Department for Communities & Local Government

ENGLISH HOUSING SURVEY

English Housing Survey

Technical Advice Note

Surveyor variability: a summary of the 2009-10 Surveyor Variability Study

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Introduction

1. This is one of a series of Technical Advice Notes about the methodology of the English Housing Survey (EHS), to assist users in their analysis and interpretation of the survey findings.

2. This note on surveyor variability focuses on a particular form of measurement error, relating to the assessments made by surveyors who work on the EHS. This is just one possible source of error that the results of the EHS are subject to. The other potential sources are discussed in detail, in the EHS Technical Advice Note on Data Quality, available here: https://www.gov.uk/government/publications/english-housing-survey-technical-advice

3. Experience has shown that surveyor variability cannot be completely eliminated or even reduced to an insignificant level, but precautions are taken during the EHS to control its impact. These precautions include:

4. Using a large number of surveyors, and setting limits on the proportion of surveys any one surveyor can complete overall, and proportion of surveys undertaken within any one geographical area.

5. Ensuring that surveyors are provided with a rigorous and uniform briefing, designed to minimise subjectivity, which is backed up by survey manuals, supervision in the field, refresher briefings, and the use of calibration workbooks[1].

6. Despite taking these precautions, it is natural that a degree of personal judgement and subjectivity will still affect surveyors' assessments. For example, some surveyors will be more likely, after weighing the evidence, to conclude that a particular dwelling is fit (e.g. meets the decent homes standard), whereas others will be more likely to conclude that the same dwelling is unfit. This between-surveyor variability is an additional source of variance in estimates from the EHS physical survey data, and can be measured by carrying out statistical analysis of data collected by surveyors.

7. A surveyor variability study (SVS) was conducted in 2009-10 to look at the effects of surveyor variability on the precision of estimates from the EHS physical survey. This study was a repeat of a similar exercise carried out on the English House Condition Survey (EHCS) in 2003-04. Further details on the 2003-04 study can be found in the 2007 EHCS Technical Report: http://webarchive.nationalarchives.gov.uk/20120919132719/www.communities.gov.uk/publications/housing/ehcstechnicalreport2007

[1] Information on this can be found in the EHS Technical Advice Note on Data Quality, available here: https://www.gov.uk/government/publications/english-housing-survey-technical-advice

8. The 2009-10 study involved a call-back exercise in which 300 properties were re-surveyed by a second surveyor and the results were compared. The objectives of this study were to:

- compare variability between surveyors
- highlight key survey measures on the EHS which were subject to high variability (low levels of agreement), or low variability (high levels of agreement)
- produce evidence to improve training of surveyors and to improve form design
- assess impact of surveyor variability on complex standard errors (and confidence intervals)
- compare the levels of variability between the EHCS and EHS

Key findings

9. The 2009-10 SVS found that, overall, there was a high level of agreement between surveyors' assessments of properties:

- 28 of the 75 survey measures included in the study had a low correlated surveyor variance, and high level of agreement when taking into account agreement by chance.
- 19 measures were found to have an acceptable level of agreement when taking both chance agreement and correlated surveyor variance into account.
- However, 28 survey measures were identified as having potentially low levels of agreement. These survey measures tended to be found in the topic areas covering external environments and stock condition and typically required a surveyor's opinion on topics with generally high degrees of variability; e.g. an opinion of the local area or the condition of a property.

10. Revised standard errors and confidence intervals were calculated taking into account any potential bias due to surveyor variability. These were calculated for 251 response options of the 75 survey measures included in this study. The majority of response options experienced insignificant changes to their standard error and confidence intervals. The largest changes to standard errors (and consequently decreasing precision surrounding the estimates) were found in the external environment measures.

11. The 2009-10 SVS found that the overall level of variability on the EHS is in line with the EHCS. We can therefore broadly conclude that variability has remained consistent across the two different survey designs.

Methodology

12. A ‘call back’ design was adopted for the sampling of cases in the 2009-10 SVS. This was the same design utilised in the 2003-04 SVS. This design essentially involved a subset of originally sampled properties (parent survey) being revisited by a second surveyor (child survey). The use of a call back design enabled the re-sampling of 300 properties by a different surveyor, allowing analysis of variability to be conducted.

13. The 2009-10 SVS focused on 75 key survey measures spanning the 5 broad topic areas covered in the 2009 EHS Housing Stock Report: www.gov.uk/government/uploads/system/uploads/attachment_data/file/6725/1937212.pdf

14. These topics were:

- **stock profile**: the age, type, size and location of dwellings in England, including details on construction type and the materials used for key building components like roofs and windows.
- **amenities and services**: the services and amenities present in dwellings, including kitchens, bathrooms, WCs, the accessibility of housing for people with mobility problems, security and smoke alarms.
- **external environment**: including the size and type of plot and garden, the type of road and parking provision, and any significant problems in the local environment.
- **stock condition**: the incidence, cost and nature of disrepair within the stock, and how these have changed over time. It also covers other aspects of dwelling condition: dampness, ventilation, electrical wiring and HHSRS (Housing Health and Safety Rating System) Category 1 hazards, highlighting which types of dwellings and households are most likely to have problems with these aspects.
- **energy performance**: the energy performance of the housing stock in terms of the energy efficiency and carbon dioxide emissions associated with its heating, lighting and ventilation characteristics.

15. Variability between surveyors was measured using a series of approaches, in order to give a holistic view of surveyor variability. These approaches are detailed in the following sections.

Level of observed agreement

16. This measure produced the percentage of cases where both the parent survey and child survey were in agreement with one another.

This was useful to get a general view of the level of observed agreement for each survey measure. It is calculated by:

$$P_0 = \frac{N_a}{N}$$

Where P_0 = observed agreement, N_a = agreement between surveyors, and N = total number of properties.

17. However this measure does not take into account the level of agreement that could be expected by chance (i.e. if both surveyors guessed their assessment, it is possible they would both agree by chance).

Chance agreement - kappa score

18. The calculation of a kappa score allows us to produce a statistic identifying the level of agreement which takes into account chance agreement. It is the ratio of the difference between the observed and the expected agreement, to the maximum possible agreement. It is calculated by:

$$K = \frac{P_o - P_e}{1 - P_e}$$

where K = kappa coefficient, P_o = observed count of agreement; and P_e = expected count of agreement.

19. The kappa coefficient can have any value between -1 and +1:

- +1 indicates the theoretical limit of maximum agreement between surveyors.
- 0 indicates agreement at a chance level.
- -1 indicates agreement smaller than chance (although a value less than 0 is unlikely).

20. The guidelines in Table 1 can be used to gain an insight into the level of agreement produced by the kappa score.

Table 1: Interpretation of kappa score

Value of Kappa	Interpretation (Strength of Agreement)
<0.00	Poor
0.00 - 0.20	Slight
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Substantial
0.81 - 1.00	Almost Perfect

Taken from Landis, J. and Koch, G. (1977) "The measurement of observer agreement for categorical data" in Biometrics. Vol. 33, pp. 159–174.

21. It should be noted that the kappa score does not take into account the *degree* of disagreement between surveyors. All disagreement is treated equally as total disagreement.

Correlated surveyor variance

22. The correlated surveyor variance (CSV) refers to the tendency of an individual surveyor to make assessments that are consistent but different from the average assessment of all surveyors. For example, a particular surveyor may be more likely, on average, to assess a particular dwelling as fit for habitation, than other surveyors. CSVs were calculated for the 251 individual response categories in the 75 key survey measures investigated in this study.

23. These CSVs were calculated using a multi-level model. This model took into account the possibility that observations taken from the same surveyor are more likely to be similar than observations taken from different surveyors. Further information on the model used in this analysis can be obtained by contacting the EHS survey team at DCLG: ehs@communities.gov.uk.

24. In terms of interpreting the CSV for each survey measure:

- a score of zero indicates no variability (perfect agreement between surveyors)
- a score of 1 indicates a theoretical limit of high variability (low agreement between surveyors)

25. For the purpose of this report, any CSV greater than or equal to 0.1 will be considered as having substantial levels of variability (low agreement). This is consistent with the criteria used in the 2003-04 study into surveyor variability. It should be noted that these CSVs do not provide a measure of the extent of any disagreement between surveyors.

Bias adjustments

26. Complex standard errors are calculated on the EHS to take account of the complex design of the survey. However these only partly reflect the effect of between-surveyor variability. In consequence, they are biased downwards and the confidence intervals calculated from them are a little too narrow.

27. Therefore, bias adjustments were calculated to take into account the impact of CSVs on the complex standard errors of the EHS.

They were produced for the 251 individual response categories of our 75 key survey measure, using the following formula:

$$\text{bias adjustment} = \bar{b}(1 + c^2)\rho\upsilon$$

where $\bar{b}$ is the average proportion of the sample allocated to each surveyor; c is the coefficient of variation of these proportions; ρ is the estimated correlated surveyor variance and υ is the total variance measured from the study.

28. This bias adjustment was then added to the variance of each individual response category, and then the square root of this equation provided the adjusted standard error.

Results

29. The results from this study have been split into the following sections of analysis:

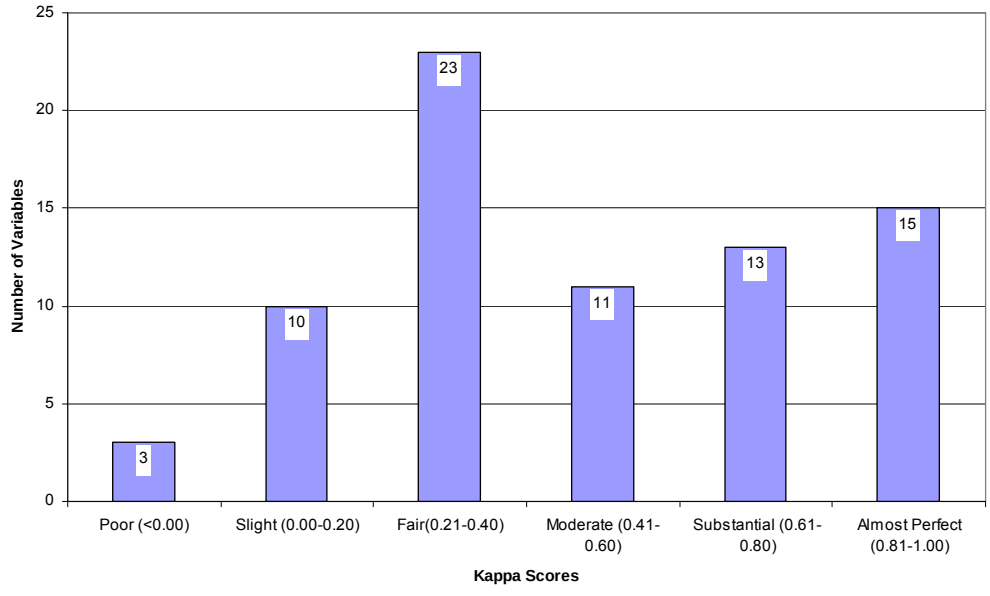
- chance agreement (kappa scores)
- correlated surveyor variance (CSVs)
- combined analysis (taking kappa and CSVs into account)
- bias adjustments, standard errors and confidence intervals
- comparison of surveyor variability in the EHCS and EHS

30. Annex 1 lists all the variables included in this study, along with the key statistics referred to in this section of the report.

Chance agreement

31. Kappa scores were produced for the 75 key survey measures under investigation in the report. Figure 1 shows the distribution of these kappa scores.

Figure 1: Distribution of kappa statistics



32. The top ten survey measures with high variability / low agreement (based on kappa scores) are presented in Table 2. A comment has been added against each measure to explain the nature of variability.

Table 2: Top 10 survey measures with high variability / low agreement (kappa scores)

Variable description	Kappa	Comment
Faults – roof structure	-0.018	Kappa scores potentially misleading due to high level of observed agreement (96%). However, variable classed as having potentially high variability, due to this exceptionally low kappa score.
Urgent repair – roof structure	-0.015	
Type of occupancy	-0.005	High level of observed agreement (98.7%). Therefore kappa score misleading. Variable appears to actually have high level of agreement.
Interior space heating present	0.000	High level of observed agreement (99.7%). Therefore kappa score misleading. Variable appears to actually have high level of agreement.
Poor quality environment – upkeep problems	0.053	Observed level of agreement = 80%. 60 out of 300 properties had some kind of disagreement. Therefore variability is potentially high.
Doorsets and Circulation meet Part M regulations	0.072	Observed level of agreement = 35.7%. 103 out of 300 properties had some kind of disagreement. Variability is potentially high.
Decent Homes modern facilities criterion	0.094	High level of observed agreement (95%). However, variable classed as having potentially high variability, due to low kappa score.
Poor quality environment - utilisation problems	0.152	High level of observed agreement (96.7%). However, variable classed as having potentially high variability, due to low kappa score.
Faults – wall structure	0.158	High level of observed agreement (92%). However, variable classed as having potentially high variability, due to low kappa score.
Urgent repair – wall structure	0.162	High level of observed agreement (92%). However, variable classed as having potentially high variability, due to low kappa score.

33. The top ten survey measures with low variability / high agreement (based on kappa scores) are presented in Table 3. Again, a comment has been added against each variable discussing the variability.

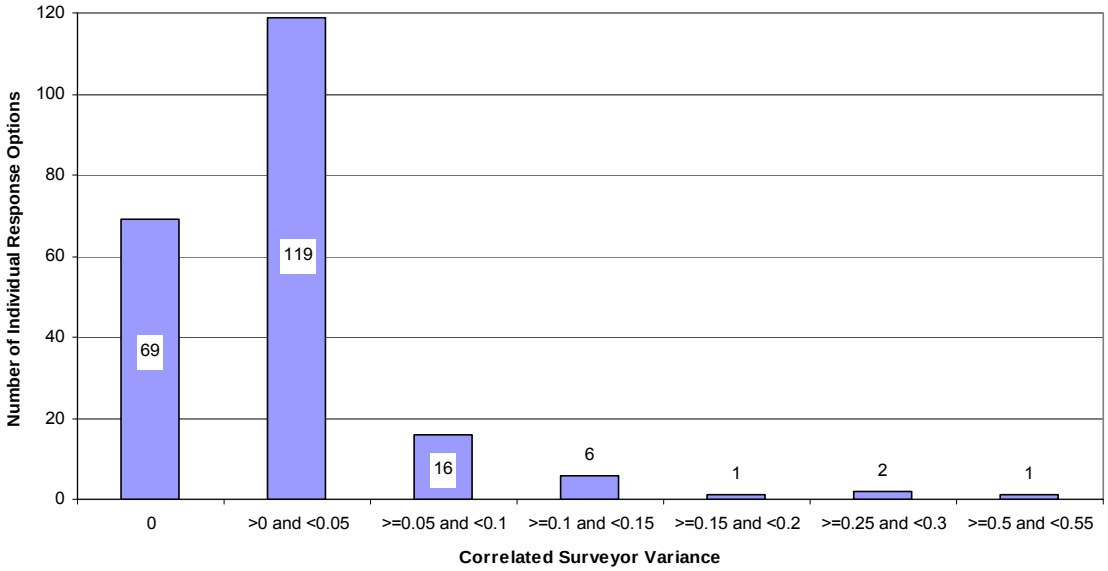
Table 3: Top 10 survey measures with low variability / high agreement (kappa scores)

Variable description	Kappa	Comment
Dwelling type (house/flat)	1.000	Perfect level of agreement (100% observed agreement).
Dwelling type	0.988	Near perfect level of agreement (99% observed agreement).
No. floors above ground in the house / module	0.977	Near perfect level of agreement (99% observed agreement).
Main fuel type	0.977	Near perfect level of agreement (99.3% observed agreement).
Main heating fuel	0.965	Near perfect level of agreement (99% observed agreement).
Type of primary heating system	0.953	Near perfect level of agreement (98.7% observed agreement).
Main heating system	0.941	Near perfect level of agreement (99% observed agreement).
Roof insulation above living space present	0.890	Near perfect level of agreement (95.7% observed agreement).
Type of Wall	0.881	Near perfect level of agreement (95% observed agreement).
Tenure	0.864	Near perfect level of agreement (91.3% observed agreement).

Correlated surveyor variance

34. 251 response options (from the 75 key survey measures included in the study) were subject to CSV calculation. From these, 37 did not have a CSV produced due to a sample of less than 12 observations being achieved. Therefore, 214 response options were analysed, with the distribution of these variables presented in Figure 2.

Figure 2: Distribution of correlated surveyor variance



35. 69 response options had CSVs with zero variability (CSV = 0). 204 response options had CSVs less than 0.1, with the remaining 10 variables having CSVs greater than 0.1.

36. The top 10 individual response options with high CSVs are discussed in Table 4. These all have CSVs greater than 0.1, suggesting the correlated surveyor variance is potentially high.

Table 4: Top 10 survey measures with high variability (CSVs)

Variable name and response option	CSV	Comment
Predominant type of window = “single glazed – metal”	0.536	High correlated surveyor variance. However based on only 12 responses. Also, kappa = 0.765 for this variable, suggesting variability may not be as great as CSV suggests.
Doorsets and Circulation meet Part M regulations = “No”	0.255	High level of variability, suggesting source of bias in surveyor responses to this variable. Also, Kappa = 0.072 indicating only a ‘slight ‘ level of agreement.
Doorsets and Circulation meet Part M regulations = “Yes”	0.255	
Number of dwellings in area = “500+”	0.188	High level of surveyor variability surrounding assessments where 500+ dwellings are in local area. Also, Kappa = 0.238 indicating fair level of agreement.
Poor quality environment – upkeep problems = “no”	0.141	Variability appears present in the assessment of upkeep problems of the local environment. Kappa = 0.053 indicating slight level of agreement.
Poor quality environment – upkeep problems = “yes”	0.141	
Poor quality environment – any probs = “no”	0.121	Variability appears high in assessment of whether an area has any problems. Kappa = 0.181 indicating only a slight level of agreement.
Poor quality environment – any probs = “yes”	0.121	
Number of dwellings in area = “Under 25”	0.121	High level of surveyor variability surrounding assessments where under 25 dwellings in local area. Also, Kappa = 0.238 indicating fair level of agreement.
Nature of area = “other urban centre”	0.105	Variability surrounding assessments whether a property assessed to be in “other urban centre”. Kappa = 0.460 indicating moderate agreement.

37. There are a large number of individual response options where CSV = zero (69 variables). As a result, it is not practical to list all these here. Annex 1 provides a list of all survey measures, individual response options, and their associated CSVs.

Combined Analysis (taking kappa and CSVs into account)

38. When identifying areas of high variability, it is important to take into account both the kappa and CSV scores, in order to get a holistic picture of the impact of surveyor variability on the EHS.

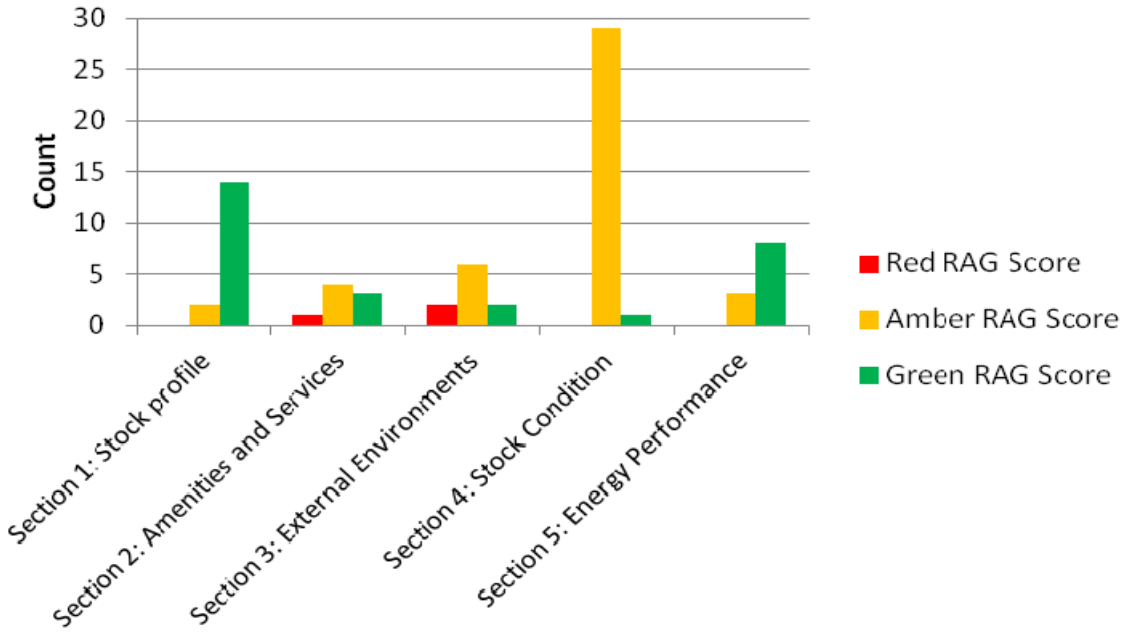
39. In order to do this, a RAG (Red, Amber, Green) score was produce for each survey measure. The scoring criteria are shown in Table 5.

Table 5: RAG criteria for combined analysis (kappa and CSV)

Score	Comment
Red	This indicates a survey measure with a low level of agreement between surveyors. Survey measures scored red will have a kappa score <= 0.40, and a CSV >= 0.1 for all individual response options.
Amber	This indicates a survey measure with a low level of agreement between variables. Survey measures scored amber will have a kappa score between 0.41 and 0.60. ***OR***
	A kappa score which indicates high level of agreement (>= 0.61), however one or more response options with a CSV >= 0.1. ***OR***
	A kappa score indicating a low level of agreement (<=0.40), however a one or more response options with a CSV <0.1.
Green	This indicates an overall high level of agreement. Survey measures scored green will have a kappa >= 0.61, and CSVs <0.1 for all individual response options.

40. Using this scoring criteria, Figure 3 shows the distribution of Red, Amber, Green Scores across each of the 5 topic areas.

Figure 3: RAG criteria for kappa and CSV



Survey measures with a red or amber score were investigated to see whether they had a low level of agreement/high variability. These investigations examined the Kappa scores and CSVs, and also looked at crosstabulations between observations, in order to identify areas of greatest concern. The investigations highlighted 28 survey measures with low levels of agreement, with the majority of these present in the

External Environment and Stock Profile topic areas. These survey measures are discussed in greater detail over the next few pages.

Red scoring variables

41. Three of the 75 key survey measures were found to have a red RAG score. These were:

- **Doorsets and Circulation meet Part M regulations**. This survey measure was found in the Amenities and Services topic area. It had a kappa score of 0.072, and CSVs of 0.255. This low level of agreement suggested further training could look at surveyors understanding of Part M regulations, or potentially the design of the questionnaire form, to see if miscoding of data is occurring for this survey measure.
- **Poor quality environment – 'upkeep problems' and 'any other problems'**. These two survey measures were both found in the External Environments topic area. These variables had a kappa score less than 0.2, and both had CSVs greater than 0.1. Due to the subjective nature of collecting information on whether an area is "poor quality", it is likely variability is inherent in such a survey measure.

Amber Scoring Variables

42. Forty-four survey measures were scored amber, however only 25 of these survey measures were considered to have variability which should be investigated further. These were:

Stock profile

- **Predominant type of window:** 30 properties experienced a disagreement with this survey measure. Specifically, the response option single glazed metal has a CSV greater than 0.1. Although the numbers of observations were small, training could focus on improving understanding of this window type to try and reduce between-surveyor variability.

Amenities and services

- **Secure windows and doors:** This survey measure had a kappa score of 0.391 (fair level of agreement). However the CSVs for the response options were less than 0.1, suggesting agreement may be higher than the kappa score suggests. As this measure is derived from various questionnaire variables, it is recommended that training could focus on how surveyors fill out the survey form, to reduce discrepancies with this survey measure.

External environment

- **Number of dwellings in area:** The kappa score suggested a poor level of agreement (0.238). Two of the 7 individual response options for this measure had CSVs greater than 0.1. As surveyors were asked to estimate the number of dwellings in the local area, it is likely that their assessments will differ. Analysis of this variable could consider condensing response categories to improve estimate precision.
- **Measures relating to nature of the local area (4 survey measures):** These measures required some kind of subjective assessment of the quality of the local area. Therefore, it is likely that one surveyor will have a slightly different perception of a local area than their colleague. Although training could reduce between-surveyor variability, it is likely variability will continue to exist with these survey measures. Therefore, it is recommended analysis of such variables are treated with caution, considering the adjusted standard errors when taking surveyor variability into account.

Stock condition:

- **Measures relating to faults / defects of the property (15 survey measures looking at defects / faults of structure, foundation, roof, walls, windows and external doors):** These measures had kappa scores ranging between -0.018 and 0.512, indicating either a poor, slight, fair or moderate level of agreement. However, all the individual response option CSVs were less than 0.1 (excluding one response option where a CSV was not produced due to small number of observations). This suggests between-surveyor variability was not large enough to be considered problematic. Further investigations suggested some variability in the reporting of urgent repairs. Further investigations could look at the guidance provided for the structural defect questions, to reduce the chance of discrepancies between surveyors.
- **Cost of repairs (2 survey measures - Basic repair costs – actual and per square metre):** Both these survey measures had low kappa scores (0.209 and 0.263), and low levels of observed agreement (41.7% and 53%, respectively). However, the CSVs for the individual response options were less than 0.1, suggesting variability may not be of a concern. Further investigations of these survey measures suggested between-surveyor variability was most apparent in lower value assessments (up to £2000). Therefore, to reduce the impact of variability, analysis could consider condensing these categories to reduce the level of disagreement.

43. The remaining 47 survey measures in the study were deemed to have acceptable levels of agreement (19 amber scoring and 28 green scoring measures).

Bias adjustments, standard errors and confidence intervals

44. The best way to understand the impact surveyor variability has on EHS data is to look at the impact on our standard errors and confidence intervals.

45. The formula used to calculate the bias adjustments for each individual response option was:

$$\text{bias adjustment} = \bar{b}(1+c^2)\rho\upsilon$$

where $\bar{b}$ is the average proportion of the sample allocated to each surveyor; c is the coefficient of variation of these proportions; ρ is the estimated correlated surveyor variance and υ is the total variance measured from the study.

46. Due to complexity of this formula, it is perhaps best to work through an example. Table 6 shows how each component of the above formula is calculated, using the following survey type of occupancy measure and the single family dwelling response option.

Table 6: Calculation of bias adjustment: type of occupancy = single family dwelling

Component	Description	Calculation	Value
$\bar{b}$	This is the average proportion of the EHS sample allocated to each surveyor. It is a constant value for all survey measures.	$\frac{1}{\text{Number of Surveyors}} = \frac{1}{202} = 0.0049$	0.004950
$(1+c^2)$	Adjusts the coefficient of variation of $\bar{b}$. It is constant for all variable response options. c is calculated from the standard deviation of the sum of all surveyor proportions (σ_{sp}) divided by the average proportion ap.	$c = \frac{\sigma_{sp}}{ap} = \frac{0.001764}{0.004950} = 0.356340$ *Therefore:* $(1+c^2) = 1+0.356340^2 = 1+0.126979$	1.126979
ρ	*Estimated correlated surveyor variance.* Differs for each survey measure.	Calculated using a statistical computer macro.	0.058882
υ	*Total variance measured from the study.* Differs for each survey measure.		0.006646

47. Taking the components listed in Table 6, these can be added to the bias adjustment formula:

$$\bar{b}(1+c^2)\rho\upsilon = 0.004950 \times 1.126979 \times 0.058882 \times 0.006646 = 2.185 \times 10^{-6}$$

48. This suggests the bias adjustments for this measure is 2.185 x 10-6. This bias adjustment can now be applied to the EHS existing complex standard error (CSE) to see the impact of surveyor variability on this survey measure. For our example (type of occupancy = single family dwelling), the complex standard error = 0.1246 (based on a percentage estimate). Our bias adjustment = 2.185 x 10-6. In order to add our bias adjustment to produce a revised standard error taking surveyor variability into account (RSE), several stages are required. These are listed in Table 7.

Table 7: Steps for calculating Revised Standard Error: Type of Occupancy = single family dwelling

Step	Calculation
1) Convert CSE into variance (σ_e^2):	$0.1246^2 = 0.0155$
2) Convert bias adjustment from a proportion estimate to a percentage estimate. This is because CSE is based on percentage estimates, whilst the SVS bias adjustment is based on proportions. This is achieved multiplying our bias adjustment by 100^2	$(2.185 \times 10^{-6}) \times 100^2 = 0.0218$
3) Add our variance from the EHS standard error (σ_e^2), to our revised bias adjustment.	0.0155 + 0.0218 = 0.0374
4) Turn this new variance into our revised standard error (RSE).	$\sqrt{0.0374} = 0.1933 = 0.19$ (to 2 dp)

49. In this example, the application of a bias adjustment has produced a revised standard error of 0.19 (from 0.12), which has widened the confidence intervals for this measure from ±0.24% to ±0.38%.

50. It is important to remember that this revised standard error taking surveyor variability into account is subject to a degree of variance itself, as well as other confounding factors which may not have been captured in this analysis. Therefore analysis should treat these revised confidence intervals with the appropriate level of caution.

51. Please note that if the bias adjustment is used with variances of a proportion rather than a percentage, the measurement variance u will be 1002 times smaller so the bias adjustment will also need to be scaled down by 1002 or 10,000.

52. Revised standard errors and confidence intervals were calculated for the 251 response options of our 75 surveys measures included in this study. In total, 12 response options were found to have an increased confidence interval of 1%. These are discussed in Table 8.

Table 8: Response options with a 1% increase in confidence intervals (between CSE and RSE)

Variable description (and response option)	Topic	Current CI	Revised CI
Doorsets and Circulation meet Part M regulations (Yes / No)	2. Amenities and Services.	± 0.73%	± 3.27%
Poor quality environment – any problems (Yes / No)	3. External Environments.	± 0.64%	± 2.05%
Number of Dwellings in area (Isolated)	3. External Environments.	± 0.43%	± 1.81%
Nature of Area (other urban central)	3. External Environments.	± 0.64%	± 1.98%
Nature of Area (Urban)	3. External Environments.	± 0.68%	± 2.01%
Poor quality environment – upkeep problems (Yes / No)	3. External Environments.	± 0.55%	± 1.87%
Predominant type of window (single glazed- metal)	1. Stock profile.	± 0.21%	± 1.52%
Visual quality of local area (Good quality)	3. External Environments.	± 0.61%	± 1.90%
Nature of Area (Suburban)	3. External Environments.	± 0.83%	± 2.03%
Nature of Area (suburban residential)	3. External Environments.	± 0.83%	± 2.03%
Number of Dwellings in area (Under 25)	3. External Environments.	± 0.60%	± 1.77%
Secure windows and doors (not fully secure / secure)	2. Amenities and Services.	± 0.77%	± 1.87%

53. The largest revision to confidence intervals was “Doorsets and Circulation meets Part M regulations (Yes/No)”, with an increase from ±0.73% to ±3.27%. However, the majority of response options either did not experience an increase to their confidence interval (69 of the 251 response options), or experience an increase but less than 1% (170 response options).

54. Annex A presents all the findings from this report, including the kappa scores, CSVs, and the revised standard errors and confidence intervals for each estimate.

Comparison of surveyor variability in the EHCS and EHS

55. The CSVs produced in the 2009-10 SVS ranged from a minimum value of 0, to a maximum value of 0.536. The mean value was 0.025 and standard deviation was 0.0514. Table 9 shows these values next to those from the 2003-04 SVS for comparison purposes.

Table 9: Comparison of CSV statistics on 2003-04 and 2009-10 SVS

	2009-10 SVS	2003-04 SVS
Number of variables / cases	214*	374
Mean	0.0232	0.0594
Standard deviation	0.0514	0.0905
Minimum	0	0
Maximum	0.536	0.477

Note: Although 251 CSVs were created in 2009, 37 did not have a value produced due to a sample size less than 12. These have been excluded from analysis.

56. As Table 9 shows, the 2009-10 SVS produced a lower mean CSV value (0.0232) when compared with the 2003-04 exercise (0.0594). When taken at face value, this indicates overall variability has reduced slightly from 2003-04 in 2009-10. This could be a result of the training surveyors have received, or through a field force who have gained experience with the EHCS / EHS. However this reduction could be a result of other factors such as the choice of survey measures included in the 2009-10 SVS, or the number of measures included in analysis (the 2009-10 SVS has fewer individual response options when compared with the 2003-04 SVS).

57. Twelve survey measures were identified as having a response option with a CSV greater than 0.1 in either 2003-04 or 2009-10. Although this does not immediately indicate a change in variability, it does provide a useful point of comparison. These are presented in Table 10.

Table 10: Comparison of CSV between 2003-04 and 2009-10 SVS: CSVs greater than 0.1

Variable description (and response option)	Topic	2003-04 CSV	2009-04 CSV
Predominant type of roof covering (*asphalt)*	Stock profile	0.000	0.237
Predominant type of wall finish (*single glazed – metal)*	Stock profile	0.536	0.000
Number of dwellings in area (*Under 25)*	External Environments	0.121	0.000
Number of dwellings in area (*300-499)*	External Environments	0.035	0.150
Number of dwellings in area (*500+)*	External Environments	0.188	0.151
Nature of area (*Urban)*	External Environments	0.089	0.159
Nature of area (*Suburban)*	External Environments	0.066	0.101
Visual quality of local area (*Good quality)*	External Environments	0.078	0.129
Visual quality of local area (*Average quality)*	External Environments	0.047	0.105
Faults – roof structure (*No)*	Stock Condition	0.033	0.105
Urgent repair – wall finish (*Yes)*	Stock Condition	0.011	0.113
Urgent repair – wall finish (*No)*	Stock Condition	0.027	0.111

58. Some potential reasons behind these differences include:

- many of these survey measures require a degree of subjective assessment by a surveyor (for example “nature of area” and “visual quality of local area”). By their nature, a certain degree of

variability would be expected. Therefore the levels of low agreement between surveyors could be down to this reason, rather than the change from the EHCS to the EHS.

- small sample sizes were used to obtain these estimates. For example, the estimate for “predominant type of roof covering = asphalt” is based on only 12 cases. Therefore, the high CSV for this response option in 2009-10 could be in part due to chance, rather than survey design.

59. The general conclusion which can be drawn is that the between-surveyor variability in the EHCS and EHS are very similar. However it should be remembered that these CSVs are themselves subject to a degree of variance, and therefore these estimates should be considered as guidelines, rather than absolute certainty.

Next steps

60. At an early stage, the variables identified by the study as having higher levels of surveyor variability were prioritised and developed into a package of training materials for the surveyors, designed to improve the consistency of their judgements.

61. Prior to the finalisation of the SVS report, briefing sessions delivered in March 2012 and March 2013 incorporated sessions specifically targeted towards variables initially identified as having a higher observed level of variability:

- A specific e-learning module created to address the identification and treatment of repairs. This exercise comprised a distance learning module followed by an on-line test, completed prior to attendance at the training venue, with the results fed back and discussed as part of the on-the-day briefing
- Interactive ‘quiz’ and discussion sessions have been employed to cover areas such as security, accessibility, door/window counts and environmental questions

62. The findings of the SVS report continue to inform and shape the nature and content of surveyor refresher briefings. The planned intention to incorporate fieldwork visits to test properties in 2014 would provide an opportunity to reinforce the correct briefing for all variables highlighted as showing greater variation by the study. At the same time, consideration will be given as to whether a standard definition could be introduced into the selection of the local area, as a means of reducing variability in this area. Information from the SVS report regarding areas of surveyor variability will continue to be used in conjunction with other data sources in this area, such as the Surveyor Calibration Workbook exercise, which is due to be run again in the Autumn of 2014.

Appendix 1

Section 1: Stock profile results

Variable	Description	Observed Agreement (%)	Kappa Score	Multi Level Modelling[1] # obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	RAG SCORE Overall	Original Standard Errors Standard error (SE)	Original Standard Errors CI ± %	Revised Standard Errors Standard error (SE)	Revised Standard Errors CI ± %
FODDTYPE	Dwelling type (house/flat)	100.0	1.000									
foddtyper1	House			460	0.180	zero	zero	Green	0.33	± 0.64	0.33	± 0.64
foddtyper2	Flat			140	0.180	zero	zero		0.33	± 0.64	0.33	± 0.64
DWTYPENX	Dwelling type	99.0	0.988									
dwtypenxr1	end terrace			71	0.105	-	-		0.27	± 0.53	0.27	± 0.53
dwtypenxr2	mid terrace			96	0.137	zero	zero		0.35	± 0.68	0.35	± 0.68
dwtypenxr3	semi detached			148	0.189	-	-		0.39	± 0.77	0.39	± 0.77
dwtypenxr4	detached			95	0.134	-	-	Green	0.33	± 0.65	0.33	± 0.65
dwtypenxr5	bungalow			50	0.079	zero	zero		0.24	± 0.48	0.24	± 0.48
dwtypenxr6	converted flat			16	0.026	zero	zero		0.19	± 0.38	0.19	± 0.38
dwtypenxr7	purpose built flat, low rise			99	0.138	-	-		0.29	± 0.58	0.29	± 0.58
dwtypenxr8	purpose built flat, high rise			25	0.040	zero	zero		0.11	± 0.22	0.11	± 0.22
FODISHMO	Type of occupancy	98.7	-0.005									
fodishmor1	single family dwelling			596	0.007	0.059	2.185	Amber	0.12	± 0.24	0.19	± 0.38
fodishmor2	shared house			4	*	*	*		0.09	± 0.19	0.09	± 0.19
FODTENUR	Tenure	91.3	0.864									
fodtenurr1	Owner Occupied			326	0.249	-	-		0.41	± 0.80	0.41	± 0.80
fodtenurr2	Private rented			91	0.129	zero	zero	Green	0.29	± 0.56	0.29	± 0.56
fodtenurr3	Local authority (LA)			101	0.141	0.012	9.104		0.21	± 0.41	0.37	± 0.72
fodtenurr4	Housing association (HA).			82	0.118	0.017	11.130		0.20	± 0.39	0.39	± 0.76
FODCONST	Construction date banded	84.3	0.803									
fodconstr1	Pre 1919			121	0.161	0.001	0.601		0.38	± 0.74	0.39	± 0.76
fodconstr2	1919-1944			99	0.138	zero	zero		0.33	± 0.65	0.33	± 0.65
fodconstr3	1945-1964			129	0.169	zero	zero	Green	0.35	± 0.69	0.35	± 0.69
fodconstr4	1965-1980			154	0.195	zero	zero		0.36	± 0.70	0.36	± 0.70
fodconstr5	Post 1980			97	0.136	-	-		0.36	± 0.72	0.36	± 0.72
DWAGE6X	Dwelling age	83.0	0.789									
dwage6xr1	pre 1919			121	0.161	0.001	0.601		0.38	± 0.74	0.39	± 0.76
dwage6xr2	1919-44			99	0.138	zero	zero		0.33	± 0.65	0.33	± 0.65
dwage6xr3	1945-64			129	0.169	zero	zero	Green	0.35	± 0.69	0.35	± 0.69
dwage6xr4	1965-80			154	0.195	zero	zero		0.36	± 0.70	0.36	± 0.70
dwage6xr5	1981-90			53	0.081	zero	zero		0.26	± 0.50	0.26	± 0.50
dwage6xr6	post 1990			44	0.068	zero	zero		0.29	± 0.58	0.29	± 0.58
BASEMENT	Basement present in dwelling	99.3	0.664									
basementr1	Yes			6	*	*	*	Green	0.12	± 0.24	0.12	± 0.24
basementr2	No			594	0.010	zero	zero		0.12	± 0.24	0.12	± 0.24
FMTCONST	Material and construction of house/module	96.3	0.787									
fmtconstr1	Masonry			544	0.085	0.012	5.804		0.23	± 0.46	0.34	± 0.66
fmtconstr2	Concrete			42	0.066	0.023	8.388	Green	0.17	± 0.33	0.34	± 0.66
fmtconstr3	Other			14	0.024	zero	zero		0.17	± 0.33	0.17	± 0.33
WALLCAVX	Type of Wall	95.0	0.881									
wallcavxr1	cavity wall			419	0.211	0.002	2.133	Green	0.40	± 0.79	0.43	± 0.84
wallcavxr2	other			181	0.211	0.002	2.133		0.40	± 0.79	0.43	± 0.84

Appendix 1

Section 1: Stock profile results

				Multi Level Modelling[1]				RAG SCORE	Original Standard Errors		Revised Standard Errors	
Variable	Description	Observed Agreement (%)	Kappa Score	# obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	Overall	Standard error (SE)	CI ± %	Standard error (SE)	CI ± %
WALLINSX	Type of wall and insulation	84.7	0.767									
wallinsxr1	cavity with insulation			243	0.242	zero	zero	Green	0.41	± 0.79	0.41	± 0.79
wallinsxr2	cavity uninsulated			176	0.208	zero	zero		0.43	± 0.84	0.43	± 0.84
wallinsxr3	other			181	0.211	0.002	2.133		0.40	± 0.79	0.43	± 0.84
ATTIC	Attic present in dwelling	98.0	0.831									
atticr1	Yes			38	0.061	0.001	0.439	Green	0.27	± 0.54	0.28	± 0.55
atticr2	No			562	0.061	0.001	0.439		0.27	± 0.54	0.28	± 0.55
TYPERCOV	Predominant type of roof covering	81.3	0.712									
typercovr0	mixed types			14	0.024	zero	zero	Green	0.12	± 0.23	0.12	± 0.23
typercovr1	natural slate/stone/shingle			67	0.099	0.002	0.854		0.29	± 0.57	0.31	± 0.60
typercovr2	man made slate			36	0.057	zero	zero		0.21	± 0.42	0.21	± 0.42
typercovr3	clay tile			99	0.138	0.036	27.399		0.33	± 0.65	0.62	± 1.21
typercovr4	concrete tile			331	0.248	0.015	21.166		0.44	± 0.85	0.63	± 1.24
typercovr5	asphalt			35	0.055	zero	zero		0.14	± 0.27	0.14	± 0.27
typercovr6	felt			8	*	*	*		0.11	± 0.22	0.11	± 0.22
typercovr7	glass/metal/laminate			9	*	*	*		0.12	± 0.24	0.12	± 0.24
typercovr8	thatch			1	*	*	*		0.03	± 0.05	0.03	± 0.05
TYPERSTR	Predominant type of roof structure	97.0	0.834									
typerstrr0	mixed types			5	*	*	*	Green	0.08	± 0.15	0.08	± 0.15
typerstrr1	pitched			541	0.089	zero	zero		0.22	± 0.44	0.22	± 0.44
typerstrr2	mansard			5	*	*	*		0.10	± 0.19	0.10	± 0.19
typerstrr3	flat			47	0.073	zero	zero		0.18	± 0.35	0.18	± 0.35
typerstrr4	chalet			2	*	*	*		0.08	± 0.16	0.08	± 0.16
TYPEWSTR	Predominant type of wall structure	87.3	0.740									
typewstrr0	mixed types			11	*	*	*	Green	0.14	± 0.27	0.14	± 0.27
typewstrr1	masonry cavity			412	0.216	0.001	1.598		0.41	± 0.80	0.43	± 0.84
typewstrr2	masonry single leaf			5	*	*	*		0.05	± 0.09	0.05	± 0.09
typewstrr3	9 inch solid			120	0.161	0.004	4.012		0.35	± 0.68	0.40	± 0.79
typewstrr4	greater than 9 inch solid			22	0.035	0.005	0.981		0.22	± 0.43	0.24	± 0.47
typewstrr5	in situ concrete			14	0.023	zero	zero		0.09	± 0.17	0.09	± 0.17
typewstrr6	concrete panels			5	*	*	*		0.07	± 0.14	0.07	± 0.14
typewstrr7	timber panels			5	*	*	*		0.11	± 0.22	0.11	± 0.22
typewstrr8	metal sheet			6	*	*	*		0.05	± 0.10	0.05	± 0.10
TYPEWFIN	Predominant type of wall finish	95.0	0.828									
typewfinr0	mixed types			20	0.032	zero	zero	Green	0.18	± 0.36	0.18	± 0.36
typewfinr1	masonry pointing			501	0.138	zero	zero		0.38	± 0.74	0.38	± 0.74
typewfinr2	non-masonry natural			3	*	*	*		0.06	± 0.12	0.06	± 0.12
typewfinr3	rendered			64	0.097	zero	zero		0.34	± 0.67	0.34	± 0.67
typewfinr7	wood/metal/plastic panels			12	0.020	zero	zero		0.09	± 0.18	0.09	± 0.18

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Section 1: Stock profile results

				Multi Level Modelling[1]				RAG SCORE	Original Standard Errors		Revised Standard Errors	
Variable	Description	Observed Agreement (%)	Kappa Score	# obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	Overall	Standard error (SE)	CI ± %	Standard error (SE)	CI ± %
TYPEWIN	Predominant type of window	90.0	0.765									
typewinr0	mixed types			26	0.042	-	-		0.16	± 0.32	0.16	± 0.32
typewinr1	single glazed - wood casement			41	0.064	zero	zero		0.24	± 0.47	0.24	± 0.47
typewinr2	single glazed - wood sash			22	0.035	zero	zero		0.18	± 0.34	0.18	± 0.34
typewinr3	single glazed - UPVC			7	*	*	*	Amber	0.08	± 0.16	0.08	± 0.16
typewinr4	single glazed - metal			12	0.020	0.536	59.029		0.11	± 0.21	0.78	± 1.52
typewinr5	double glazed - wood			31	0.049	zero	zero		0.26	± 0.50	0.26	± 0.50
typewinr6	double glazed - UPVC			450	0.188	0.005	4.964		0.41	± 0.80	0.47	± 0.91
typewinr7	double glazed - metal			11	*	*	*		0.19	± 0.37	0.19	± 0.37

Footnotes:

[1] Multi-Level Modelling only analysed categories with a response. Categories where no response was provided have been excluded.

Key notations

~ = count of response options includes missing values. See crosstabulations for types of missing values.

* = value not reported as multi-level modelling produced on less than 12 responses to this variable. Results too variable to produce confident estimates, and therefore excluded.

- = results reported are negligible (values were greater than zero, however reported as 0.000). Although there is variability between surveyors for this variable, value reported is negligible, and therefore these values have been replaced with a "-".

"zero" = indicates no variability identified with this variable.

Appendix 1

Section 2: Amenities and Services

Variable	Description	Observed Agreement (%)	Kappa Score	Multi Level Modelling[1] # obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	RAG SCORE Overall	Original Standard Errors Standard error (SE)	Original Standard Errors CI ± %	Revised Standard Errors Standard error (SE)	Revised Standard Errors CI ± %
FINBATL	Date bathroom last refurbished	68.3	0.531									
FinbatlrR1	Pre 1980			88	0.125	0.028	19.876	Amber	0.33	± 0.64	0.55	± 1.09
FinbatlrR2	1980s			93	0.131	0.019	13.705		0.33	± 0.65	0.50	± 0.98
FinbatlrR3	1990s			129	0.170	zero	zero		0.38	± 0.75	0.38	± 0.75
FinbatlrR4	2000s			290	0.250	0.001	1.935		0.45	± 0.87	0.47	± 0.91
FINKITLR	Date kitchen last refurbished	72.7	0.552									
FinkitlrR1	Pre 1980			36	0.057	0.008	2.674	Amber	0.24	± 0.47	0.29	± 0.57
FinkitlrR2	1980s			84	0.127	zero	zero		0.33	± 0.65	0.33	± 0.65
FinkitlrR3	1990s			148	0.186	zero	zero		0.40	± 0.78	0.40	± 0.78
FinkitlrR4	2000s			332	0.248	0.006	8.368		0.44	± 0.87	0.53	± 1.04
FINCHEAT	Interior space heating present	99.7	0.000									
FincheatR1	Yes			599	0.002	zero	zero	Amber	0.09	± 0.17	0.09	± 0.17
FincheatR2	No			1	*	*	*		0.09	± 0.17	0.09	± 0.17
FINGASMS	Mains gas supply present	96.7	0.857									
FingasmsR1	Yes			520	0.116	zero	zero	Green	0.30	± 0.59	0.30	± 0.59
FingasmsR2	No			4	*	*	*		0.10	± 0.19	0.10	± 0.19
FINBATEN	Accessibility - Shower or bath at entrance level	92.3	0.836									
FinbatenR1	Yes			223	0.234	zero	zero	Green	0.43	± 0.84	0.43	± 0.84
FinbatenR2	No			377	0.234	zero	zero		0.43	± 0.84	0.43	± 0.84
FINCIRCU	Doorsets and Circulation meet Part M regulations	35.7	0.072					Red				
fincircuR1	Yes			147	0.186	0.255	265.372		0.37	± 0.73	1.67	± 3.27
fincircuR2	No			453	0.186	0.255	265.372		0.37	± 0.73	1.67	± 3.27
FFCSHARE	Whether shared facilities exist	92.3	0.787									
FfcshareR1	Yes			141	0.181	0.010	9.660	Green	0.33	± 0.65	0.46	± 0.89
FfcshareR2	No			459	0.181	0.010	9.660		0.33	± 0.65	0.46	± 0.89
SECURE	Secure windows and doors	79.3	0.391									
SecureR0	not fully secure			130	0.171	0.080	75.905	Amber	0.39	± 0.77	0.96	± 1.87
SecureR1	secure			470	0.171	0.080	75.905		0.39	± 0.77	0.96	± 1.87

Footnotes:

[1] Multi-Level Modelling only analysed categories with a response. Categories where no response was provided have been excluded.

Key notations

~ = count of response options includes missing values. See crosstabulations for types of missing values.

* = value not reported as multi-level modelling produced on less than 12 responses to this variable. Results too variable to produce confident estimates, and therefore excluded.

- = results reported are negligible (values were greater than zero, however reported as 0.000). Although there is variability between surveyors for this variable, value reported is negligible, and therefore these values have been replaced with a "-".

"zero" = indicates no variability identified with this variable.

Appendix 1

Section 3: External environments

				Multi Level Modelling[1]				RAG SCORE	Original Standard Errors		Revised Standard Errors	
Variable	Description	Observed Agreement (%)	Kappa Score	# obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	Overall	Standard error (SE)	CI ± %	Standard error (SE)	CI ± %
FARNATUR	Nature of area	76.3	0.577									
farnaturR1	Urban			148	0.187	0.089	93.554	Amber	0.35	± 0.68	1.03	± 2.01
farnaturR2	Suburban			358	0.242	0.066	89.004		0.42	± 0.83	1.03	± 2.03
farnaturR3	Rural			94	0.133	0.017	12.695		0.32	± 0.62	0.48	± 0.94
ARNATX	Nature of area	68.0	0.460									
arnatxR1	city centre			32	0.051	0.094	26.746	Amber	0.17	± 0.34	0.54	± 1.07
arnatxR2	other urban centre			116	0.157	0.105	91.648		0.33	± 0.64	1.01	± 1.98
arnatxR3	suburban residential			358	0.242	0.066	89.004		0.42	± 0.83	1.03	± 2.03
arnatxR4	rural residential			54	0.082	zero	zero		0.27	± 0.54	0.27	± 0.54
arnatxR5	rural			40	0.062	0.010	3.437		0.22	± 0.43	0.29	± 0.56
FARDWELL	Number of dwellings in area	39.3	0.238									
fardwellR1	Under 25			72	0.107	0.121	72.178	Amber	0.30	± 0.60	0.90	± 1.77
fardwellR2	25-49			87	0.125	0.059	41.174		0.33	± 0.65	0.72	± 1.42
fardwellR3	50-99			137	0.177	0.066	65.198		0.39	± 0.77	0.90	± 1.76
fardwellR4	100-299			189	0.217	0.055	66.484		0.40	± 0.79	0.91	± 1.78
fardwellR5	300-499			63	0.094	0.035	18.529		0.24	± 0.47	0.49	± 0.97
fardwellR6	500+			50	0.077	0.188	80.966		0.22	± 0.43	0.93	± 1.81
fardwellR7	Isolated			2	*	*	*		0.07	± 0.14	0.07	± 0.14
STOREYX	No. of floors above ground in the house / module	99.0	0.977									
storeyxR1	1 floor			50	0.079	zero	zero	Green	0.24	± 0.48	0.24	± 0.48
storeyxR2	2 floors			441	0.196	-	-		0.40	± 0.78	0.40	± 0.78
storeyxR3	3 floors			59	0.089	-	-		0.31	± 0.61	0.31	± 0.61
storeyxR4	4 floors			17	0.028	zero	zero		0.17	± 0.33	0.17	± 0.33
storeyxR5	5 floors			8	*	*	*		0.09	± 0.18	0.09	± 0.18
storeyxR6	6 floors or more			25	0.040	zero	zero		0.11	± 0.22	0.11	± 0.22
FLOORX	Total useable floor area M2	74.0	0.668									
floorxR1	less than 50			78	0.115	0.006	3.825	Green	0.28	± 0.54	0.34	± 0.67
floorxR2	greater than or equal to 50, and less than 70			156	0.197	zero	zero		0.38	± 0.75	0.38	± 0.75
floorxR3	greater than or equal to 70, and less than 90			169	0.211	0.002	2.570		0.41	± 0.81	0.44	± 0.87
floorxR4	greater than or equal to 90, and less than 110			97	0.136	zero	zero		0.32	± 0.63	0.32	± 0.63
floorxR5	greater than or equal to 110			100	0.139	0.003	2.226		0.37	± 0.72	0.40	± 0.78
FARQUALI	Visual quality of local area	73.0	0.332									
farqualiR1	Good quality			444	0.194	0.078	84.216	Amber	0.31	± 0.61	0.97	± 1.90
farqualiR2	Average quality			130	0.170	0.047	44.700		0.30	± 0.58	0.73	± 1.43
farqualiR3	Worst Quality			26	0.042	0.030	6.913		0.13	± 0.25	0.29	± 0.57
LV1UPKPX	Poor quality environment – upkeep problems	80.0	0.053									
lv1upkpxR0	no			528	0.106	0.141	83.467	Red	0.28	± 0.55	0.96	± 1.87
lv1upkpxR1	yes			72	0.106	0.141	83.467		0.28	± 0.55	0.96	± 1.87
LV2TRAFX	Poor quality environment – traffic problems	88.7	0.232									
lv2trafxR0	no			552	0.074	0.071	29.387	Amber	0.23	± 0.45	0.59	± 1.15
lv2trafxR1	yes			48	0.074	0.071	29.387		0.23	± 0.45	0.59	± 1.15

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Section 3: External environments

				Multi Level Modelling[1]				RAG SCORE	Original Standard Errors		Revised Standard Errors	
Variable	Description	Observed Agreement (%)	Kappa Score	# obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	Overall	Standard error (SE)	CI ± %	Standard error (SE)	CI ± %
LV3UTILX	Poor quality environment - utilisation problems	96.7	0.152									
lv3utilxR0	no			588	0.020	0.040	4.408	Amber	0.12	± 0.24	0.24	± 0.48
lv3utilxR1	yes			12	0.020	0.040	4.408		0.12	± 0.24	0.24	± 0.48
LVANYX	Poor quality environment – any probs	76.3	0.181									
lvanyxR0	no			495	0.145	0.121	98.307	Red	0.32	± 0.64	1.04	± 2.05
lvanyxR1	yes			105	0.145	0.121	98.307		0.32	± 0.64	1.04	± 2.05

Footnotes:

[1] Multi-Level Modelling only analysed categories with a response. Categories where no response was provided have been excluded.

Key notations

~ = count of response options includes missing values. See crosstabulations for types of missing values.

* = value not reported as multi-level modelling produced on less than 12 responses to this variable. Results too variable to produce confident estimates, and therefore excluded.

- = results reported are negligible (values were greater than zero, however reported as 0.000). Although there is variability between surveyors for this variable, value reported is negligible, and therefore these values have been replaced with a "-".

"zero" = indicates no variability identified with this variable.

Appendix 1

Section 4: Stock Condition

				Multi Level Modelling[1]				RAG SCORE	Original Standard Errors		Revised Standard Errors	
Variable	Description	Observed Agreement (%)	Kappa Score	# obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	Overall	Standard error (SE)	CI ± %	Standard error (SE)	CI ± %
FSTPRES	Structural defects	91.7	0.242									
fstpresR1	Yes			35	0.055	0.034	10.418	Amber	0.24	± 0.47	0.40	± 0.79
fstpresR2	No			565	0.055	0.034	10.418		0.24	± 0.47	0.40	± 0.79
FSTMOVDE	Differential movement – Defect	91.3	0.219									
fstmovdeR1	Yes			6	*	*	*	Amber	0.09	± 0.18	0.09	± 0.18
fstmovdeR2	No			29	0.046	0.034	8.724		0.23	± 0.44	0.37	± 0.73
FSTFOUDE	Foundation settlement - Defect	91.3	0.216									
fstfoudeR1	Yes			4	*	*	*	Amber	0.10	± 0.20	0.10	± 0.20
fstfoudeR2	No			31	0.049	0.042	11.594		0.22	± 0.44	0.41	± 0.80
FEXRSFL	Faults – roof structure	96.0	-0.018									
fexrsflR1	Yes			12	0.020	0.033	3.601	Amber	0.15	± 0.29	0.24	± 0.47
fexrsflR2	No			588	0.020	0.033	3.601		0.15	± 0.29	0.24	± 0.47
FEXRSUR	Urgent repair – roof structure	96.0	-0.015									
fexrsurR1	Yes			3	*	*	*	Amber	0.06	± 0.12	0.06	± 0.12
fexrsurR2	No			9	*	*	*		0.14	± 0.27	0.14	± 0.27
FEXRCFL	Faults – roof covering	85.3	0.392									
fexrcflR1	Yes			84	0.121	0.037	24.849	Amber	0.32	± 0.63	0.59	± 1.16
fexrcflR2	No			516	0.121	0.037	24.849		0.32	± 0.63	0.59	± 1.16
FEXRCUR	Urgent repair – roof covering	83.0	0.319									
fexrcurR1	Yes			27	0.043	0.025	6.097	Amber	0.21	± 0.41	0.32	± 0.63
fexrcurR2	No			57	0.086	0.030	14.485		0.26	± 0.51	0.46	± 0.91
FEXWSFL	Faults – wall structure	92.0	0.158									
fexwsflR1	Yes			30	0.048	0.068	18.174	Amber	0.19	± 0.38	0.47	± 0.92
fexwsflR2	No			570	0.048	0.068	18.174		0.19	± 0.38	0.47	± 0.92
FEXWSUR	Urgent repair – wall structure	92.0	0.162									
fexwsurR1	Yes			3	*	*	*	Amber	0.10	± 0.19	0.10	± 0.19
fexwsurR2	No			27	0.043	0.070	16.787		0.17	± 0.33	0.44	± 0.87
FEXWFFL	Faults – wall finish	78.7	0.334									
fexwfflR1	Yes			120	0.161	0.035	31.455	Amber	0.38	± 0.74	0.67	± 1.32
fexwfflR2	No			480	0.161	0.035	31.455		0.38	± 0.74	0.68	± 1.32
FEXWFUR	Urgent repair – wall finish	75.7	0.276									
fexwfurR1	Yes			31	0.049	0.011	2.922	Amber	0.23	± 0.44	0.28	± 0.55
fexwfurR2	No			89	0.127	0.027	18.975		0.33	± 0.64	0.55	± 1.07
FEXWNFL	Faults – windows	88.0	0.512									
fexwnflR1	Yes			86	0.123	0.029	19.990	Amber	0.35	± 0.68	0.57	± 1.11
fexwnflR2	No			514	0.123	0.029	19.990		0.35	± 0.68	0.57	± 1.11
FEXWNUR	Urgent repair – windows	83.3	0.349									
fexwnurR1	Yes			37	0.058	0.045	14.637	Amber	0.25	± 0.49	0.46	± 0.90
fexwnurR2	No			49	0.075	0.034	14.400		0.27	± 0.52	0.46	± 0.91

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Section 4: Stock Condition

				Multi Level Modelling[1]				RAG SCORE	Original Standard Errors		Revised Standard Errors	
Variable	Description	Observed Agreement (%)	Kappa Score	# obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	Overall	Standard error (SE)	CI ± %	Standard error (SE)	CI ± %
FEXDFFL	Faults – external doors	89.0	0.398									
fexdfflR1	Yes			61	0.092	0.007	3.725	Amber	0.29	± 0.56	0.35	± 0.68
fexdfflR2	No			539	0.092	0.007	3.725		0.29	± 0.56	0.35	± 0.68
FEXDFUR	Urgent repair – external doors	86.3	0.273									
fexdfurR1	Yes			30	0.048	0.026	7.006	Amber	0.21	± 0.41	0.34	± 0.66
fexdfurR2	No			31	0.049	0.023	6.191		0.21	± 0.41	0.33	± 0.64
FINCHBAC	Boiler – actionrequied	95.0	0.191									
finchbacR1	None			581	0.031	zero	zero	Amber	0.18	± 0.36	0.18	± 0.36
finchbacR2	Minor repair			13	0.021	0.011	1.333		0.13	± 0.26	0.18	± 0.35
finchbacR3	Major repair			4	*	*	*		0.05	± 0.11	0.05	± 0.11
finchbacR4	Replace			1	*	*	*		0.08	± 0.16	0.08	± 0.16
FINCHBAR	Boiler age – ranges	70.0	0.563									
finchbagR1	0 to 7 years			300	0.250	0.004	6.092	Amber	0.45	± 0.88	0.51	± 1.00
finchbagR2	8 to 13 years			108	0.148	zero	zero		0.36	± 0.72	0.36	± 0.72
finchbagR3	14 to 18 years			55	0.084	zero	zero		0.28	± 0.54	0.28	± 0.54
finchbagR4	19 to 28 years			79	0.117	0.005	3.150		0.33	± 0.66	0.38	± 0.74
finchbagR5	29 or more			42	0.065	0.021	7.769		0.25	± 0.48	0.37	± 0.73
DHMODX	Decent Homes modern facilities criterion	95.0	0.094									
dhmodxR0	pass			583	0.029	zero	zero	Amber	0.16	± 0.30	0.16	± 0.30
dhmodxR1	fail			17	0.029	zero	zero		0.16	± 0.30	0.16	± 0.30
DHOMESY	Decent homes - HHSRS 15 model	78.0	0.385									
dhomesyR0	decent			460	0.179	0.014	13.656	Amber	0.42	± 0.82	0.56	± 1.09
dhomesyR1	non-decent			140	0.179	0.014	13.656		0.42	± 0.82	0.56	± 1.09
DHOMESZ	Decent homes - HHSRS 26 model	78.0	0.403									
dhomeszR0	decent			454	0.185	0.011	11.739	Amber	0.42	± 0.82	0.54	± 1.06
dhomeszR1	non-decent			146	0.185	0.011	11.739		0.42	± 0.82	0.54	± 1.06
DHDISRX	Decent Homes repair criterion	93.3	0.341									
dhdisrxR0	pass			568	0.051	0.013	3.787	Amber	0.22	± 0.43	0.29	± 0.57
dhdisrxR1	fail			32	0.051	0.013	3.787		0.22	± 0.43	0.29	± 0.57
DHTHERMY	Decent Homes Thermal Comfort Criterion	95.0	0.545									
dhthermyR0	pass			565	0.055	0.017	5.237	Amber	0.28	± 0.55	0.36	± 0.71
dhthermyR1	fail			35	0.055	0.017	5.237		0.28	± 0.55	0.36	± 0.71
DHHHSRSX	Decent Homes HHSRS 15 criterion	82.3	0.288									
dhhhsrsxR0	pass			513	0.124	0.026	18.040	Amber	0.37	± 0.72	0.56	± 1.10
dhhhsrsxR1	fail			87	0.124	0.026	18.040		0.37	± 0.72	0.56	± 1.10
DHHHSRSY	Decent Homes HHSRS 26 criterion	81.0	0.299									
dhhhsrsyR0	pass			503	0.136	0.013	9.524	Amber	0.37	± 0.73	0.48	± 0.95
dhhhsrsyR1	fail			97	0.136	0.013	9.524		0.37	± 0.73	0.48	± 0.95
HSRALL_26	HHSRS 2009: Overall all 26 hazards	81.0	0.299									
hsrall_26R0	OK			503	0.136	0.013	9.524	Amber	0.37	± 0.73	0.48	± 0.95
hsrall_26R1	Fails			97	0.136	0.013	9.524		0.37	± 0.73	0.48	± 0.95

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Section 4: Stock Condition

Variable	Description	Observed Agreement (%)	Kappa Score	Multi Level Modelling[1] # obs	Multi Level Modelling[1] Total Variance	Multi Level Modelling[1] Correlated Surveyor Variance (CSV)	Multi Level Modelling[1] Bias Adjustment ($x10^{-6}$)	RAG SCORE Overall	Original Standard Errors Standard error (SE)	Original Standard Errors CI ± %	Revised Standard Errors Standard error (SE)	Revised Standard Errors CI ± %
HSRFALLS	HHSRS falls category 1	87.3	0.277									
hsrfallsR0	no category 1 fall hazard			542	0.088	0.038	18.688	Amber	0.30	± 0.59	0.53	± 1.03
hsrfallsR1	has category 1 fall hazard			58	0.088	0.038	18.688		0.30	± 0.59	0.53	± 1.03
HSRCLD	HHSRS – cold homes	96.3	0.601									
hsrcldR0	OK			571	0.046	0.014	3.683	Green	0.25	± 0.49	0.32	± 0.62
hsrcldR1	Fails			29	0.046	0.014	3.683		0.25	± 0.49	0.32	± 0.62
DAMPALF	Damp – problem present?	91.7	0.281									
dampalfR0	No damp			563	0.058	0.010	3.222	Amber	0.25	± 0.49	0.31	± 0.60
dampalfR1	Damp in one or more rooms			37	0.058	0.010	3.222		0.25	± 0.49	0.31	± 0.60
CSTACTBX	Basic repair costs – actual (banded)	41.7	0.209									
cstactbxRB0	zero			197	0.222	0.032	39.320	Amber	0.42	± 0.83	0.76	± 1.48
cstactbxRB1	up to 1000			215	0.231	0.031	39.625		0.41	± 0.81	0.75	± 1.48
cstactbxRB2	over 1000, up to 2000			78	0.113	0.010	6.580		0.31	± 0.61	0.40	± 0.79
cstactbxRB3	over 2000, up to 3000			36	0.057	zero	zero		0.23	± 0.46	0.23	± 0.46
cstactbxRB4	over 3000, up to 4000			18	0.029	zero	zero		0.19	± 0.37	0.19	± 0.37
cstactbxRB5	over 4000, up to 5000			16	0.026	0.022	3.136		0.14	± 0.28	0.23	± 0.45
cstactbxRB6	over 5000			40	0.063	0.020	6.983		0.24	± 0.48	0.36	± 0.71
CSTSTDBX	Basic repair costs (per square metre)	53.0	0.263									
cststdbxRB0	zero			197	0.222	0.032	39.320	Amber	0.42	± 0.83	0.76	± 1.48
cststdbxRB1	greater than zero, and less than or equal to 20			296	0.251	0.025	35.381		0.45	± 0.88	0.75	± 1.46
cststdbxRB2	greater than 20, and less than or equal to 35			49	0.075	0.020	8.386		0.26	± 0.51	0.39	± 0.77
cststdbxRB3	greater than 35, and less than or equal to 35			39	0.061	zero	zero		0.22	± 0.43	0.22	± 0.43
cststdbxRB4	greater than 65			19	0.031	0.037	6.319		0.20	± 0.39	0.32	± 0.63

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Key notations

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Section 5: Energy Performance

Variable	Description	Observed Agreement (%)	Kappa Score	Multi Level Modelling[1] # obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	RAG SCORE Overall	Original Standard Errors Standard error (SE)	Original Standard Errors CI ± %	Revised Standard Errors Standard error (SE)	Revised Standard Errors CI ± %
FINMHFUE	Main heating fuel	99.0	0.965									
finmhfuer1	Gas			502	0.137	-	-	Green	0.32	± 0.63	0.32	± 0.63
finmhfuer2	Oil			14	0.023	zero	zero		0.17	± 0.33	0.17	± 0.33
finmhfuer3	Solid Fuel			2	*	*	*		0.08	± 0.15	0.08	± 0.15
finmhfuer4	Electric			52	0.079	zero	zero		0.26	± 0.51	0.26	± 0.51
finmhfuer5	Communal			29	0.046	zero	zero		0.09	± 0.18	0.09	± 0.18
FUELX	Main fuel type	99.3	0.977									
fuelxr0	not identified - communal system			29	0.046	zero	zero	Green	0.10	± 0.19	0.10	± 0.19
fuelxr1	gas fired system			502	0.137	-	-		0.32	± 0.63	0.32	± 0.63
fuelxr2	oil fired system			14	0.023	zero	zero		0.17	± 0.33	0.17	± 0.33
fuelxr3	solid fuel fired system			2	*	*	*		0.08	± 0.15	0.08	± 0.15
fuelxr4	electrical system			53	0.081	-	-		0.27	± 0.53	0.27	± 0.53
FINCHTYP	Type of primary heating system	98.7	0.953									
finchtypr1	Central heating (wet with rads)			505	0.134	-	-	Green	0.31	± 0.60	0.31	± 0.60
finchtypr2	Storage heaters			43	0.067	zero	zero		0.23	± 0.45	0.23	± 0.45
finchtypr3	Warm air			10	*	*	*		0.09	± 0.18	0.09	± 0.18
finchtypr4	Communal/CHP			29	0.046	zero	zero		0.09	± 0.19	0.09	± 0.19
finchtypr5	Electric ceiling/underfloor			1	*	*	*		0.06	± 0.12	0.06	± 0.12
finchtypr6	Room heaters			11	*	*	*		0.15	± 0.30	0.15	± 0.30
HEAT4X	Main heating system	99.0	0.941									
heat4xr1	central heating			545	0.083	-	-	Green	0.28	± 0.55	0.28	± 0.55
heat4xr2	storage heater			47	0.072	zero	zero		0.24	± 0.47	0.24	± 0.47
heat4xr3	fixed room heating			8	*	*	*		0.16	± 0.31	0.16	± 0.31
FLIINSUL	Roof insulation above living space present	95.7	0.890									
fliinsulr1	Yes			452	0.187	-	-	Green	0.35	± 0.68	0.35	± 0.68
fliinsulr2	No			11	*	*	*		0.16	± 0.31	0.16	± 0.31
FLITHICK	Loft insulation thickness	59.0	0.495									
flithickr0	No insulation			11	*	*	*	Amber	0.16	± 0.31	0.16	± 0.31
flithickr1	50mm or less			43	0.067	0.025	9.366		0.27	± 0.53	0.41	± 0.80
flithickr2	75mm			40	0.062	zero	zero		0.25	± 0.49	0.25	± 0.49
flithickr3	100mm			109	0.149	0.019	15.542		0.38	± 0.75	0.55	± 1.08
flithickr4	125 to 150mm			72	0.106	0.020	11.598		0.32	± 0.62	0.47	± 0.91
flithickr5	>150mm			184	0.213	0.006	6.836		0.36	± 0.71	0.45	± 0.88
LOFTINS6	Loft insulation thickness	63.3	0.528									
loftins6r1	none			11	*	*	*	Amber	0.16	± 0.31	0.16	± 0.31
loftins6r2	less than 50mm			6	*	*	*		0.14	± 0.28	0.14	± 0.28
loftins6r3	50 up to 99mm			90	0.128	0.009	6.413		0.35	± 0.69	0.43	± 0.85
loftins6r4	100 up to 149mm			161	0.197	0.011	11.776		0.42	± 0.82	0.54	± 1.06
loftins6r5	150 up to 199mm			56	0.088	zero	zero		0.29	± 0.57	0.29	± 0.57
loftins6r6	200mm or more			188	0.216	0.005	5.674		0.37	± 0.73	0.44	± 0.86
FHQCAVIT	Cavity wall insulation present	71.3	0.528									
fhqcavitr1	Yes			237	0.240	-	0.488	Amber	0.39	± 0.77	0.40	± 0.78
fhqcavitr2	No			281	0.250	0.012	16.569		0.44	± 0.86	0.60	± 1.17

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Section 5: Energy Performance

Variable	Description	Observed Agreement (%)	Kappa Score	Multi Level Modelling[1] # obs	Total Variance	Correlated Surveyor Variance (CSV)	Bias Adjustment ($x10^{-6}$)	RAG SCORE Overall	Original Standard Errors Standard error (SE)	Original Standard Errors CI ± %	Revised Standard Errors Standard error (SE)	Revised Standard Errors CI ± %
DBLGLAZ4	Extent of double glazing	88.0	0.705									
dblglaz4r1	no double glazing			56	0.085	zero	zero	Green	0.25	± 0.50	0.25	± 0.50
dblglaz4r2	less than half			29	0.046	zero	zero		0.21	± 0.41	0.21	± 0.41
dblglaz4r3	more than half			61	0.092	zero	zero		0.31	± 0.60	0.31	± 0.60
dblglaz4r4	entire house			454	0.185	zero	zero		0.40	± 0.78	0.40	± 0.78
SAP05	Energy Efficiency (SAP 05) rating	76.0	0.616									
sap05r1	less than 30			26	0.042	0.009	2.040	Green	0.24	± 0.47	0.28	± 0.55
sap05r2	greater than or equal to 30, and less than 50			170	0.204	0.003	3.299		0.42	± 0.82	0.46	± 0.90
sap05r3	greater than or equal to 50, and less than 70			311	0.250	zero	zero		0.45	± 0.88	0.45	± 0.88
sap05r4	greater than or equal to 70			93	0.131	0.006	4.320		0.27	± 0.52	0.34	± 0.66
EPCEEB05E3	EPC energy efficiency band – 3 groups	87.0	0.708									
epceeb05e3R1	A, B or C			107	0.147	0.003	2.630	Green	0.30	± 0.58	0.34	± 0.66
epceeb05e3R2	D or E			429	0.204	0.004	4.065		0.41	± 0.79	0.45	± 0.89
epceeb05e3R3	F or G			64	0.096	zero	zero		0.32	± 0.64	0.32	± 0.64

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