This chapter provides details of the final response rates and information on action taken to maximise response.

Overview

- 4.2 In 2023-24, EHS fieldwork was carried out by field interviewers. Interviewers visited each issued address in person to introduce the survey and carry out the survey interview face-to-face or, if this was not possible, by telephone. A full physical survey was also carried out by experienced surveyors, including observations inside and outside the dwelling. Fieldwork took place between March 2023 and March 2024.
- 4.3 The Ministry of Housing, Communities and Local Government (MHCLG) and NatCen monitored response on the survey closely through analysis of electronic data reports and direct contact between interviewers and their team leader. NatCen also set and monitored targets for coverage within each wave of fieldwork, monitored response at an area and interviewer level and adapted the approach to optimise response.
- 4.4 Interviewers collected the same information as standard EHS years and used similar response categories. Vacant and derelict addresses were identified and passed on to the surveyor for the physical survey. Interviewers identified Houses of Multiple Occupation, enumerated the number of dwellings and households and carried out a dwelling or household selection where needed. Non-contact and refusals were included as response categories.

Interview survey

- 4.5 In 2023-24, interviews were achieved at 15,846 households. This represents a response rate of 30%. More details on the response rate to the EHS interview survey in 2023-24 are provided in Table 4.1.

Table 4.1: Interview survey response rates, 2023-24*all issued households*

	number (N)	issued cases (%)	in-scope cases (%)
total issued addresses	55,631		
not yet built/under construction ¹	35	0.1	
demolished/derelict ¹	123	0.2	
vacant/empty or derelict housing unit ²	1,782	3.2	
non-residential address ¹	730	1.3	
address occupied - no resident household ^{1, 5}	74	0.1	
communal establishment/institution ¹	121	0.2	
other ineligible ¹	143	0.3	
total ineligible addresses	3,008	5.4	
total in-scope addresses	52,623	94.6	
not issued ³	-	0.0	0.0
issued, but not attempted ³	5,355	9.6	10.2
inaccessible ³	54	0.1	0.1
unable to locate address ¹	432	0.8	0.8
unknown whether residential: Info refused	58	0.1	0.1
unknown whether residential: no contact	790	1.4	1.5
residential but unknown eligibility : info refused	103	0.2	0.2
residential but unknown eligibility : no contact	216	0.4	0.4
info refused about whether address is residential	30	0.1	0.1
info refused whether resident(s) are eligible	105	0.2	0.2
eligibility not confirmed: language barrier	41	0.1	0.1
other unknown eligibility	3,004	5.4	5.7
total unknown eligibility	10,188	18.3	19.4
office refusal	1,004	1.8	1.9
information refused on no. of dwellings	808	1.5	1.5
information refused on no. of households	385	0.7	0.7
can't identify target respondent(s): info refused	948	1.7	1.8
refusal before interview: by selected respondent	14,157	25.4	26.9
proxy refusal	565	1.0	1.1
refusal during interview (unproductive partial)	301	0.5	0.6
broken appointment, no re-contact	2,026	3.6	3.9
total refusals⁴	20,194	36.3	38.4
no contact with anyone at address	2,072	3.7	3.9
multi dwellings - No contact made with selected dwelling	958	1.7	1.8
no contact with responsible adult	209	0.4	0.4
contact made at dwelling, but not from selected household	86	0.2	0.2
total non-contact⁵	3,325	6.0	6.3
ill at home during survey period: Head Office	31	0.1	0.1
ill at home during survey period: Interviewer	444	0.8	0.8
away or in hospital all survey period: Head Office	89	0.2	0.2
away or in hospital all survey period: Interviewer	679	1.2	1.3
physically/mentally unable/incomp: Head Office	55	0.1	0.1
physically/mentally unable/incomp: Interviewer	542	1.0	1.0
language difficulties: Head Office	44	0.1	0.1
language difficulties: Interviewer	387	0.7	0.7
lost productive	1	0.0	0.0
interview achieved but resp requested data deleted	1	0.0	0.0
interview achieved but research requested data deleted	199	0.4	0.4
other unproductive	598	1.1	1.1
total other unproductive	3,070	5.5	5.8
full interview	15,834	28.5	30.1
partial interview	12	0.0	0.0
total interviews	15,846	28.5	30.1

Note: The text in superscript marks the instances where the response rate calculations and sampling processes treat some of the survey outcomes differently. Please see Annex Table 4.1, published alongside this report, for full notes on these differences

- 4.6 Of these 15,846 interviews, 85% were conducted with the household reference person (HRP), 13% with the HRP's partner and 1% with a proxy respondent answering on behalf of the HRP or partner, Table 4.2.

Table 4.2: Interview respondents, 2023-24

all productive cases

	number (N)	percentage (%)
HRP	13,530	85.4
HRP's partner	2,133	13.5
total non-proxies	15,663	98.8
proxy for the HRP	177	1.1
proxy for the Partner	6	0.0
total proxies	183	1.2

Physical survey

- 4.7 Not every household that takes part in the interview survey is eligible to take part in the physical survey. Cases eligible¹¹ for the physical survey are identified by the Computer Assisted Personal Interviewing (CAPI) program during 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.
- 4.8 Of the 15,284 interviewed households eligible for the physical survey, 56% agreed to have a physical survey, which is below the target of 78% and lower than 2022-23 when a 59% agreement rate was obtained for an external-only physical survey. The lower agreement rate may be, in part, associated with a return to the full physical survey, including measures inside the home, Table 4.3.
- 4.9 In 2023-24, 7,496 physical surveys were achieved. Of these, 7,312 were surveys in occupied properties and 184 were of vacant dwellings. This represents 85% of households which agreed to a physical survey at the interview and 23% of identified vacant dwellings eligible for a physical survey, Table 4.3.

¹¹ See Chapter 1 for more information on the sub-sampling process that determines how addresses are deemed eligible for the physical survey.

Table 4.3: Physical survey response rate, 2023-24*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	15,284		
eligible but refused appointment at interview	6,723	44.0	
eligible and agreed appointment at interview	8,561	56.0	
total unproductive	1,249		
incomplete survey	0	0.0	.0
refusal on doorstep	652	4.3	7.6
refusal to HQ	88	0.6	1.0
	3		
partial survey then refusal		0.0	.0
household missed appointment	65	0.4	.8
surveyor missed appointment - no contact	2	0.0	.0
surveyor missed appointment - rescheduled	1	0.0	.0
speculative call - no contact	413	2.7	4.8
address untraceable	0	0.0	.0
other reason for non-survey	25	0.2	.3
full survey (paired cases)	7,312	47.8	85.4
vacant/derelict addresses			
total vacant/derelict addresses eligible for physical survey⁶	1,582		
eligible but refused appointment at interview ⁶	788	49.8	
total unproductive	610	38.6	76.8
refusal on doorstep	120	7.6	15.1
refusal to HQ	15	0.9	1.9
household missed appointment	11	0.7	1.4
Surveyor missed appointment - rescheduled	1	0.1	.1
speculative call no contact	422	26.7	53.1
address untraceable	2	0.1	.3
dwelling derelict	9	0.6	1.1
dwelling demolished	1	0.1	.1
no longer usable as dwelling	2	0.1	.3
other reason for non-survey	27	1.7	3.4
survey achieved (vacant)	178	11.3	22.4
survey achieved (derelict)	6	0.4	.8
total vacant/derelict physical surveys achieved	184	11.6	23.2
total physical surveys achieved	7,496	44.4	80.1

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 a physical survey; and the cases agreed to a physical survey at the interview 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 cases with outcome 'address untraceable' and 'dwelling demolished' have been added to other reasons for non-survey for both occupied and vacant dwellings

5) vacant and appointment led cases not covered due to COVID-19 are included in 'other reason for non-survey

6) includes 3 cases treated as ineligible in sampling but eligible

Chapter 5

Data processing

- 5.1 The data of the English Housing Survey (EHS) undergo a series of checks and quality assurance after they have been collected. The process begins at the point of data collection, both through the Computer Assisted Personal Interviewing (CAPI) system and through surveyors validating their forms using the online system developed by the Building Research Establishment (BRE). This chapter outlines those procedures and also gives information about the main derived variables and data outputs.
- 5.2 Over the past three years the survey's data collection and subsequent data processing and modelling methodology was impacted by the circumstances surrounding the COVID-19 pandemic. The 2023-24 data collection year is the first year of fieldwork since 2019-20 free of such impacts. The interview survey was held predominantly face-to-face (telephone interviews were offered for those who preferred). Physical inspections of dwellings had already returned to the traditional in-person mode in 2022-23. More information on the impact of COVID-19 on the English Housing Survey and the modelling methodology can be found in the [EHS 2022-23 Technical Report](#).

Data editing

Interview data

- 5.3 The CAPI program has numerous built-in checks for identifying obvious discrepancies so 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 to identify where the answer falls outside a pre-specified range of responses, for example, an unusually high/low weekly rent is entered; and
 - conflicting answers to different questions, for example, if the number of years living in the current accommodation is greater than the respondent's age.
- 5.4 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 and therefore checking the answer with the respondent if appropriate.

Physical survey data

- 5.5 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.
- 5.6 First, a large number of checks are built into the EHS surveyors' website as surveys are uploaded. These include:
- range checks – to identify where the entered answer falls outside a pre-specified 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 are 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).
- 5.7 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.
- 5.8 Second, the CADS Housing Surveys regional managers check the data and where necessary discuss with surveyors to agree on a final set of response.
- 5.9 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 data 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 regarding the number of storeys in the building, and the floor occupied by the dwelling. The BRE checks test for the following possible errors:
 - 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);
 - 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); and
 - 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 that the section is not applicable, question is not applicable, or the information is 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

5.10 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 discrepancies in the data. For example:

- If tenure in the interview survey (IS) was owner occupied AND tenure in the physical survey (PS) was another tenure, the PS tenure would be changed to owner occupied.
- If tenure in the interview survey (IS) was renting from local authority AND tenure in the physical survey (PS) was another tenure, the PS tenure would be changed to renting from local authority.

5.11 The remaining discrepancies between the two parts of the survey are flagged, investigated and recoded where applicable. This process is carried out 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. number of bedrooms, 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

5.12 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 in an HMO generally have separate tenancy agreements and usually have begun their tenancies independently of each other. The identification of HMOs is critical 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 interviewers and/or CADS Housing Surveys surveyors is described below.

- 5.13 Whether a case is flagged as an HMO or not is dependent 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.
- 5.14 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.
- 5.15 There are occasions when a physical surveyor considers that a referred address appears to be an HMO despite not being flagged as such by the NatCen 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, with confirmation on the exact nature of the case sought from the interviewer or surveyor where necessary.
- 5.16 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 the 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.
- 5.17 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, MHCLG conducts

spot checks on these ratios as well as the HMO edits resulting from the process above.

- 5.18 A record of all address changes is 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 MHCLG at the end of fieldwork.

Coding

- 5.19 After the interview, the data are coded and edited by trained coders and editors at NatCen. An edit program is used 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 HmpyElec3), and the respondent is shown eight possible answers 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).
- 5.20 Errors detected by the edit program 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 have passed all the checks. 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.
- 5.21 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

- 5.22 Derived variables are created either by simply recoding a particular survey question or by combining the information collected from several 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.

- 5.23 In addition to the three key EHS derived datasets, further detailed derived files such as dimensions 22+23.sav, energy performance 22+23.sav and 22+23 paired sample equivalised income.sav are available via the UK Data Service, as listed in Table 5.1.
- 5.24 Physical survey data published on the UK Data Service consist of two EHS survey years. For example, the dimensions 22+23.sav dataset will consist of data collected in the 2022-23 and 2023-24 EHS survey years.
- 5.25 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 Service (<http://ukdataservice.ac.uk/>).
- 5.26 The EHS derived variables are included in the datasets made available from UK Data Service. 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. In addition, the very disclosive geo-demographic variables (local authority and postcode) are available only through the Service's Secure Data Service.

Modelling

- 5.27 The derivation of some of the derived variables involves complex data 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

Imputation

- 5.28 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. 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.

5.29 Imputation of data also takes place in the modelling of derived variables where a value provided in the raw data falls outside the pre-specified range of the 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.

5.30 Examples of imputation that occurred in the modelling of EHS 2023-24 derived variables are as follows (figures are based upon weighted data):

- In the modelling of the derived variables from the EHS 2023-24 interview survey, 39% of the weighted 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), 17% of renters had weekly rents imputed and 20% 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 39% 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 affect the total household income.
- In the modelling of derived variables from the EHS 2023-24 physical survey on the dimensions of the property e.g. derivation of floor area, external wall area etc., a total of 280 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.

5.31 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

5.32 A range of EHS data files are produced annually and released via the UK Data Service under the End User Licence and the Special Licence, Table 5.1.

Table 5.1 List of annual datasets

Physical data files	Interview data files	Detailed derived data files	Derived data files (paired sample)	Derived data files (full household sample)
Available via the Special Licence only			Available under both End User Licence and Special Licence	
Amenity.sav	Attitudes.sav	Dimensions 22+23.sav	General 22+23.sav	Generalfs23.sav
Around.sav	Contact.sav	Energy performance 22+23.sav	Physical 22+23.sav	Interviewfs23.sav
Chimney.sav	Damp.sav	2023 full sample equivalised income.sav 22+23 paired sample equivalised income.sav	Interview 22+23.sav	
Commac.sav	Disability.sav	Actual costs 22+23.sav		
Common.sav	Dwelling.sav	Standardised costs 22+23.sav		
Damppc.sav	Employment.sav	HHSRS 22+23.sav		
Doors.sav	Energy.sav			
Dormers.sav	Fire.sav			
Elevate.sav	Firstimp.sav			
Firstimp_PS.sav	HhldType.sav			
Flatdets.sav	Identity.sav			
Hhsrs.sav	Income.sav			
HQ.sav	Owner.sav			
Interior.sav	People.sav			
Introoms.sav	Renter.sav			
Numflats.sav	Rooms.sav			
Plotlvl.sav	Vacant.sav			
Roofcov.sav	WaitList.sav			
Rooffeat.sav				
Roofstru.sav				
Services.sav				
Shape.sav				
Shared.sav				
Structure.sav				
Wallfin.sav				
Wallstru.sav				
Windows.sav				

- 5.33 The data, user guides and supporting documentation are publicly available from the UK Data Service (<https://ukdataservice.ac.uk/>). Datasets can be downloaded in SPSS and SAS format.
- 5.34 Prior to releasing the data to the UK Data Service, 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

- 5.35 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 Service (<http://ukdataservice.ac.uk/>).
- 5.36 In Table 5.2.1 the Household Reference Person (HRP) is the person in whose name the dwelling is owned or rented or who is otherwise responsible for the accommodation. In the case of joint owners and tenants, the person with the highest income is taken as the HRP. Where incomes are equal, the older is taken as the HRP. This procedure increases the likelihood that the HRP better characterises the household's social and economic position.

Annex Table 5.2.1: interview 22+23.sav and interviews23.sav

accomhh	Type of accommodation for household	SL only
accomhh1	Type of accommodation for household & if not self-contained	EUL and SL
agehrp2x	Age of HRP - 2 band	EUL and SL
agehrp4x	Age of HRP - 4 band	EUL and SL
agehrp6x	Age of HRP - 6 band	EUL and SL
agehrpx	Age of HRP - continuous	SL only
agen16	Number of persons under 16 in household	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	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
atspapr	Is partner at state pension age?	EUL and SL
bedrqx	Number 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	SL only
cohabhrp	If HRP is cohabiting	SL only
cohabprt	If HRP's partner is cohabiting	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
empprt	Employment status (primary) of partner	EUL and SL
equity5x	Equity in home (based on respondent valuation only)	EUL and SL
equityflg	Equity data changed/imputed	SL only
equityr	Equity in home (based on respondent valuation only)	EUL and SL
ethhrp2x	Ethnic origin of HRP - 2 categories	EUL and SL
ethhrp4y	Ethnic origin of HRP - 4 categories	SL only
ethhrp8y	Ethnic origin of HRP - 8 categories	SL only
ethprt2x	Ethnic group of HRP's partner - 2 categories	EUL and SL
ethprt8y	Ethnic group of HRP's partner - 8 categories	SL only
famnumx	Number of family units in household	SL only
freeLeas	Freehold or leasehold	EUL and SL
ftbuyer	If first-time buyer	EUL and SL
grossA	Age group & sex of youngest person in household	SL only
hatentp3	Type of housing association tenancy	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	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 household income	SL only
hhincx	EHS Basic Income (annual net household income (HRP + Partner) including savings)	EUL and SL
hhlltsick	Anyone in household have long term illness or disability?	EUL and SL
hhsizex	Number of persons in the household	EUL and SL
hhtype6	Household type - 6 categories	EUL and SL
hhtype7	Household type - 7 categories	EUL and SL
hhtype11	Household type - full 11 categories	EUL and SL
hhvulx	Household vulnerable - on means tested or certain disability related benefits?	EUL and SL
hhwhch	Anyone in household uses a wheelchair	EUL and SL
housbenx	Household (HRP + partner) receives any housing benefit?	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
lenresb	Length of residence	EUL and SL
lharqx	Number 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
mortflg	Mortgage data changed/imputed	SL only
mortwkx	Weekly mortgage payments	EUL and SL
nbatha	If shares a bathroom, shower room or WC	SL only
nbedsx	Total number of bedrooms household actually has	EUL and SL
ncouple	Number of couples in household	SL only
ndepchild	Number of dependent children in household	EUL and SL
nEmp	Number of employed persons in household	SL only
nlnac	Number of economically inactive persons in household	SL only
nkita	If shares a kitchen	SL only
nliving	If shares other room (living room)	SL only
nlpar	Number of lone parent families in household	SL only
noUnits1	Banded number of family units in household	EUL and SL
nrooms1a	Number of rooms available to household (grouped)	EUL and SL
nroomsa	Number of rooms available to household	SL only
nshare	If shares any part of accommodation	SL only
nsing	Number of one-person family units in household	SL only
nssech9	NS-SEC Socio-economic Classification - HRP	EUL and SL
nssecp9	NS-SEC Socio-economic Classification - HRP's partner	EUL and SL
nStud	Number of students in household	SL only
nUnemp	Number of unemployed persons in household	SL only
nxdepch	Number of non-dependent children in household	SL only
olderx	Number 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	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
rentflg	Rent/housing benefit changed/imputed	SL only
rentwkx	Total weekly rent payable (rent plus housing benefit)	EUL and SL
sexhrp	Sex of HRP	EUL and SL
sexprt	Sex of HRP's partner	SL only
sft	Number of full-time workers in household	EUL and SL
sharer	If shares accommodation with other household	EUL and SL
srtentype2	Type of social sector tenancy	EUL and SL
studhrp	If HRP is a full-time student	SL only

studprt	If HRP's partner is a full-time student	SL only
tenex	Extended tenure of household	EUL and SL
tenure1	Tenure group 1	SL only
tenure2	Tenure group 2	EUL and SL
tenure3	Tenure group 3	SL only
tenure4	Tenure group 4	EUL and SL
totkitsa	Number of unshared kitchens	SL only
workless	Household with no one of working age employed - ILO defn	EUL and SL

Annex Table 5.2.2: physical 22+23.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
ctbcco2	Cost to make EER band C: post-improvement CO2 emissions (kg/yr) [SAP 2012]	EUL
ctbceerb	Cost to make EER band C: post-improvement energy efficiency rating band [SAP 2012]	EUL
ctbcimcst	Cost to make EER band C: total cost to improve dwelling to EER band C (£)	EUL
ctbcimcst5x	Cost to make EER band C: total cost to improve dwelling to EER band C (£)	EUL
ctbcrct	Cost to make EER band C: post-improvement running costs (£/yr) [SAP 2012]	EUL
ctbcsap12	Cost to make EER band C: post-improvement SAP rating [SAP 2012]	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
dampsf	Rising damp in one or more rooms	EUL and SL
dbglaz2	Extent of double glazing	EUL and SL
dbglaz4	Extent of double glazing	EUL and SL
dhcosty	Cost to make decent (15 hazard HHSRS model)	EUL and SL
dhdisrx	Decent homes repair criterion	EUL and SL
dhhhsrsx	Decent homes HHSRS (15 hazard) criterion	EUL and SL
dhhhsrsy	Decent homes HHSRS (26 hazard) criterion	EUL and SL
dhmodx	Decent homes modern facilities criterion	EUL and SL

dhnumy	Decent homes: number of criteria failed (15 hazard HHSRS model)	EUL and SL
dhnumz	Decent homes: number of criteria failed (26 hazard HHSRS model)	EUL and SL
dhomesy	Decent homes - overall standard (15 hazard HHSRS model)	EUL and SL
dhomesz	Decent homes - overall standard (26 hazard HHSRS model)	EUL and SL
dhreasny	Decent homes criterion not met (15 hazard HHSRS model)	EUL and SL
dhreasnz	Decent homes criterion not met (26 hazard HHSRS 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
dwage7x	Dwelling age	EUL and SL
dwage10x	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 (SAP 2012)	EUL and SL
EPceib12e	Environmental impact rating band (SAP 2012)	EUL and SL
EPceir12e	Environmental impact rating (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
mainsgas	Mains gas supply present	EUL and SL

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 (SAP 2012) rating	EUL and SL
sap412	Energy efficiency (SAP 2012) 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 structure	SL only
typewfin	Predominant type of wall finish	SL only
typewin	Predominant type of window	SL only
typewstr2	Predominant type of wall structure	SL only
wallcavy	Type of wall	EUL and SL
wallinsz	Type of wall and insulation	EUL and SL
watercyl	Hot water cylinder present	EUL and SL
watersys	Water heating system	EUL and SL
wins95x	Type of wall - post 1995 assumption	EUL and SL

Annex Table 5.2.3: general 22+23.sav and generalfs23.sav

aagh23	Household weight (2023) (generalfs23.sav only)	EUL and SL
aagpd2223	Rounded dwelling weight for 2-year physical survey sample (general 22+23.sav only)	EUL and SL
aagph2223	Rounded household weight for 2-year paired sample (general 22+23.sav only)	EUL and SL
fimonth	Interview survey month (interviewed)	SL only
fiqtr	Interview survey quarter (interviewed)	SL only
fiyear	Interview survey year (interviewed)	SL only
fmonth	Interview survey month (issued)	SL only
fqtr	Interview survey quarter (issued)	SL only
fyyear	Interview survey year (issued)	SL only
gorehs	Government office region EHS version	EUL and SL
govreg1	Government office Region, grouped	EUL and SL
imd1910	IMD 2019 decile ranking of areas (lower layer SOA)	SL only
paired	Whether paired sample case (generalfs23.sav only)	EUL and SL
pmonth	Physical survey fieldwork month (completed)	SL only
pqtr	Physical survey fieldwork quarter (completed)	SL only
pyear	Physical survey fieldwork year (completed)	SL only
region3x	Overall region of England	EUL and SL
ru11combin	Rurality classification - combined (2011 COA)	SL only
ru11contxt	Rurality classification - context (2011 COA)	SL only
ru11morph	Rurality classification - morphology (2011 COA)	SL only
tenure2x	Tenure	EUL and SL

tenure4x	Tenure	EUL and SL
tenure8x	Tenure with vacancy	EUL and SL
vacantx	Whether occupied or vacant (general 22+23.sav only)	EUL and SL
vaclength	Length of vacancy (general 22+23.sav only)	SL only

Annex 5.3: Accessibility indicators

- 5.37 The EHS collects a good deal of information on whether dwellings possess certain features or attributes to make them more accessible and usable 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 (Volume 1), 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.
- 5.38 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 that 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	<p>This is only recorded as satisfactory if the doors and circulation space serving habitable rooms, kitchen, bathroom or WC comply with Part M4(1) regulations, as follows:</p> <table> <tr> <th>Doorway clear opening width (mm)</th><th>Corridor/passageway width (mm)</th></tr> <tr> <td>750 or wider</td><td>900 (when approach head-on)</td></tr> <tr> <td>750</td><td>1200 (when approach not head-on)</td></tr> <tr> <td>775</td><td>1050 (when approach not head-on)</td></tr> <tr> <td>800</td><td>900 (when approach not head-on)</td></tr> </table>	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)
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.										

5.39 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
- bathroom wheelchair accessible

Annex 5.4: Household derived indicators

- 5.40 This Annex focuses on providing details of the data processing methods and modelling assumptions for 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 benefit
 - modelling of mortgage repayments
 - equity
 - household composition
- 5.41 These complex derived household variables, along with more straight forward household variables e.g. age of the household reference person (HRP), ethnicity of the HRP etc, are used throughout the 2023-24 EHS annual reports. The HRP is the person in whose name the dwelling is owned or rented or who is otherwise responsible for the accommodation. In the case of joint owners and tenants, the person with the highest income is taken as the HRP. Where incomes are equal, the older is taken as the HRP. This procedure increases the likelihood that the HRP better characterises the household's social and economic position.
- 5.42 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.
- 5.43 All interview based variables are derived from the full annual EHS sample. Most of the EHS annual reports and fact sheets published in 2023-24 are based mainly on one full annual EHS sample. The exceptions are the reports and fact sheets that predominantly use physical survey data such as: Drivers and Impacts of Housing Quality, Low Carbon Technologies in English Homes and Climate Resilient Homes. The EHS datasets containing these household variables are available to users via the UK Data Service (<http://ukdataservice.ac.uk/>)

Income

- 5.44 The EHS reports present household/housing related characteristics in relation to various income indicators, to examine housing costs and affordability.

- 5.45 The interview survey collects information on the main components of income for the HRP and their partner as well as the income of other additional household members aged 16 or over. The components of income collected on the HRP and partner 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, interest from investments etc;
 - state benefits including state pensions; and
 - income from savings.
- 5.46 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 have 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 to indicate the nature and extent of any imputation (variable hhincflg).
- 5.47 Where respondents report receipt of private income sources, e.g. employment, self-employment income etc., 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. All private incomes are modelled as gross amounts and converted (if applicable) to net amounts later in the income modelling process according to Income Tax and National Insurance rates and allowances.
- From 2015 modelling onwards, where the HRP/partner selected working in terms of their employment status, stated as being in receipt of paid work, but did not select any employment or self-employment income under their income sources (nor responded/refused to their income sources) and is not in receipt of any 'other' private income, then the HRP/partner is assigned an employment income and an employment income amount is imputed based upon the method outlined in Annex Table 5.4.1. In this situation it is assumed the HRP/partner unintentionally omitted employment income as an income source in the EHS interview survey.
 - From 2017 modelling onwards, in an attempt to address the issue of low student household incomes, several minor modelling changes surrounding the income of student households were incorporated.
 1. If an additional adult is a full-time student (likely to be a university student), with no reported income, living in a house where the HRP is a full-time student in further education, then the additional adult

income is set to missing (highly likely that they have misreported presence of an income source) and an income amount is imputed.

2. If the HRP/partner is in full-time education (and not studying for A-Levels), with no reported income, living in what appears to be a university household, then the HRP/partner income is set to in receipt of 'other income', rather than 'no income'.

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

- 5.48 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.
- 5.49 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. All state benefit incomes are modelled as gross amounts and converted (if applicable) to net amounts later in the income modelling process according to Income Tax rates and allowances.
- 5.50 Since its introduction in April 2013, attention is paid to cases where the HRP or partner selects receipt of Universal Credit in the benefit module of the EHS interview survey. To better capture the data on Universal Credit amounts, questions regarding Universal Credit were altered in the EHS 2018-19 interview survey. The modelling of Universal Credit has been updated to reflect the EHS interview survey revisions. From 2018 modelling, Universal

Credit cases are assigned a Universal Credit scenario (between 1 to 20) that is defined based upon how the suite of Universal Credit/housing related benefit questions are answered in the EHS interview survey, and for some scenarios, also in combination with the household theoretically modelled Universal Credit award. Depending on the scenario assigned, the Universal Credit amount collected in the benefit section of the EHS interview survey is either treated as the total Universal Credit amount that includes help towards housing costs i.e. an 'income' element and a 'housing' element combined, or as an 'income' only amount i.e. an amount that excludes the housing element. In the former situation, the income only amount is derived by deducting the housing element (as collected in the housing benefit module of the EHS interview survey) from the total amount. The housing element of Universal Credit is not incorporated in the derived annual income of the HRP and any partner variables (hhincx and JOINTINCx), but the housing element of Universal Credit is included in the derived annual income of the HRP and any partner variable that includes housing related benefit (variable ALLincx).

- 5.51 Information is also collected on saving amounts held by the HRP and partner. Where the amount of savings has not been provided, a method based on CHAID analysis (Chi-square automatic interaction detection) is used to estimate the combined savings of the HRP and any partner using predictor variables such as tenure, age/sex of HRP, number of jobs (HRP plus any partner) etc. Once all the cases with savings have an assigned savings amount, income received from these savings is calculated using a gross interest rate of 3.75%. No information is collected on the EHS interview survey that relates to the type of savings account, the term of the account or the rate of interest. The rate of 3.75% (gross) is fixed for all householders and has been used for all years of the EHS income calculation regardless of whether interest rates are higher or lower than this. Income from savings is modelled as a gross amount and converted (if applicable) to a net amount later in the income modelling process according to Income Tax rates and allowances.
- 5.52 Up to this point in the income modelling, the components of income are calculated as gross amounts. When deriving the annual net income measure, 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 (incorporating the personal savings allowance where applicable from 2016 modelling) and deducted from the gross income to give the total net annual income of the HRP and partner. From EHS 2017 modelling, if the HRP/partner selects receipt of income from rent, the income modelling assumes that the HRP/partner benefits in tax relief from either the £1,000 property trading allowance scheme (a new policy from April 2017) or, if a lodger is present, the Rent-a-room relief legislation (existing policy but not previously modelled). Recipients cannot get both allowances, therefore the

greatest applicable tax allowance figure is derived based on the HRP/partner modelled rental income and circumstances and assigned to the individual.

- 5.53 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 Universal Credit (excluding the household element) /pension credit entitlement, the income amount is changed as follows. Households in receipt of one or more of the main income based benefits (excluding child benefit) and with an income below their theoretical Universal Credit (excluding the housing element)/pension credit entitlement are allocated their Universal Credit (excluding the housing element)/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 Universal Credit (excluding the housing element)/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 household income value is then derived as further noted below.
- 5.54 Prior to the EHS 2020-21 income modelling process the low income assessment for the working age group (and associated uplift of income) was based on theoretical income support entitlement. The modelling converted to using theoretical Universal Credit entitlement in the low income assessment as Universal Credit replaced income support as part of the 2013 Welfare Reform Act and Universal Credit overtook income support as the predominant working age means tested benefit.
- 5.55 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.
- 5.56 There are two versions of the variable for the annual income of the HRP and any partner (known as the primary benefit unit income). 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 benefit/allowances.
- 5.57 For the EHS 2022-23 and EHS 2023-24 data, the annual income of the HRP and any partner accounts for a number of government income support packages, referred to as Cost of Living Payments. The EHS 2022-23 and EHS 2023-24 interview survey was modified in multiple places to make it clear to respondents not to include these payments in their responses. Therefore, for the EHS 2022-23 and 2023-24 data only, Cost of Living Payments

associated with the HRP and partner have been modelled according to eligibility and added to the annual income of the HRP and any partner. The modelled payments include the means tested Cost of Living Payment assigned to households where the HRP or partner selected a qualifying low income benefit/tax credit, or with an income uplifted to the basic minimum threshold (a payment of £650 in 2022-23 and a payment of £900 in 2023-24), the disability Cost of Living Payment assigned to households where the HRP or partner selected a qualifying disability benefit (a payment of £150 in both 2022-23 and 2023-24) and the Council Tax Rebate assigned to households in Council Tax bands A to D (a payment of £150 in 2022-23 only, as this rebate did not apply to 2023-24 data).

- 5.58 In addition to the above derived income variables hhincx and JOINTINCx, a variable providing the gross income of the HRP and partner has been created that includes housing related benefit (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 ($\text{amthbenx} * 52$). See the section on 'Rents and housing related benefit' for the calculation of housing related benefit using EHS data.
- 5.59 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 additional adults living within the household that are not part of the primary benefit unit e.g. a grown-up child living with their parents or two or more unrelated individuals sharing a house (see below for the derivation of additional adult income). For the EHS 2022-23 and 2023-24 data only, in addition to the HRP/partner modelled allocation of Cost of Living Payments (see above), the income for HYEARGRx also included a means tested Cost of Living Payment where an additional adult in the household selected a qualifying low income benefit/tax credit, provided that the HRP and partner had not been allocated the payment (as it was a maximum of one payment per household). Note that this income variable does not include any housing related benefit/allowances.
- 5.60 Data on the total gross income of other additional household members aged 16 or over (who are not the HRP or partner) are collected at the person level in the EHS interview survey. Household members aged 16 or over that are not in the same benefit unit as the HRP are considered as additional adults and form Other Benefit Units. If the household member is a child of the HRP/partner, aged between 16 and 18 in full-time education (an age threshold of 19 is used if the dependent child is studying for A-Levels or equivalent), then they will be included in the same benefit unit as the HRP and therefore not considered as an additional adult. Also, 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 income.

- 5.61 If a gross income amount is provided for the additional adult, then this value is used for the income of the household member. Also, from 2015 modelling onwards, where an additional adult household member selected 'working' as their employment status, stated as being in receipt of paid work, but provided a gross income value of zero, then their gross income is overwritten and set to missing, and an income amount imputed based upon the standard imputation method for additional adult income as outlined below.
- 5.62 If an income has not been provided for the additional adult, an amount for their income is then imputed based on a 'hot-decking approach'. The process of hot-decking involves finding cases in the data set that provided an income amount, which are similar in other parts of their responses to the cases with the missing value. For imputing missing additional adult income values, a specification to find similar cases is created for each case based on age (banded), sex, working status, socio-economic group (where applicable), grouped geographical location for those in work, and (from 2015 modelling onwards), presence of an income source. The case with the missing value has a precise specification and it is matched at random to a case with an income value with the same specification, this income value is then used for the missing case.
- 5.63 Not all missing cases are matched and this occurs in two situations:
1. if a case with a missing value has a specification which is not matched by a case with a non-missing value; or
 2. when there are more cases with missing values than with non-missing values of the same specification.
- 5.64 Missing cases that are not matched during the hot-decking process are imputed to a sample median based on working status, and for some working status categories with large samples, age (banded) and sex.

Equivalised income

- 5.65 A measure known as 'in poverty' is sometimes reported on in the EHS Reports and associated tables e.g. the EHS Drivers and Impacts of Housing Quality Report, 2023-24. For this report, this variable is based on an income measure that is 'equivalised' after housing costs are considered. All analysis makes clear the precise equivalisation measures being used.

- 5.66 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, the modified Organisation for Economic Co-operation and Development OECD equivalence scale is employed, taking each household's size and composition into account, to make sensible comparisons.
- 5.67 Equivalised income measures were constructed for the EHS 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 DWP Households Below Average Income (HBAI) 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 the components that 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 Cost (BHC) and After Housing Cost (AHC) measures and describe how the information is addressed through the EHS.

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 payments	Collected
Water rates, community or council water charges	Not collected
Mortgage interest payments	Total mortgage repayments used as a proxy (i.e. interest and capital repayments).
Structural insurance premiums	Not collected
Ground rent and service charges	Not included

5.68 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 measured EHS 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/reduction (previously referred to as council tax benefit) and housing related benefit. For each household the BHC income 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

income measure is derived by deducting rent and mortgage payments from the BHC measure, as outlined in Annex Table 5.4.6.

- 5.69 For the EHS 2022-23 and EHS 2023-24 data, the BHC and AHC income measures account for a number of government income support packages, referred to as Cost of Living Payments. The EHS 2022-23 and EHS 2023-24 interview survey was modified in multiple places to make it clear to respondents not to include these payments in their responses. Therefore, for 2022-23 and 2023-24 data only, Cost of Living Payments were modelled according to eligibility and added onto the BHC and AHC income. The modelled payments include the means tested Cost of Living Payment assigned to households where the HRP or partner selected a qualifying low income benefit/tax credit, or with an income uplifted to the basic minimum threshold (a payment of £650 in 2022-23 and £900 in 2023-24), a means tested Cost of Living Payment where an additional adult in the household selected a qualifying low income benefit/tax credit (provided that the HRP and partner was not allocated the payment as it was a maximum of one payment per household), the disability Cost of Living Payment assigned to households where the HRP or partner selected a qualifying disability benefit (a payment of £150 in both 2022-23 and 2023-24), the Council Tax Rebate assigned to households in Council Tax bands A to D (a payment of £150 in 2022-23 only, as this rebate did not apply to the 2023-24 data) and a pensioner Cost of Living Payment assigned to households entitled to a Winter Fuel Payment for the winter of 2022-23 and 2023-24 (a payment of £300 in both 2022-23 and 2023-24).

Annex Table 5.4.5: Income components of the BHC 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 gross income data at a basic level for all other additional household members that are 16 or over which is used in the derivation of the income variable HYEARGRx (see the section above on 'Income'). The gross income amount (as used for HYEARGRx) 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 (also known as Council tax reduction)	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 benefit i.e. housing benefit, Local Housing Allowance (LHA) and Universal Credit payments towards rent	The BHC income measure includes income from housing related benefit. See the section on 'Rents and housing related benefit' for the calculation of housing related benefit using EHS data. The derived variable amthbenx is used.
Deduction of council tax payable	<p>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. Single person discount is applied where appropriate which is based upon information collected in the EHS interview survey. A final adjustment is made where the householder states that they are not in receipt of council tax support, where council tax is not included in their rent and that they do not pay/not liable for council tax. In this situation the council tax amount due is set to £0. For a small number of HMO properties, where the council tax band is deemed to be for the whole dwelling, the council tax due for the household is derived by dividing the council tax amount that corresponds to the band by the total number of households that share the accommodation.</p> <p>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.</p>

Annex Table 5.4.6: Income components of the AHC income

Components of the AHC income measure	Method of calculating the income component
Deduction of rent	The AHC income measure deducts the amount of net rent paid by the household (if applicable). See the section on 'Rents and housing related benefit' 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.

5.70 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 to produce an equivalised BHC and AHC income from the measured EHS BHC and AHC income variables, 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.

5.71 The measured BHC and AHC household income constructed as outlined above are divided by the appropriate equivalisation factor. Any household with an equivalisation factor of less than one (e.g. a single person household) will have their BHC/AHC income inflated, reflecting the fact that they are relatively better off than a larger household with the same income. Households with an

equivalisation factor greater than one have their BHC/AHC incomes reduced, reflecting the fact that they are relatively worse off than a smaller household. The BHC and AHC incomes of households containing two adults without children will not change. This calculation creates the equivalised BHC and AHC income variables included in the main derived interview file.

- 5.72 Note, no cases have a measured AHC income greater than the measured BHC income. However, as outlined in Annex Table 5.4.7, different equivalisation factors are applied to the BHC income measure than the AHC income measure. When the equivalisation factors are applied to the measured BHC income and AHC income, this can result in an equivalised AHC income, greater than the equivalised BHC income.
- 5.73 On occasions, the EHS Reports use the BHC/AHC equivalised weekly income measures ranked and grouped into five equal sized categories. Thus the first quintile relates to the households with the lowest 20% of BHC/AHC equivalised weekly incomes and the fifth quintile relates to the households with the highest 20% of BHC/AHC 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 are considered.

Rents and housing related benefit

- 5.74 Information on rents and housing related benefit are presented in detail in EHS reports in analysis of social and private renters. The amount of rent and housing related benefit also feeds into the calculation of Equivalised income (see above).
- 5.75 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.
- 5.76 The total weekly rent payable for the property (variables rentwkx) includes the rent paid by the householder plus any housing related benefit received towards the rent payment i.e. housing benefit, Local Housing Allowance (LHA) and Universal Credit payment intended towards the rent (variable amthbenx)¹². These variables are calculated based on the householder's response to the set of detailed rent and housing related benefit questions

¹² Local Housing Allowance (LHA) is not a separate benefit to housing benefit, rather LHA rates are used in the process of calculating housing benefit/Universal Credit Housing element for tenants renting from private landlords. However, the EHS 2022/23 and EHS 2023/24 interview survey refers to LHA as a housing benefit option, therefore LHA is referenced as a housing related benefit in this Technical Report.

asked in the EHS interview. For households that report a rent holiday, an adjustment is made so 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). From 2019 modelling, for Universal Credit cases that report a rent holiday and provide an amount of Universal Credit housing element that helps towards rent during the interview survey, only the rent is adjusted to incorporate the rent-free weeks, and not the Universal Credit housing element amount. This aligns the modelling to how Universal Credit housing element payments are issued to claimants.

- 5.77 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 paragraph below.

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	Local Authority average general need net rents based on rent data from the Local Authority Data Return (LADR) statistics submitted by Local Authority Registered Providers, supplied by the Regulator of Social Housing (RSH). The data provided by the RSH represents rent levels for the year prior to the EHS data collection period, therefore, the guide rents supplied by the RSH are adjusted using the social sector rent uplift mechanics as outlined in the 'Policy statement on rents for social housing' (i.e. by a factor based on CPI for September of the previous year + 1%). However, for 2023-24, in response to the rising cost of living (and an associated high inflation rate), the government imposed a cap of 7% on social rent increases. Therefore, for 2023-24 rent modelling, the guide rents supplied by the RSH were uplifted by a factor of 7% (as opposed to a factor based on CPI).
Housing association and shared owners	Rent amount missing	Housing Association average general need net rents based on rent data from the Statistical Data Return submitted by Private Registered Providers, (supplied by the RSH). The data provided by the RSH represents rent levels for the year prior to the EHS data collection period, therefore, the guide rents supplied by the RSH are adjusted using the social sector rent uplift mechanics as outlined in the 'Policy statement on rents for social housing' (i.e. by a factor based on CPI for September of the previous year + 1%). However, for 2023-24, in response to the rising cost of living (and an associated high inflation rate), the government imposed a cap of 7% on social rent increases. Therefore, for 2023-24 rent modelling, the guide rents supplied by the RSH were uplifted by a factor of 7% (as opposed to a factor based on CPI).
Private renters	Rent amount missing	EHS data using the year in question and modelled accordingly

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

- If the household states they are in receipt of full housing related benefit, then the weekly housing benefit is set to their theoretical guide net rent amount (as opposed to the assigned total weekly rent payable,

since housing related benefit does 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 benefit or if they do not know if their housing related benefit covers all or some of their rent, then an amount of housing related benefit 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.

- 5.79 There are a selected number of Universal Credit cases where the missing weekly housing related benefit amount received by the household is calculated earlier on in the income modelling process, rather than following the above rules. Where this applies, the housing related benefit value is brought into the rent and housing benefit modelling to calculate the final amounts.
- 5.80 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; and
 - TV licence.
- 5.81 If the amount of rent the householder provided does not include any of those 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`.
- 5.82 From 2018 modelling, if the rent amount provided by the householder does include one or more of the services stated above then the net rent is modelled consistently for all cases by subtracting an estimated service charge from the total weekly rent payable for the property. An estimated amount for the selected services is modelled according to the methods shown in Annex Table 5.4.9 to derive a rent amount excluding the cost of services.

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 benefit then the council tax service 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) and further adjusted by geographical factor that considers regional variance in water and sewerage bills.
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 licence	Based on the cost of a colour TV licence

- 5.83 EHS reports mainly focus 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 rent data were processed in the EHS compared with 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.
- 5.84 The rent and housing related benefit amounts are thoroughly checked for inconsistencies and errors to make sure as far as possible that the data are reasonable and that missing data have been imputed correctly. Implausible values are interrogated and only changed when almost certain that the data are incorrect. Any changes made are flagged indicating the nature and extent of any imputation (variable rentflg).

Modelling of mortgage repayments

5.85 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).

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

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

5.87 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 MHCLG 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 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.

5.88 From 2022-23, updates were made to the imputation of unknown deposits, unknown length of mortgage and mortgagors with an equity release mortgage, details of these are provided below. It should be noted that the imputation changes in 2022-23, were most pronounced for households aged 65 or older as many of these mortgagors were equity release mortgagors that had previously been given a mortgage payment value, that was now set to a nominal value.

5.89 If the deposit is unknown, it is imputed based on a proportion of the original purchase price, set at an average deposit proportion for the last 10 years for either first time mortgagors or former owners calculated from ONS annual house price index (HPI) Table 38, deposit as a percentage of purchase price.

In 2023-24, this was 21.0% for first time mortgagors and 34.4% for former owners. Prior to 2022-23, all imputed deposits were assumed to be 10% of the original purchase price for all mortgagors irrespective of whether they had previously owned a home or not¹³.

- 5.90 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 reaches state pension age, currently 66 or 67 years old. Cases where the HRP is past retirement age and has owned their home for fewer than 5 years are flagged and checked (if there is insufficient data they are later set to a nominal value (and flagged under 'mortflg'). Prior to 2022-23, retirement age was assumed to be around 60 years old, and a minimum mortgage length was given to all households that were past this age and had owned their home for less than 5 years.
- 5.91 The annual interest rate is taken from monthly data provided by UK Finance. An average is calculated for the period covered by the EHS survey.
- 5.92 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. For shared owners that stated they had no outstanding mortgage (onoutmrg1=3) and validated as correct, these were set to a nominal value (from 2016-17). Flexible/all in one/offset mortgages are also derived as above. Payments for equity release mortgages are imputed for households with a HRP aged under 55 are modelled as above. For equity release households with a HRP aged 55 or older these are set to a nominal amount from 2022-23¹⁴. Prior to 2022-23, all equity release mortgagors were imputed irrespective of the HRP age.
- 5.93 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.
- 5.94 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).

¹³ The average 10% deposit was no longer in line with current trends and excluded the difference in average deposit amounts for first time buyers compared with former owners.

¹⁴ Equity release mortgages are available for mortgagors aged 55 or older and the most common types of these mortgages do not require any payments against the loan until the property is sold.

Equity

5.95 The value of a household's equity in their property is calculated for all owner occupied (including shared owner¹⁵) 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).

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

5.96 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 'equity5x'). From 2022-23, the derived variable 'equityr5' was updated and replaced with 'equity5x' with revised value (£) band groupings.

5.97 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 'equity5x') is likely to be an overestimate.

5.98 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.

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

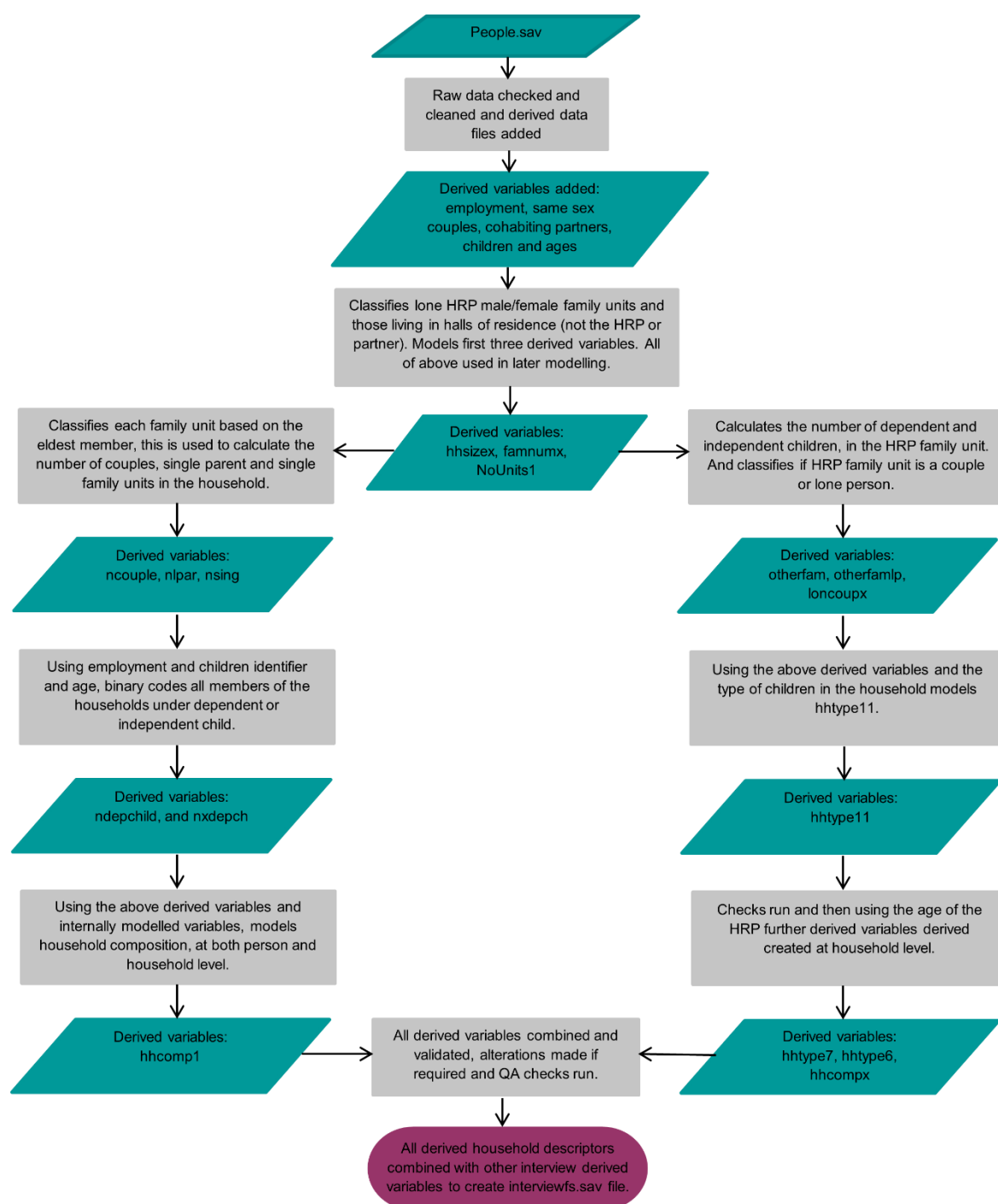
Household composition

5.100 Each year, EHS data are 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.

¹⁵ In 2023-24, shared owners that stated they owned outright their share of the property were given an equity value based on their share of ownership provided all the necessary information was available (prior to 2022-23 these shared owner equity values had been set to unknown).

- 5.101 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).
- 5.102 The flow chart below (Figure 5.4.1) outlines the modelling process of the household descriptors. As part of the modelling, the raw data are 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.
- 5.103 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.
- 5.104 Some of these simpler derived variables and raw data are used to model the more complex final household composition descriptors, hhtype11, hhtype7, 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 variables



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 famnumx, NoUnits1, otherfam and othfam1p 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 famnumx, NoUnits1, otherfam and othfam1p 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 aged 16+ living in halls of residence who are not the HRP or partner (unlike old SEH definition). Also, same sex cohabiting couples are counted as separate family units, despite being treated as a couple living together in other variables (e.g. 'loncoupx', 'hhcomp1'). 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
nlpar	Number of lone parent families in household	For some households that state they are married or cohabiting (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 live in halls of residence who are not the HRP or partner.	-

Derived descriptor	Descriptor variable label	Modelling key issues	Data conflict issues
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 live in halls of residence who are 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 aged 16+ that live in halls of residence who are not the HRP or partner.	It is possible to be a one-person 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 16 or those aged 16 to 18 that are in full time further education (i.e. up to A-level or equivalent). This is based on all children in the household, irrespective of which family unit they are in, but not those living in halls of residence.	All dependent 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 one-person 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, and do not consider other dependent children in the household.
nxdepch	Number of non-dependent children in household	All children aged 16+ that are not in full time education or children that are aged 19 or older. (Children aged 16-18 in full time further education are considered dependent). Excludes those living in halls of residence.	All independent 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, and do not consider other independent children in the household.

Derived descriptor	Descriptor variable label	Modelling key issues	Data conflict issues
otherfam	Additional families present in household	Based on the recoding on famnumx, the number of separate family units. Excludes those aged 16+ that live in halls of residence who are not the HRP or partner.	May conflict with other ncouple due to some same sex couples being recoded under couples.
othfam1p	Type of additional families in household	Based on otherfam and the size of each family unit. Excludes those aged 16+ that live in halls of residence who are 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 othfam1p due to HRP same sex couples.

5.105 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.

5.106 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 hhcompx, 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.

5.107 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	hhcomp (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 lone person single family units in the household as well	Possible to have additional single-family units 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
2. Couple dependent child(ren) only	All in the same family unit, but possible to have lone person single family units in the household as well.	Possible to have additional single-family units 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 lone person single family units in the household as well.	Possible to have additional single-family units if not HRP	2. Couple with dependent child(ren)	2. Couple with dependent child(ren)	3. Couple 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	hhcomp (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
4. Couple with independent child(ren) only	All in the same family unit, but possible to have lone person single family units in the household as well.	Possible to have additional single-family units 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 lone person single family units in the household as well.	Possible to have additional single-family units if not HRP	3. Lone parent with dependent child(ren)	3. lone parent with dependent child(ren)	4. Lone parent with dependent child(ren)
6. Lone parent with dependent and independent children only	All in the same family unit, but possible to have lone person single family units in the household as well.	Possible to have additional single family units 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 lone person single family units in the household as well.	Possible to have additional single family units if not HRP	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	hhcomp1 (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
8. Two or more families	Other additional families, a second family unit in the household needs 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 of 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	An exception to the rule is adult sibling households in one family unit that are singles sharing with other singles.	4. Other multi-person households	4. Other multi-person households	5. Other multi-person households
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

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	hhcomp1 (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
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 sex of individuals.

5.108 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 are not recoded, the household is coded 8 'as two or more families' which is not in accordance with the guidance. Usually this just affects a few households in the data set each year.

5.109 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 couple with or without children (independent or dependent). There can be additional single person family units in the household. Note - couple 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 coded 1 to 3 above.	An exception to the rule is adult sibling households in one family unit that are singles sharing with other singles.

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 parent family units or 2 or more single people in their own family unit. It is not possible to have a single person family unit with a family unit of 2 or more people in this derivation; these will be coded 1 to 3 above.	An exception to the rule is adult sibling households in one family unit that are singles sharing with other singles.
6. One male	One person households - single family unit	-
7. One female	One person households - single family unit	-

5.110 Although, the majority of household 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 hhcomp1, where it's possible to be coded as a household with no dependent children in it, when in fact the household contains dependents in a separate family unit to the HRP.
- hhcomp1 can conflict with hhtype11, hhtype7, hhtype6 and hhcomp1; 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 otherfam, othfam1p famnumx and NoUnits1 due to the modelling of cohabiting same sex couples; although these conflicts are not easy to identify through top level analysis.

Annex 5.5: Derived indicators on housing conditions

- 5.111 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 the surveyors must make can be complex and the modelling must combine several of these into a composite indicator.
- 5.112 The following sections will provide more information regarding three more complex housing condition measures as modelled in the EHS 2023-24 single year:
- the Housing Health and Safety Rating System (HHSRS)
 - Decent Homes
 - disrepair (repair costs)
- 5.113 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.
- 5.114 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

What is the HHSRS?

- 5.115 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 replaced 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

<p>Physiological requirements</p> <ul style="list-style-type: none"> • 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 <p>Psychological requirements</p> <ul style="list-style-type: none"> • crowding and space • entry by intruders • lighting • noise 	<p>Protection against infection</p> <ul style="list-style-type: none"> • domestic hygiene, pests and refuse • food safety • personal hygiene, sanitation and drainage • water supply <p>Protection against accidents</p> <ul style="list-style-type: none"> • 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
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5.116 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.

5.117 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

5.118 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

5.119 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

5.120 A number of guidance documents for HHSRS practitioners and private landlords are available. For guidance published by gov.uk see: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/15810/142631.pdf

How does EHS measure and model Category 1 hazards?

5.121 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.

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

5.123 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. The EHS surveyors fully measure six hazards (falling on level surfaces; falling on stairs; falling between levels; flames and hot surfaces; fire; and damp and mould growth).
- 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. The EHS surveyors assess 16 hazards by this approach (Annex Table 5.5.6).
- The remaining four hazards (excess cold, overcrowding, radon and lead) are 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. Annex Table 5.5.7 summarises the assumptions and data used for the four hazards that are modelled from other data.

- 5.124 Annex Figure 5.5.5 shows a worked example of a 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.

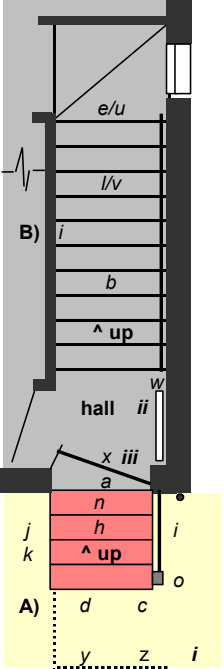
Annex Figure 5.5.5: Worked example of HHSRS assessment

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



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
u Thermal efficiency	2	-	1		2	Defective	-
							Not satisfactory
							Satisfactory/NA

COMPLETION OF SECTION 22 OF EHS FORM

LIKELIHOOD

Falling on stairs etc. Significantly higher than average ☒ Y ☐ N

Likelihood of a person over 60 having a fall leading to harm

		1800	1000	560	320	180	100	56	32	18	6	2
--	--	------	------	-----	-----	-----	-----	----	----	----	---	---

Average Pre 1919

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
	Class 3 Serious %	0.1	0.2	0.5	1	2.2	4.6	10	21.5	31.6	46.4	100
Action required												

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	D	C	B	B	A	A	A	A
31.6%			D	C	C	B	A	A	A	A	A
46.4%	E	C	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.

5.125 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>).

5.126 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 section), continued to use the 'old' (15 hazards) version of HHSRS for continuity over time until 2020¹⁶. 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) ¹⁷ . 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 to 2017, the EHS report used the updated SAP 2012 methodology and the comparable excess cold threshold was recalculated to 33.52. In 2018, the SAP 2012 methodology was updated for the EHS and the comparable excess cold threshold was recalculated to 37.6. This approach ensured that the number and percentage of dwellings failing on excess cold would be the same under both the old and new SAP2012 methodology. Although the changes in SAP methodology and cut-off thresholds create difficulties in reporting on excess cold trends over time, the approach allows the findings to offer some degree of consistency for those who wish to look at HHSRS over time.
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 (not modelled in 2020-21)	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 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

5.127 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

¹⁶ Due to the Covid19 restrictions which prevented internal physical survey inspections, the EHS 2020-21 and 2021-22 used predictive modelling for dwelling level estimates on the prevalence of any of the 26 Category 1 hazards.

¹⁷ SAP is the Governments standard procedure for Energy ratings of dwellings.

are also used to monitor variability in surveyors' HHSRS assessments over time.

5.128 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

5.129 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 2023-24 single year 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

5.130 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).

5.131 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 were included to ensure consistency over time until the EHS 2020-21. At this time COVID-19 restrictions prevented internal physical survey inspections, and the EHS 2020-21 and 2021-22 used predictive modelling for dwelling level estimates on the prevalence of any of the 26 Category 1 hazards¹⁸. The 2022-23 published EHS reports on the Decent Homes Standard continue to use the 26 HHSRS hazards assessed.

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

5.132 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.

¹⁸ The prevalence of any of the 15 or 26 HHSRS Category 1 hazards in the dwelling stock is very similar.

5.133 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; and
- electrics.

5.134 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.

5.135 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.

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

5.137 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 cases where components are the 'same age as dwelling', the probability that they have exceeded their lifetime is calculated based on dwelling age band. This is because in earlier years of decent homes modelling, dwelling age was only recorded in bands rather than as a single year. In recent years, although actual age of construction is recorded as a single year, the same method of calculating these probabilities is adopted for a consistent approach.

- 5.138 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 1981 and 1990 (inclusive) and still had the original windows, some 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. In 2023, houses built in 1981 and 1982 (are over 40 years old and) represent 2 years out of the 10 year age band, so all original windows in houses built in 1981-1990 are given a probability of 0.2 (2/10) of being over 40 years old.
- 5.139 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.
- 5.140 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

5.141 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.

5.142 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.

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

Building components (key components marked)	Definition of ‘in poor condition’ used on the EHS
Wall structure	Replace 10% or more, or repair 30% or more
Wall finish	Replace/repoint/repair 50% or more
Chimneys	One chimney needing partial rebuilding or more
Roof structure	Replace 10% or more, or strengthen 30% or more
Roof covering	Replace or isolated repair 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

5.143 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

5.144 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.

5.145 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.

5.146 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 to determine whether the dwelling should be classed as non-decent.

- 5.147 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:
- 5.148 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.
- 5.149 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.
- 5.150 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.
- 5.151 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

- 5.152 This criterion was modelled using outputs from the EHS energy model. 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.
- 5.153 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.
- 5.154 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).

5.155 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.communities.gov.uk/publications/housing/ehcstechnicalreport2007>

5.156 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.

5.157 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).
- The type of loft insulation is now recorded and used to adjust insulation thickness based on the relative performance of the insulation material compared to mineral wool.
- 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.
- Park homes are now identified through the EHS survey. A park home is a temporary dwelling which is located on a managed site, alongside

other similar homes. Insulation parameters for these dwellings are calculated using specific park home assumptions from Appendix S.

Repair costs

5.158 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; and
- an outline of how the raw data is used to generate the costs.

5.159 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

5.160 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

5.161 This is an index of disrepair that expresses costs in pounds per square metre (£/m²) 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.

- 5.162 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

- 5.163 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

- 5.164 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 database= cstactbx and cststdbx)

Comprehensive repairs

- 5.165 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 database = cstactcx and cststdcx)

What types of work are included and excluded?

- 5.166 The costs described above include all 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; and
- 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.

5.167 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; and
- VAT, professional fees, overheads or profit.

5.168 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

5.169 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, for example, the shape of the dwelling.

- Unit prices for different types of job from the 1996 National Schedule of Rates (NSR), adjusted for inflation using the Office for National Statistics “All construction (new work and repair and maintenance)” national price index. The ONS data is used to convert basic standardised repair costs (£/m²) to 2023 prices so that the level of disrepair over time can be examined.

5.170 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 the internal amenities and services are surveyed individually.

5.171 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.

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

5.173 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; and
- determine the timing of the action (for exterior elements only).

5.174 These assessments will depend on many 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.

5.175 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.

5.176 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; or
- 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.

5.177 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.

5.178 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 (m² or linear metres) from the dimensions taken of the dwelling/building and then this quantity is multiplied by the unit price (per m² 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.

5.179 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

5.180 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.

5.181 Where data are 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

5.182 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.

5.183 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 used to further refine the 'required expenditure' costs.

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

Cost to make decent

5.185 Costs to make decent for 2023-24 are calculated for those items causing the dwelling to fail the Standard and do not take account of work that may arise in the future due to ageing components.

5.186 For the initial modelling, dwellings failing each of the four components of decent homes (modernisation, disrepair, thermal comfort and HHSRS) are costed separately.

HHSRS component

5.187 Costs to mitigate Category 1 HHSRS hazards, known as costs to make safe, provide notional costs to remedy each type of Category 1 hazard.

- I. For the fully measured hazards, this involves two processes;
 - costing the required works identified by the surveyor in the HHSRS section of the physical survey form; a 'typical'

specification of work has been devised by an experienced HHSRS practitioner for the remedial action

- using repair cost work described elsewhere on the form.

- II. For costs to mitigate excess cold at a dwelling the EHS uses the latest EPC methodology to identify both the energy improvement work required and the associated cost.
- III. For the modelled hazards, a typical action has been selected by an experienced HHSRS practitioner (as above for measured hazards). The exceptions are for: falls associated with baths, entry by intruders, noise and collision and entrapment. In 2012 those were assessed as extreme risks, having previously been fully measured by surveyors. For those hazards, the average costs of mitigating the hazard, based on previous years' data, is used to derive the costs.

5.188 The outputs from the three processes above are then combined to provide the notional overall costs for all 26 hazards collected by the EHS and the 15 hazards used in the cost to make decent modelling. Any double counting of work (e.g. heating improvements may be required to mitigate dampness and excess cold) is removed where feasible. Actions are grouped into broad work areas e.g. insulation, heating, kitchens, stairs. Remedial works that do not fit into these classifications, and are independent of any other jobs, are grouped as 'other' e.g. work to mitigate the risk of harm from lead or overcrowding.

Disrepair, modernisation and thermal comfort components

5.189 The costs for dealing with disrepair are based on repair costs derived from the repair cost model. Action to services and heating are costed slightly differently. Although those are based on repair cost model prices, the specifications of work are more specific than in the repair cost model.

5.190 For dwellings failing the modernisation component, the costs include work to remedy all items that currently fail the Standard (even if by fixing only one item makes the dwelling decent, costs here include remedying all items). Costs to modernise the kitchen and bathroom are based on 2001 Major Repairs Allowance (MRA) prices. Only kitchen costs are scaled by dwelling size. The costs to install double glazing are also based on 2001 MRA prices and scaled by total window area for dwelling. Costs for other works are specified and derived using information from price books, actual spending on work from other sources and professional experience.

5.191 Thermal comfort (heating) costs are derived from MRA prices. Thermal comfort (insulation) costs are derived from price books, actual spending on work from other sources and professional experience.

Total costs

- 5.192 The four component costs are then combined. Any double counting between all four components is removed where feasible. For example, bathroom disrepair (failing on age and action needed), bathroom modernisation and HHSRS personal hygiene/sanitation costs). In order to resolve that, actions are grouped into broad work areas e.g. windows, bathroom, kitchen, heating, common access areas. Types of work that do not fit into those classifications, and are independent of any other jobs, are grouped as 'other' (e.g. installing/repairing extractor fans to fix condensation).
- 5.193 Once the costs for all work areas are added together, additional costs are added to account for preliminaries and access equipment to arrive at a total cost to make decent for each dwelling. This cost is then inflated to the current survey year, adjusted for region and whether the dwelling is in the private or social sector.

Annex 5.6: Energy efficiency

5.194 The 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 annex 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

5.195 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

5.196 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, heat pumps, 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 (CO₂) emissions will be closely linked to the type of fuel.

Storage heaters

5.197 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

5.198 This category includes all other types of heater, such as fixed electric heaters. This type of heating is generally considered to be the least cost effective of the main systems and produces more CO₂ emissions per kWh than other heating systems.

Secondary heating systems

5.199 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 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

5.200 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

5.201 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. This category includes dedicated back boilers and communal systems for water heating only.
- 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: these 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.
- Instantaneous showers: these are shower units in which the water is heated electrically on demand.
- Other: category can include solar water heating, or any other systems not captured by the categories above.

Wall types and wall insulation

5.202 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

- 5.203 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.
- 5.204 Dwellings are only classed as having 'cavity walls' 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'.
- 5.205 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. Cavity uninsulated walls are classified as: at least 50% of the total external wall area is cavity brickwork but less than 50% of that wall area is insulated. Cavity walls with insulation are therefore classified as: at least 50% of the total external wall area is cavity brickwork and at least 50% of that wall area is insulated.

Post-1995 dwellings

- 5.206 In addition to cases that have been identified in the EHS physical survey as having evidence of cavity wall insulation and those without evidence of cavity wall insulation, a third category is established: post-1995 dwellings with predominantly cavity walls, without evidence of full cavity wall insulation. It is likely that these dwellings had cavity wall insulation installed at the time of construction (known as 'as-built' insulation), however the non-intrusive survey undertaken in the EHS would not always be able to identify this. In order to provide a more realistic estimate of the number of insulated cavity walls, all post-1995 cavity wall dwellings are assumed to be fully insulated, even if this was not apparent in the physical survey.
- 5.207 The 1990 and 1994 Building Regulations both specify an external wall U-value, however compliance could be achieved through other mechanisms as an alternative to cavity fill. Therefore, an increasing proportion of new dwellings were built with cavity wall insulation in the early 1990s, and it is thought to have become the predominant practice after 1995. The age band in which as-built insulation is assumed to have been installed was revised for the EHS data from 2015, in order to bring the methodology in line with the SAP and RdSAP modelling methodologies. Details of the previous methodology can be found in the 2014 Technical Report <https://www.gov.uk/government/publications/english-housing-survey-2014-to-2015-technical-report>.

Solid walls

5.208 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. For a solid wall to be classified as insulated, more than 50% of the total external wall area is solid and at least 50% of that wall area is insulated, otherwise solid walls with less than 50% of the wall area insulated would be classed as uninsulated.

Other

5.209 This section is mostly made up of dwellings with less common construction types, such as timber, as well as cases where there is no clear majority type e.g. 50% masonry cavity and 50% 9" solid.

Park homes

5.210 From 2019 onwards, the EHS form allows for park homes to be identified as a distinct dwelling type (previously these were classed as detached dwellings). Where a park home is identified, the wall type for these dwellings is classified in the same way as for other dwelling types, using form data as recorded by the surveyor but specific park home U-values are used to calculate the thermal performance of the walls, as specified in appendix S of SAP 2012.

Loft insulation

5.211 Adequate loft insulation can make significant savings to both heating costs and CO₂ emissions, making this generally a cost-effective method of insulation. It involves fitting insulating foam or fibre between the joists or rafters in a loft, which reduces heat from within the thermal envelope below escaping through the roof. 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. From 2015 onwards, the performance of loft insulation has been adjusted to reflect the performance of the material compared with mineral wool. Rigid foam board is assumed to perform twice as well as mineral wool and Vermiculite beads are modelled to perform two-thirds as well as mineral wool.

5.212 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. 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 these factors were the main determinants of the amount of loft insulation present. In the case of park homes, insulation thickness is imputed by following RdSAP conventions. RdSAP consists of a number of conventions, default assumptions, and inference procedures which can be followed in the event of having fewer data inputs than is required to perform a full SAP calculation. These are listed in Appendix S of SAP 2012. The latest version (v9.94) can be found here: [Standard Assessment Procedure \(SAP\) 2012 - BRE Group](#).

Solid floor insulation

5.213 Energy calculations require the internal dimensions of the surveyed rooms (living room, kitchen, bedroom and bathroom) to calculate the extent of solid floors on the basement/ground level to inform the calculation of ground floor heat losses.

Low energy lighting and conservatories

5.214 Analysis in the 2011 EHS Report on the housing stock (<https://www.gov.uk/government/statistics/english-housing-survey-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, while data relating to the size, glazing type and heating of conservatories were also taken from the raw physical survey data. These data have not been re-analysed in subsequent EHS reports, but these areas may be re-visited in future.

Renewable energy measures

5.215 Since 2009, EHS surveyors have recorded the presence of solar photovoltaic panels and domestic wind turbines for electricity generation, while 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.

5.216 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 based on dwelling orientation and over-shading. Prior to 2014, 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.

5.217 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. From the 2017-18 survey onwards, information on the type of biomass fuel has also been collected for communal heating systems, where previously, the heating fuel was assumed to be gas. This allows heating systems with renewable heating fuels to be modelled more effectively.

Standard Assessment Procedure (SAP) of buildings energy performance

SAP ratings

- 5.218 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 rating of one.
- 5.219 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.
- 5.220 The 2012 changes in the SAP methodology are far less reaching than those which occurred following the move from SAP2005 to SAP2009 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).
- 5.221 In 2017, an update to Appendix S of SAP was released (RdSAP 2012 v9.93) which included revised U-values for solid and cavity brick walls and stone walls. The changes specified in this update were incorporated into the EHS modelling from 2019, with the full effect of the changes realised in the 2019-20 combined year survey. The RdSAP v9.93 updates have been applied in the modelling of Fuel Poverty by DESNZ since 2018. It is therefore worth noting that outputs produced for the 17-18 and 18-19 EHS surveys will not be directly comparable to the equivalent Fuel Poverty outputs, due to the staggered adoption of the methodological update.

5.222 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; and
- renewable energy technologies.

5.223 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.

5.224 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. The 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.

5.225 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
• or more	A

Carbon dioxide emissions

5.226 The carbon dioxide (CO₂) emissions are calculated using the same SAP document and method as for the SAP rating except that it uses CO₂

emissions factors for each fuel in place of unit prices to derive the CO₂ emissions rate per m² of floor area. The same logarithmic scale as used for SAP converts the CO₂ emissions rate into the Environmental Impact Rating (EIR), which also runs on a 1–100 scale where 1 represents very high emissions per m² 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

5.227 The SAP methodology that is used to calculate both energy efficiency and CO₂ 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.

Changes to energy modelling methodology

5.228 Several form changes and new questions were added to the 2023/24 physical survey questionnaire to improve the quality of the data, some of which were relevant to the derivation of energy efficiency ratings.

Solar hot water panel area

5.229 The physical survey already collected the presence of solar hot water panels on each face of a dwelling, and from 2023/24, also collects the size of the panels on each face of the dwelling in m². Prior to this, the SAP calculation used the presence of panels on each face summed to give the total number of faces with SHW present, assuming just one panel was present on a face. RdSAP 2012 parameters from Table S18 were applied. From 2023/24, actual recorded areas for each face of the dwelling are used within the SAP 2012 calculation. This resulted in a -0.0001 average SAP point difference across the whole stock.

Rooflight area

5.230 A new question was added to the 2023/24 physical survey questionnaire on the presence and area (m²) of rooflights on each face of the dwelling. Prior to this, no information on rooflights was collected, and assumptions were made within the SAP calculation for any dwelling with a room in the roof, but without a dormer window or roof extension. A 1m² window was assumed present and modelled to be in the East orientation. For the 2023/24 survey year onwards,

the SAP 2012 calculation uses the new recorded rooflight areas to replace this assumption. This has resulted in a -0.0065 average SAP point difference across the whole stock.

Loft conversion date range

5.231 A new date range, 2020 – present, was added to Section 15, Improvements and Alterations of the physical survey questionnaire in the 2023/24 survey year. Loft conversion date is taken into consideration during the SAP calculation. Whilst RdSAP assumptions only supply U value data up to band L (2012-), cases with this new loft conversion date would not have been assigned a U value. The new date range has been incorporated into the SAP2012 model and those cases which fall into this new age band have been set to pick up the previous age band U values.

Presence of a draught lobby

5.232 A new variable for the presence of a draught lobby was added to the 2023/24 physical survey questionnaire, following SAP 2012 specifications. Previously, the SAP 2012 calculation had used imputations based on the presence of porches, for all dwellings, as well as the presence of any wall exposed to internal accessways, for flats, to assign a draught lobby (following Section 2.4 of the SAP 2012 methodology).

5.233 From the 2023/24 survey year onwards, the new yes/no variable has been used to indicate the presence of a draught lobby within the SAP2012 calculation, replacing the porch imputation. The imputation for flats has been retained, to ensure that an accurate U value was assigned for the door that would have been sheltered by the internal accessway. This has resulted in a 0.005 average SAP point difference across the whole stock.

Triple glazing window and material

5.234 A new triple glazing window type, with the opportunity to record material was added to the 2023/24 EHS physical survey questionnaire, with triple glazing U values added to the SAP 2012 calculation. Single glazed wood casement and UPVC windows were combined into one column, based on U values.

Sheltered sides

5.235 The number of sides of a dwelling that are 'sheltered' is used in the calculation of ventilation rate within the SAP 2012 calculation. As part of the 2023/24 EHS physical survey questionnaire, surveyors can record the number of sheltered sides of a dwelling. Previously, data collected on whether part of face is unattached was used within the SAP 2012 calculation, and the number of sheltered sides was assumed to be the sum of any of the 4 faces that were fully attached. For the 2023/24 dataset onwards, the SAP 2012 calculation uses the recorded number of sheltered sides. This has resulted in a 0.2 average SAP point difference across the whole stock.

Energy performance certificates (EPC)

Energy performance certificate (EPC) improvement measures

- 5.236 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 and electricity generation technologies that would improve its energy performance. The EHS is able to provide a whole stock assessment of homes that could benefit from these measures.
- 5.237 SAP was updated to SAP 2012, version 9.92, in October 2013. In June 2014, Appendix S and Appendix T of the SAP booklet were updated to RdSAP as part of SAP 2012. The revisions significantly altered the way that RdSAP software implements improvements as part of the EPC production process. The methodology for assessing the EPC improvement measures using the EHS data was therefore substantially revised in light of these revisions, with the new methodology applied to the 2015 EHS data onwards. The change in methodology means that results for pre-2015 data should not be directly compared. Revisions to the RdSAP methodology as part of the version 9.93 update have not affected the improvement modelling process for the EHS data, other than to inform the U-values that are applied to dwellings where cavity or solid wall insulation is applicable.
- 5.238 Details of the upgrade measures recommended on an EPC are provided in Appendix T of the RdSAP 2012 9.94 specification, available at: [Standard Assessment Procedure \(SAP\) 2012 - BRE Group](#). Compared to the previous methodology (last applied to the 2014 EHS data), measures are no longer categorised as low cost, higher cost and further measures and the order for considering recommendations has been updated. The most relevant being that Measure Q (solid wall insulation) is now third priority, and measures R, S and T (upgrading boilers with/without fuel switching) have moved up in priority. Seven additional improvement measures have been added to the specification and the criteria and/or improvement specification has changed for some existing measures.
- 5.239 From 2019 onwards, the EHS form allows for park homes to be identified as a distinct dwelling type and improvement measures were updated to ensure these dwellings were improved following SAP assumptions. When applying insulation improvements to park homes the following calculation is used to determine the improved U-value, as outlined in Appendix S of the SAP 2012 specification, where R_{ins} is the thermal resistance and is provided in Appendix T for all relevant measures

$$U_{insulated} = \frac{1}{\frac{1}{U_{existing}} + R_{ins}}$$

Annex Table 5.6.2: List of improvements specified in SAP 2012 appendix T that are included in the updated methodology

Item	Measure	Calculated in previous methodology	Any change to measure since previous version?
A	Loft insulation	Yes	Improve to 270mm (previously 250mm) For a park home use $R_{ins} = 1.5\text{m}^2\text{K/W}$
A2	Flat roof insulation	No	For a park home use $R_{ins} = 1.5\text{m}^2\text{K/W}$
A3	Roof room insulation	No	
B	Cavity wall insulation	Yes	
Q	Solid wall insulation	No	For a park home use $R_{ins} = 2.0\text{m}^2\text{K/W}$
W1	Floor insulation (suspended floor)	No	For a park home use $R_{ins} = 1.5\text{m}^2\text{K/W}$
W2	Floor insulation (solid floor)	No	
C	HW cylinder insulation	Yes	
D	Draught proofing	No	
E	Low energy lighting	No	
F	Cylinder thermostat	Yes	
G	Heating controls for wet Central Heating system	Yes	TRVs without room thermostat can be also without programmer
H	Heating controls for warm air system	Yes	
J	Biomass boiler	Yes	
K	Biomass room heater with boiler	Yes	Water cylinder upgraded in addition to heating system
I	Upgrade boiler, same fuel	Yes	
R	Install condensing oil boiler	No	
S	Condensing gas boiler no fuel switch	No	

T	Condensing gas boiler fuel switch	No	
L2	Replacement/New storage heaters	Yes	Change from fan assisted with automatic charge control to high heat retention type. Electric secondary heating no longer included
M	Replacement warm air unit	Yes	Split by fuel type, applies to non-condensing, mains gas units, and LPG units installed before 1998
N	Solar water heating	No	
O	Double glazing	No	
O3	Glazing replacement	No	
X	Insulated doors	No	
U	Photovoltaics	No	
V2	Wind turbine	No	

5.240 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 or that the home is deficient in terms of any particular standard.

5.241 The calculation of Improvements N (solar hot water) and U (photovoltaics) deviate slightly from Appendix T in that additional data collected in the EHS on dwelling roof pitch and orientation are used.

5.242 The EHS does not include EPC measure T2 (flue gas heat recovery) or Y (waste water heat recovery) because the survey is unable to assess how effective they would be in improving the performance of individual dwellings. Measure B4 (party wall insulation) is also excluded, as the EHS does not provide enough information to assess whether the dwelling has satisfied the installation condition.

5.243 The SAP 2012 Appendix T also includes some 'Alternative measures' which are measures shown on an EPC if relevant but are never selected for inclusion unless an assessor specifically includes it. These alternative measures (Q2, J2, Z1, Z2 and Z3) are not included in this update to the EHS EPC modelling. Measure P is considered in the same way as the "alternative" measures because it is only considered if the assessor de-selects measure O.

Notional costs of installing the recommended EPC measures

5.244 The EHS estimates the notional costs of installing the recommended measures. The methodology for estimating these costs has also been revised from 2015 onwards and are now calculated using indicative costs that have been produced and included within the Product Characteristics Database (PCDB). Indicative costs for EPC measures are provided in Table 181 of the PCDB (available at <http://www.boilers.org.uk/download.php>). For the majority of measures, a low and high range of costs is provided and the mean of these is used. The costs are also calculated using the low and high prices to give an indication of the impact that the range has on the overall cost of improving the stock. Measure E (low energy lighting), L2 (storage radiators) and X (insulated doors) have an associated cost per item dependant on a variable e.g. number of rooms for L2. The costs for these measures are therefore specific to each dwelling. The cost of measure U was revised down in May 2019 to better reflect the reduction in cost associated with installing photovoltaics.

Annex Table 5.6.3: Indicative costs of the EPC measures

Item	Measure	PCDB Indicative cost (£) (mean, (low, high))	
A	Loft insulation	£225	(£100, £350)
A2	Flat roof insulation	£1,175	(£850, £1,500)
A3	Roof room insulation	£2,100	(£1,500, £2,700)
B	Cavity wall insulation	£1,000	(£500, £1,500)
Q	Solid wall insulation	£9,000	(£4,000, £14,000)
W1	Floor insulation (suspended floor)	£1,000	(£800, £1200)
W2	Floor insulation (solid floor)	£5,000	(£4,000, £6,000)
C	HW cylinder insulation	£23	(£15, £30)
D	Draught proofing	£100	(£80, £120)
E	Low energy lighting	£5 per unit	(£5, £5) per unit
F	Cylinder thermostat	£300	(£200, £400)
G	Heating controls for wet Central Heating system	£400	(£350, £450)
H	Heating controls for warm air system	£400	(£350, £450)
J	Biomass boiler	£10,000	(£7,000, £13,000)
K	Biomass room heater with boiler	£10,000	(£7,000, £13,000)
I	Upgrade boiler, same fuel	£2,600	(£2,200, £3,000)

R	Install condensing oil boiler	£5,000	(£3,000, £7,000)
S	Condensing gas boiler no fuel switch	£5,000	(£3,000, £7,000)
T	Condensing gas boiler fuel switch	£5,000	(£3,000, £7,000)
L2	Replacement/New storage heaters	£500 per unit	(£400, £600) per unit
M	Replacement warm air unit	£1,875	(£1,250, £2,500)
N	Solar water heating	£5,000	(£4,000, £6,000)
O	Double glazing	£4,900	(£3,300, £6,500)
O3	Glazing replacement	£1,200	(£1,000, £1,400)
X	Insulated doors	£500 per unit	(£500, £500) per unit
U	Photovoltaics	£4,500	(£3,500, £5,500)
V2	Wind turbine	£20,000	(£15,000, £25,000)

Pre- and Post-improvement performance and costs

5.245 The EHS also estimates the total carbon dioxide emissions, primary energy use and fuel costs by end-use before and after any recommended improvements have been installed. The EPC methodology has been updated so that for running costs and savings, total emissions and primary energy, the calculations are done using regional weather and fuel prices taken from the SAP fuel price library for the July of the survey year (see file 'RdSAP fuel prices', available to download at <https://www.bre.co.uk/sap2012/page.jsp?id=2759>)

5.246 The SAP rating and Environmental Impact rating are still calculated using UK average climate data and the fuel prices or emissions factors published in Table 12 of the SAP 2012 document. The Environmental Impact (EI) rating is a representation of carbon dioxide emissions attributable to a dwelling. Similar to the SAP rating, the EI rating scale goes from 1 – 100, where 100 represents net-zero emissions. It can rise above 100 if the dwelling is a net exporter of energy.

5.247 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.

Cost of improving to EER band C

5.248 Since 2019, analysis has been undertaken to determine the cost to improve dwellings with an EER band of D or lower to an EER band of C. For each of the dwellings identified as having an EER band of D or lower, improvement

measures are simulated cumulatively following Appendix T of the SAP 2012 specification. After each improvement, the SAP rating is recalculated until the dwelling reaches the threshold for EER band C (a SAP rating of 68.5 or higher).

- 5.249 A dwelling's EER may also be improved beyond the target band in certain cases. This may occur where a dwelling's energy efficiency rating is already close to the band C threshold, and a measure with a high SAP improvement yield is installed (e.g. solid wall insulation), pushing the dwelling beyond band C and across the band B threshold.
- 5.250 A proportion of dwellings are not able to be improved to a EER band of C after applying the eligible improvement measures outlined in Appendix T. This occurs in two instances; where the dwelling qualifies for certain improvement measures but is not able to be improved enough to reach the band C threshold, and where the dwelling either does not qualify for any of the improvement measures outlined in Appendix T, or each measure applied does not make a greater than 0.95 SAP point improvement to the dwelling. In this case, the dwelling does not receive the measure or have the associated notional costs applied. That is not to say that it is impossible for these dwellings to reach a band C, just that measures included in the EPC modelling process are insufficient to reach the target EER band.

Barriers to improving insulation

- 5.251 EHS energy reports have often 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.

Loft insulation

- 5.252 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 is

needed to be added between the rafters, very extensive work and considerable expense would be involved. For the EHS 2020 Energy Report onwards, the methodology was updated to use the EPC improvement modelling variable for Measure A3, so that rooms in the roof which were assessed as having sufficient insulation were no longer designated as hard to treat.

- 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. For the EHS 2020 Energy Report onwards, the methodology was updated to use the EPC improvement modelling variable for Measure A2, so that flat or shallow pitched roofs which were assessed as having sufficient insulation were no longer designated as hard to treat.

Cavity wall insulation

- 5.253 For the 2012 and 2016 EHS Energy Efficiency of English Housing Reports, the main classification and analysis for the ‘fillability’ of cavity walls 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/sites/default/files/docs/2014/05/eco_supplementary_guidance_on_hard-to-treat_cavity_wall_insulation_0.pdf
- 5.254 For the 2020 EHS Energy Report onwards, the same characteristics were continued to be used in the classification of hard to treat cavity walls, with a minor methodological update to use the wall thickness variable in the assessment of narrow cavities.
- 5.255 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.
- 5.256 *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.
- 5.257 *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.
- From 2015, the definition was widened to include cavity walls that were not suitable to insulate due to severe dwelling exposure to wind-driven rain, or where there was disrepair to the existing wall finish.

Solid wall insulation

5.258 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 is stone or timber.
- Flats: if the dwelling is a flat, then this treatment can be problematic. Firstly, there can 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

- 5.259 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.
- 5.260 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 those 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.
- 5.261 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.
- 5.262 The raw EHS 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

- 5.263 From 2013/14, the ‘wall structure’ section of the EHS 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 information is used within the Dimensions model in the calculation of the floor area, replacing the previous default wall thickness assumption of 0.2m.
- 5.264 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 look 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 2023, 88 cases were flagged and investigated with 2 cases subsequently being edited.

- 5.265 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

- 5.266 A series of checks, written in SPSS syntax, are performed 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.

- 5.267 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)
- an additional part of the dwelling that starts on a higher storey than the main part of the dwelling

- 5.268 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 2023, 117 cases were flagged as having possible

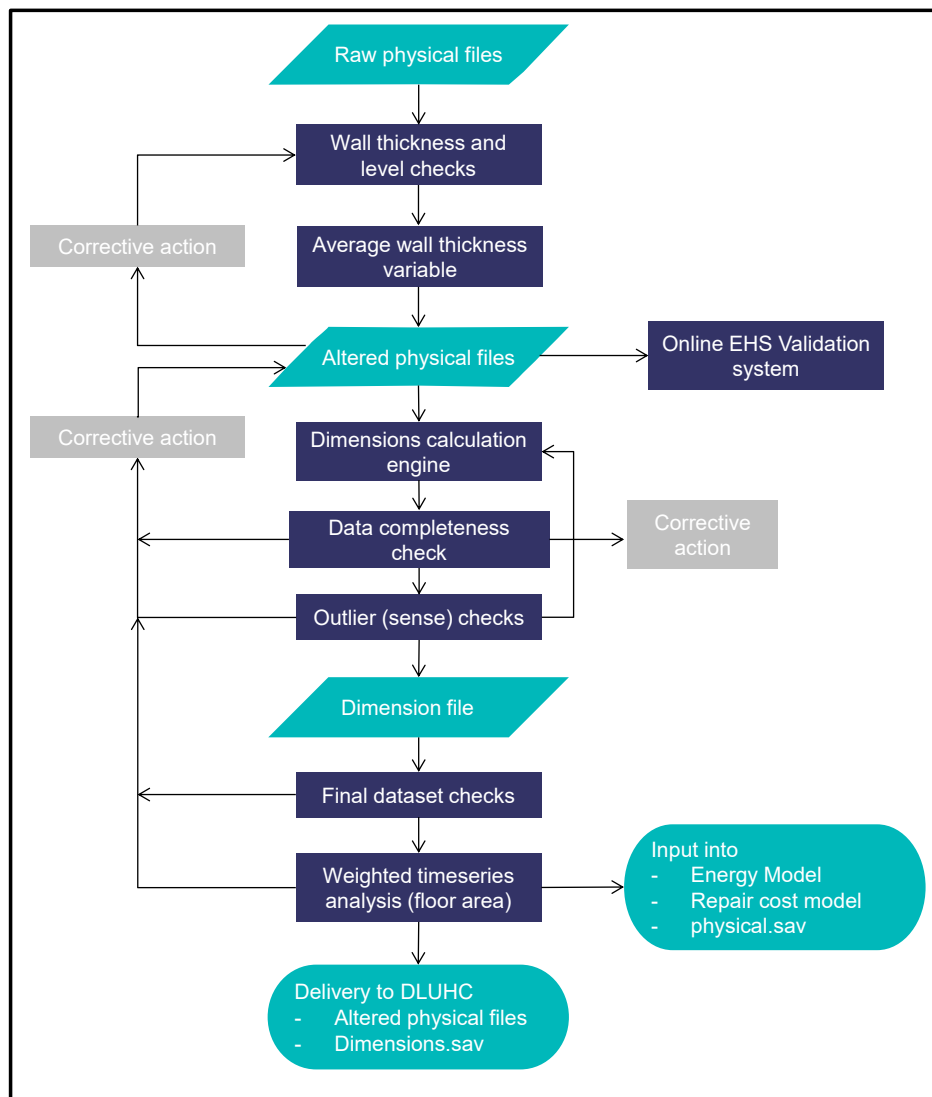
inconsistencies. Of these, 38 were found to have an error and were therefore corrected.

- 5.269 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

- 5.270 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.
- 5.271 The model begins by taking the surveyor measurements for the floors measured by the surveyor and then extrapolates from those 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.
- 5.272 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. 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.
- 5.273 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.
- 5.274 Data on the internal elements of the form was collected, including the measurements of internal rooms (kitchen, living room, main bedroom, and bathroom) which are used to calculate the area of partition walls and the total usable floor area of the dwelling.
- 5.275 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.

Figure 5.7.1: Dimension model process



5.276 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.

5.277 The preliminary results are stored in SPSS database format.

Data completeness checks

5.278 In previous years, some cases were not processed by the Dimensions model due to missing data for the flat floor level. In those 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 from 2016 onwards.

Outlier (sense) checks

5.279 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

5.280 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 genuine, 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 2023 around 570 cases were identified as outliers for floor, wall or window areas, and of these 99 cases were found to have an error of some kind.

5.281 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.

5.282 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

5.283 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

- 5.284 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.
- 5.285 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.
- 5.286 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.
- 5.287 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.
- 5.288 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.
- 5.289 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 MHCLG 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 more about the derivation of the individual variables.

Chapter 6

Weighting

- 6.1 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

- 6.2 The following weights have been calculated for the 2023-24 EHS data:
- Household weights for the full sample interview survey 2023-24 – aagfh23
 - Average dwelling weights for cases in 2022-23 and 2023-24 that had both the interview and physical survey conducted (paired cases)¹⁹ – aagpd2223
 - Average household weights for cases in 2022-23 and 2023-24 that had both the interview and physical survey conducted (paired cases) – aagph2223
- 6.3 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.
- 6.4 The weighting of the 2023-24 EHS data was undertaken by NatCen who managed the survey on behalf of the Ministry of Housing, Communities & Local Government (MHCLG).

Application of weights during analysis

- 6.5 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 `generalfs23.sav` and is called `agfh23`. This should be used for any analysis

¹⁹ 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.

for which the aim is to provide estimates of households, based on the data of the interview survey.

- 6.6 The weights covering the dwelling sample of cases can be found in the file general 22+23.sav. aagpd2223 should be used for any analysis where the aim is to provide estimates of dwellings and includes physical survey data (e.g. percentage of non-decent dwellings), while aagph2223 should be used for any analysis where aim is to provide estimates of households and 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.
- 6.7 The recommended application of weights is summarised in Table 6.1.

Table 6.1: Application of weights during analysis

Weight	Description	Base
aagfh23	Household weights for the full sample interview survey 2023-24	15,846
aagpd2223	Average dwelling weights for cases in 2022-23 and 2023-24 that had both an interview and physical survey (paired cases)	13,288
aagph2223	Average household weights for cases in 2022-23 and 2023-24 that had both the interview and physical survey conducted (paired cases)	12,918

Summary of weighting methodology

- 6.8 The weighting methodology²⁰ used a sequence of stages²¹ 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.
- 6.9 In 2023-24, the EHS was conducted face-to-face in respondents' homes with a telephone option for those unwilling to take part face-to-face. The fieldwork period ran between March 2023 and March 2024.
- 6.10 The following stages were applied to both the full household sample and the dwelling sample:

²⁰ 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.

²¹ 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.

- 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: Address-to-dwelling ratio
- Stage N6: Dwelling-to-household ratio

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

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

6.12 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

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

6.14 The weighting stages are described in more detail below.

Weighting the full household sample

6.15 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 wave). That correction factor was equal to the number predicted to be in owner occupied, private rented, or social rented tenure, in the PAF, divided by the number selected in that predicted tenure.

- 6.16 Up to 2019-20 (when fieldwork was only carried out face-to-face), a very small number of the addresses sampled were not issued to interviewers for operational reasons and these 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. In 2023-24, many of the sampled addresses were not issued to interviewers because of challenges with fieldwork allocation. These addresses were filtered out at stage N2a by applying a CHAID model with the same predictors utilized for the Stage N2 Office Refusal model described below.
- 6.17 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 CHAID²² algorithm of the SPSS Decision Trees module. 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. Once the classes were generated, the adjustment within each class was made based on the weighted estimates (using the combined weights up to that stage).
- 6.18 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 household²³. 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 that 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 a given dwelling that contains more than one household, weights were applied.
- 6.19 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

²² Chi-squared Automatic Interaction Detector

²³ 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”.

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-dwelling²⁴ and dwelling-to-household ratios are averaged (smoothed) within weighting (smoothing) classes defined by type of property (3 groups: house, low-rise flat, high-rise flat), tenure (4 groups) and region (9 groups) to remove large peaks and troughs within the classes.

- 6.20 The smoothing of the dwelling-to-household ratio is carried out over two years of the EHS (2022-23 and 2023-24) to improve the stability of year-on-year estimates including household totals. This is because the household totals are dependent on estimates of the “dwelling-to-household” ratio which is subject to sampling variation²⁵.
- 6.21 The previous stages account for the sampling and response probabilities. Applying the weights derived from the previous stages 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.
- 6.22 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.
- 6.23 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.

²⁴ 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).

²⁵ Unlike the dwelling totals which are controlled to “external” MHCLG estimates of dwellings by tenure and region during the calibration stage N7. More details about the effect of the smoothing methodology in producing less variable dwelling-to-household ratios can be found in the 2015-16 Headline Report: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/595785/2015-16_EHS_Headline_Report.pdf

- 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 MHCLG dwelling counts, which include both occupied and vacant dwellings, using 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 of 1 October 2023.

- 6.24 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

- 6.25 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 that were eligible for PS (the paired sample) included addresses that the interviewers determined to be vacant and where a physical survey was also achieved. The inclusion of vacant addresses was necessary for the production of the final paired dwelling weights.
- 6.26 The weighting process started by using stages N1 to N5 as described above.
- 6.27 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 wave). Stage N8 calculated selection weights to take account of the under-sampling of owner-occupied properties.
- 6.28 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 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.
- 6.29 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.

- 6.30 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);
 - MHCLG 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 MHCLG dwelling counts using estimates of vacancy rates from the current and four previous years of the EHS).
- 6.31 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.
- 6.32 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

- 6.33 Because of the smaller annual sample sizes involved, analysis of the dwelling sample is normally carried out using two years' weighted data. This section sets out how the combined weights were calculated.
- 6.34 The individual year (2022-23 and 2023-24) 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 two, so that each dataset has equal influence on the weighting process.

- 6.35 The two-year dwelling weights were calibrated by repeating stages N10 and N11 of the annual weighting²⁶. This process generated the final two-year paired sample dwelling weights.
- 6.36 Similarly to stage N12 of the annual weighting, the final two-year paired dwelling weights were adjusted using the dwelling-to-household ratio to generate the final two-year paired sample household weights.

²⁶ The reference date for the 2-year weights was 1st April 2023, therefore the estimated MHCLG dwelling counts used as control totals were adjusted accordingly.

Chapter 7

Standard errors

- 7.1 All survey estimates are subject to sampling error because they are derived from a sample of a population rather than from the whole population. This chapter describes how the sampling errors of the key 2023-24 EHS variables were calculated. The sampling errors of the key 2023-24 EHS variables are available as a separate document on Gov.uk.²⁷

Overview

- 7.2 The sampling errors associated with survey estimates are expressed in terms of standard errors that measure the uncertainty around survey estimates. Standard errors for the 2023-24 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 2023-24 EHS has been taken account of in the calculation of the standard errors.

Sources of error in surveys

- 7.3 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

- 7.4 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.

²⁷ The sampling errors of the key 2023-24 EHS variables are made available in the annex tables of this chapter on <https://www.gov.uk/government/collections/english-housing-survey-technical-advice>.

Random error

- 7.5 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.
- 7.6 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

- 7.7 Key features of the design of a survey such as weighting, clustering and stratification can have an impact on the 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.
- 7.8 The sample design features of the EHS that have 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.
- 7.9 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 of 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.
- 7.10 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

- 7.11 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.
- 7.12 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:

$$se(p)_{srs} = \sqrt{\frac{p \times (100 - p)}{n}}^{28}$$

- 7.13 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.

²⁸ The precise formula uses *n*-1 as the denominator but this equates to *n* in large samples.

Confidence intervals

- 7.14 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.
- 7.15 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.
- 7.16 The 95% confidence interval for the difference between two percentages is given by:

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

- 7.17 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 2023-24 EHS estimates

- 7.18 The sampling errors of the key 2023-24 EHS variables are released on Gov.uk. Weighted data were used to calculate the standard errors so the values of the percentages and means were the same as those in the published EHS 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.

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