

**Scotland's Census 2021
Central Heating Topic Report**

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1. Main Points

- A question on central heating has been included in Scotland's Census since 1991. However, 2011 was the first time that type of central heating was collected.
- Strong user need was identified for data on type of central heating. This includes use in the analysis and monitoring of energy efficiency and fuel poverty and to inform where resources to support interventions with these should be prioritised; and by local authorities to identify dependence on specific types of heating, particularly in rural areas.
- In the [Topic Consultation Report](#) (PDF) NRS proposed to continue to collect information on central heating in 2021.
- The following changes to the question were tested:
 - Addition of response options including Other gas (including LPG and biogas), Biomass and Renewable energy sources (including electric and air heat pump systems).
 - Addition/review of in-question guidance
 - Removal of the text box from the 'Other' response option
- Research and analysis support taking a question on central heating further at this stage.
- The digital first approach for 2021 requires further development and user testing to fully understand the best way to present the questions online to maximise response, minimise respondent burden and ensure good quality data which meets user needs. An on-going programme of question development, focusing on sensitive or complex questions will further inform the specific question wording.

2. Introduction

This topic review sets out the evidence gathered in developing a central heating question for Scotland's Census 2021.

Question development for the 2021 Census began in 2015. An iterative and comprehensive process of user consultation, evaluation and prioritisation of user requirements, and qualitative and quantitative question testing has been carried out to inform decisions on the questions to be recommended for inclusion in the 2021 Census. More information about [research and preparation](#) and [question development](#) for Scotland's Census 2021 can be found online.

The 2021 Census will be digital first. The Census 2021 questionnaire must gather high quality data that meets user needs. More information about [key elements of the design](#) for 2021 can be found online.

Two frameworks have been published by National Records of Scotland (NRS) to evaluate the effectiveness of [question design for existing, alternative and new questions](#) (PDF) and to evaluate the effectiveness of [question design of tick box response options](#) (PDF).

Questions and their response options are evaluated against five main themes:

Strength of user need

- ✓ Data collected by the census must meet a user need for equality monitoring, policy development, resource allocation and/or service planning and delivery.

Suitability of alternative sources

- ✓ Data collected by the census must meet a user need that cannot be met elsewhere.

Acceptability, clarity and data quality

- ✓ Questions asked in the census must be acceptable to the majority of the public, clear and be designed with minimal respondent burden in order to obtain good data quality that meets user needs.

Comparability

- ✓ Data collected by the census should be comparable over time where possible, and harmonised across the UK where reasonable.

Operational considerations

- ✓ Census questions must be considered as part of the census as a whole, where effective digital and paper design, space and financial constraints must be considered. Additionally, some questions may be required for operational purposes in the process of conducting the census.

The final decision on the content of Scotland's Census 2021 questionnaire will ultimately be made by the Scottish Parliament.

As in previous years, there will be separate censuses conducted by the Office for National Statistics (ONS) in England and Wales, and the Northern Ireland Statistics and Research Agency (NISRA) in Northern Ireland. The three census offices work together to develop a set of questions that, wherever possible and necessary, will deliver harmonised outputs across the UK.

3. Background

Information on the availability of central heating is an important indicator of housing standards and quality. It is also used in the analysis and monitoring of energy efficiency and fuel poverty, and to inform where resources to support interventions with these should be prioritised.

Information from this question gives an insight into the types of fuels, dual-fuel systems and the uptake of energy-efficient systems across Scotland.

3.1 Previous Scotland's Census Central Heating Questions

Figure 1. Scotland's Census 2001 Central Heating Question

H6 Does your accommodation have central heating?

◆ If you have central heating available, ✓ 'Yes' whether or not you use it.

◆ Central heating includes:

- gas, oil or solid fuel central heating
- night storage heaters
- warm air heating
- underfloor heating

Yes, in some or all rooms

No

Figure 2. Scotland's Census 2011 Central Heating Question

H9 What type of central heating does this accommodation have?

◆ If the central heating is available, please tick the box whether or not you use it.

◆ Central heating is a central system that generates heat for multiple rooms.

No central heating

Gas

Electric (including storage heaters)

Oil

Solid fuel

Other central heating, please write in

Updates to the central heating question between 2001 and 2011 included the following changes:

1. The question was redesigned to ask about the fuel source of a household's central heating system, rather than just whether or not it had one. The additional data on type of central heating was collected to provide evidence of deprivation and fuel poverty as well as allowing an insight in to the types of fuel used by households. The 2011 question still allowed the identification of accommodation with no central heating.
2. The question stem was redesigned to make it clear that the question was about the property to which the census questionnaire had been addressed.
3. Addition of a guidance instruction describing what central heating is.

These changes were made in line with user needs identified in the [Spring 2007 Census Consultation](#).

The Census Quality Survey (CQS) agreement rates¹ can be found in Chapter 9 of the [2011 General Report](#). The rate for central heating was 94.8%.

¹ The CQS was a voluntary survey carried out after the census to measure the accuracy of responses in the census. The survey asked a sample of the population the same questions as were asked in the

Write-in Responses

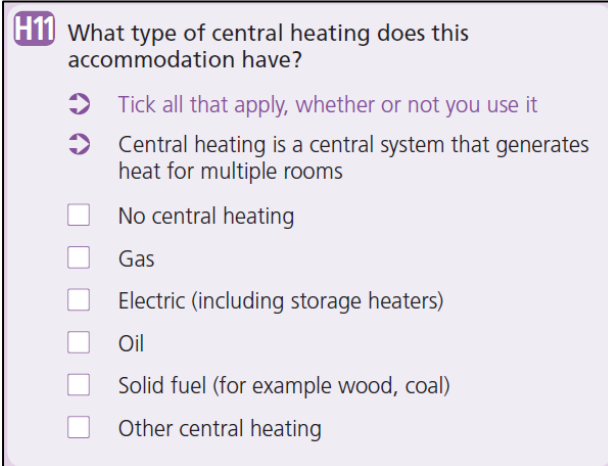
Analyses of write-in responses are discussed in further detail in the Understanding User Need section. However, it is worth noting that through these analyses it was identified that around 25% of the 23,400 write-in responses gave information that the question did not intend to capture. These write-in responses included the central heating suppliers (e.g. EDF), information on non-heating appliances (e.g. 'electric shower') and whether the central heating was working or not.

This indicates respondents did not understand what information the question was asking for.

3.2 Central Heating Questions in Other UK 2011 Censuses

The central heating question asked by ONS and NISRA is shown below in Figure 3.

Figure 1. ONS and NISRA Central Heating Question 2011



H11 What type of central heating does this accommodation have?

➤ Tick all that apply, whether or not you use it

➤ Central heating is a central system that generates heat for multiple rooms

No central heating

Gas

Electric (including storage heaters)

Oil

Solid fuel (for example wood, coal)

Other central heating

A key difference between the above question and the NRS question was that the NRS question did not include instruction to tick multiple answers while the question used by ONS and NISRA included 'Tick all that apply' guidance.

Additionally, the NRS question included a text box for respondents who selected 'Other central heating' to enter their central heating type, to allow respondents to indicate any form of central heating powered by renewable energy. The question used by ONS and NISRA did not include a text box.

census. Answers between the census and the CQS were compared and where responses differed, follow-up questions were asked of the respondents to determine why this was. Agreement rates were calculated for each question: the percentage of CQS respondents that gave the same response to the census and the CQS question. The CQS agreement rates are an indicator of quality for the Scotland's Census 2011 questions.

3.3 Alternative Sources

Since 2012, a set of core questions has been used to provide information on the composition, characteristics and attitudes of Scottish households and adults across a number of topic areas through the three largest surveys in Scotland:

- the [Scottish Household Survey](#) (SHS)
- the [Scottish Health Survey](#) (SHeS)
- the [Scottish Crime and Justice Survey](#) (SCJS)

A set of core and harmonised questions is recommended in order to provide comparable estimates across Scotland. More information can be found on the Scottish Government website ([Core Survey Questions](#)).

Central heating is not included in the Core and Harmonised Survey Questions.

The SHS collects information about central heating through a number of questions including what rooms are heated, what forms of heating are used, whether or not there is a thermostat.

None of the other social surveys listed above collect information on central heating.

4. Understanding user need

4.1 Topic Consultation

NRS invited views on [Scotland's Census 2021 – Topic Consultation](#) (PDF) between 8 October 2015 and 15 January 2016. The consultation was a key step towards understanding what information users will need from the census in 2021, and helped to build strong cases to justify the inclusion of topics. The focus of the consultation was on information required at topic-level, not the detail of the questions that should be asked on the questionnaire.

Following the consultation, NRS worked closely with stakeholders through follow-up events, meetings, focus groups and online surveys to gather more detailed information about data requirements to ensure user needs were understood. Information about these events can be found on our [Get Involved pages](#) online.

There were 46 responses received through the topic consultation on the subject of Housing and Accommodation, around 25 of which commented on central heating. A summary of these responses can be found in the [Topic Consultation Report](#) (PDF).

Through the consultation, stakeholders identified that data on type of central heating are used by local authorities to identify dependence on specific types of heating, particularly in rural areas. The information is also used in the analysis and monitoring of energy efficiency and fuel poverty and to inform where resources to support interventions with these should be prioritised.

In the [Topic Consultation Report](#), NRS proposed to continue to collect information on central heating type in Scotland's Census 2021.

4.2 Analysis of Response Options

Response options for this question were reviewed to ensure that they reflect the available types of central heating for 2021.

As part of this review, the write-in responses from the 2011 central heating question were analysed. NRS analysed 23,400 write-in responses and grouped them into 18 broad categories. These 18 categories have been grouped into three main types as detailed in table 1.

Broadly, 35% of write-in responses gave information that should have been captured in the existing response options. Around 25% gave information that was not intended to be collected by this question, for example central heating suppliers, information on non-heating appliances and whether the central heating was working or not. The remaining 40% gave responses which were valid and not covered by the existing response options.

Table 1. Scotland's Census 2011 - Central Heating Write-in Responses

Main Types	Type Description	Broad Categories
Already tick box (35% of responses)	Those that should/could have been captured by existing tick boxes e.g. 'gas', 'wood'	Multiple
		None
		Gas
		Electric
		Oil
		Solid
Not intended to be collected (25% of responses)	Those giving information other than that intended to be collected e.g. 'radiators', 'electric shower'	Unknown
		No fuel mentioned
		Not central heating
		Broken/Unused
		Central Heating Supplier
		Other
New category to consider (40% of responses)	Those that indicated valid responses not covered by an existing tick box	Bio
		Eco/renewable
		Ground Source Heat Pump
		Air Source
		Bottled Gas/LPG
		Communal/District

Based on the above analysis, the following changes were made to this question for testing:

1. Addition/review of response options

NRS developed a question for testing which included additional categories:

- Other gas (including LPG and biogas)
- Biomass
- Renewable energy sources (including electric and air heat pump systems)

2. Addition/review of in-question guidance

Inclusion of guidance for the 'Solid fuel' response option.

3. Removal of the text box

Given that 60% of the write-in responses for central heating fell into the first two categories above (already tick boxes or not intended to be collected) NRS tested versions of a central heating question which did not include a text box for the 'Other central heating' response option.

Removal of the text box would reduce coding requirements for this question.

5. Question testing

This section provides evidence from the question testing process carried out by NRS in the question development process for Scotland's Census 2021.

Both cognitive testing and quantitative testing processes were used in developing the questions for potential inclusion in Scotland's Census 2021.

1. Cognitive testing is a form of in depth interviewing with a small number of respondents. It aims to provide an insight into the mental processes respondents use when answering questions. This helps us to identify if there are any problems with a question or question design and gain an insight into the source of any difficulty respondents are having.
2. Quantitative testing is undertaken primarily to identify data quality concerns. NRS conducted a quantitative test in 2017 which included feedback questions in order to gather further information on public acceptability and to identify specific difficulties respondents faced if they were unable to answer a question easily.

In 2017 NRS commissioned ScotCen Social Research to conduct cognitive and quantitative testing of selected questions for potential inclusion in Scotland's Census 2021. Information about this testing can be found in the [2017 Cognitive and Quantitative Testing Report](#) (PDF).

5.1 Cognitive testing

Two versions of the central heating questions were tested as part of the 2017 Cognitive Testing. Version one asked about the 'type' of central heating in the accommodation (as the 2011 question did) whereas version two asked about the fuel used by the central heating in the accommodation.

In both versions, the order of the points of guidance was swapped from the order in the Scotland's Census 2011 question. The aim of this was to draw respondents' attention to the guidance on what central heating is.

As discussed in section 4.2, the versions of the central heating question tested included a number of new response options and did not include a write-in response option for those who selected 'Other'.

Both versions are shown below, along with the key aims and results of testing.

Version one

Q2A. What type of central heating does this accommodation have?

Central heating is a central system that generates heat for **multiple rooms**.

If central heating is available, please select the type.

- No central heating
- Mains gas
- Other gas (including liquid petroleum gas and biogas)
- Electric (including storage heating)
- Oil
- Wood or biomass (logs, pellets, chippings)
- Other solid fuel (coal, coke)
- Other renewable energy source (including electric and air heat pump systems)
- Other

◀ Previous Stop ■ Next question ▶

Version two

Q2B. What type of fuel does the central heating in this accommodation use?

Central heating is a central system that generates heat for **multiple rooms**.

If central heating is available, please select the fuel.

- No central heating
- Mains gas
- Other gas (including liquid petroleum gas and biogas)
- Electric (including storage heating)
- Oil
- Wood or biomass (logs, pellets, chippings)
- Other solid fuel (coal, coke)
- Other renewable energy source (including electric and air heat pump systems)
- Other

◀ Previous Stop ■ Next question ▶

Aims of cognitive testing:

- Establish whether respondents understood terminology used in both versions.
- Establish whether respondents could easily answer the question, including whether the appropriate response options were available.
- Explore respondents' preference between the two versions of the question.

Key results:

- Both versions were subject to some misunderstanding of the term 'central heating' and errors in response mapping.
- Three key causes of error in respondent response were identified:
 - a. Uncertainty on the type of central heating - particularly prevalent amongst respondents who were renting their properties.
 - b. Confusion over terminology - including either a lack of understanding, or misunderstanding, of the term 'central heating'. For example, respondents responding about the energy source for non-heating appliances.
 - c. An inability to locate the correct (or desired) answer in the list of response options.
- There was no clear respondent preference for either version of the question.

Further discussion of the cognitive testing of the central heating question can be found in Annex A.

5.2 Quantitative testing

The central heating question that was carried forward to the 2017 Quantitative Testing is shown below.

Quantitative Test – Paper Version

- 6 What type of central heating does this accommodation have?**
- ◆ Central heating is a central system that generates heat for **multiple** rooms
 - ◆ If the central heating is available please tick the box, whether or not you use it
- No central heating
 - Mains gas
 - Other gas (including liquid petroleum gas and biogas)
 - Electric (including storage heating)
 - Oil
 - Wood or biomass (logs, pellets, chippings)
 - Other solid fuel (coal, coke)
 - Other renewable energy source (including electric and air heat pump systems)
 - Other

Quantitative Test – Online Version

- Q6. What type of central heating does this accommodation have?**
- Central heating is a central system that generates heat for **multiple** rooms
 - If the central heating is available please select the type, whether or not you use it
- No central heating
 - Mains gas
 - Other gas (including liquid petroleum gas and biogas)
 - Electric (including storage heating)
 - Oil
 - Wood or biomass (logs, pellets, chippings)
 - Other solid fuel (coal, coke)
 - Other renewable energy source (including electric and air heat pump systems)
 - Other

Aims of quantitative testing:

- Look at the distribution of responses, including similarities and differences in distribution by mode, and renting status in comparison with 2011 census data;
- Look at the prevalence and components of multi-selection;
- Analyse item non-response rates and invalid responses as measures of data quality.

Key results:

- In total, 97% of all respondents gave a valid response to the central heating question. An invalid response was given by the remaining 3% (including those who had previously dropped out of completing the questionnaire).
- Introducing more types of central heating into the question, and omitting the write-in for the 'Other' response option, did not appear to have any effect on the data.
- The answers provided by respondents largely reflected the distributions of central heating types from Scotland's Census 2011.
- Around 5% of respondents selected multiple types of central heating; the equivalent in the general population in 2011 was 3%, and uptake of 'other' remained stable at 1% in both the census and the quantitative testing.
- Uptake of 'Other' was slightly higher amongst those who rented their accommodation, than those who did not. While base sizes amongst this group are small, and this finding has not been tested for significance, it could be indicative of a link between renting and uncertainty of central heating type.
- There were 57 cases of respondents selecting two types of central heating, and 9 cases of respondents selecting three or more types. Mains gas and electric are commonly selected in combination with each other. Around 82% of people who selected oil in combination with another type of central heating selected it in combination with wood or biomass. Interestingly, it should be noted that respondents only reported having other solid fuel as a form of central heating in combination with at least one other type.
- There were eight cases of invalid combination of responses, that is where a respondent selected 'No central heating' as well as one or more types of central heating. All of these invalid responses were attributable to the paper questionnaire as this type of response was not possible online.
- A feedback question asked "Did you find any of the following questions difficult to answer?" Of respondents that responded to this question, 25 indicated that they found the central heating question difficult to answer. Of these, 24 gave valid responses to the question. Of those who said they found the question difficult to answer, 10 rented their accommodation.

6. Other Considerations

During the Topic Consultation respondents highlighted information requirements for a range of additional housing and accommodation sub-topics. The majority of these requests were made for information to be collected on quality of accommodation, or house condition. Other suggestions made for collecting data relating to accommodation included affordability of heating, renewable energy and length of time in a dwelling/household mobility. However, there was insufficient user need identified through the Topic Consultation to consider including these sub-topics in Scotland's Census 2021.

7. Next Steps

Research and analysis support taking a question on central heating further at this stage.

NRS is continuing question development of a full question set for the 2021 Census and will be considering questionnaire design and respondent burden. The final decision on the content of Scotland's Census 2021 questionnaire will ultimately be made by the Scottish Parliament.

The digital first approach for 2021 requires further development and user testing to fully understand the best way to present the questions online to maximise response, minimise respondent burden and ensure good quality data which meets user needs. An on-going programme of question development, focusing on sensitive or complex questions will further inform the specific question wording.

More information about preparation for Scotland's Census 2021 and details about upcoming events can be found on the [Scotland's Census website](#), by subscribing to the [Scotland's Census newsletter](#) and following us on Twitter [@NatRecordsScot](#).

Annex A – Cognitive Testing – Central Heating

In 2017 NRS commissioned ScotCen Social Research to conduct cognitive and quantitative testing of selected questions for potential inclusion in Scotland's Census 2021. Information about this testing can be found in the [2017 Cognitive and Quantitative Testing Report](#) (PDF).

1. Questions tested and measurement aims

During the interviews two versions of a question on central heating were tested. These are shown below.

Questions tested on central heating

Version One

Q2A. What type of central heating does this accommodation have?

Central heating is a central system that generates heat for **multiple rooms**.

If central heating is available, please select the type.

- No central heating
- Mains gas
- Other gas (including liquid petroleum gas and biogas)
- Electric (including storage heating)
- Oil
- Wood or biomass (logs, pellets, chippings)
- Other solid fuel (coal, coke)
- Other renewable energy source (including electric and air heat pump systems)
- Other

◀ Previous Stop ■ Next question ▶

Version Two

Q2B. What type of fuel does the central heating in this accommodation use?

Central heating is a central system that generates heat for **multiple rooms**.

If central heating is available, please select the fuel.

- No central heating
- Mains gas
- Other gas (including liquid petroleum gas and biogas)
- Electric (including storage heating)
- Oil
- Wood or biomass (logs, pellets, chippings)
- Other solid fuel (coal, coke)
- Other renewable energy source (including electric and air heat pump systems)
- Other

◀ Previous Stop ■ Next question ▶

Version one asked what **type** of central heating the accommodation had while version two asked about the **fuel** the central heating uses. The aim of testing the two versions was:

- To establish whether respondents understood terminology used in each version of the central heating question; and
- To establish whether respondents could easily answer the question correctly, including whether the appropriate answer options were available.

Participants' preference between the two versions of the question was also explored.

2. Findings on comprehension of 'central heating'

Participants varied in whether they understood the term 'central heating' as intended:

- Some respondents felt they understood what the question was asking and found the guidance clear.
- Other respondents expressed confusion over the term 'central heating' and probing discovered that they had given inappropriate answers to the question. For example, some respondents had selected options that did not constitute part of their household's heating system, instead referring to energy for other appliances in their house.
- The central heating definition given in the question guidance ('central heating is a central system that generates heat for multiple rooms') did not appear to be consistently applied.

The effects these comprehension issues had on the data collected are discussed in more detail in Section 3.

3. Findings on response mapping and response options

Findings on response options were mixed. Some respondents appeared able to easily match their type of central heating with an available answer option, others found this process more difficult.

Some respondents felt unsure which category their central heating fell under. One respondent, who lived in rented accommodation, had underfloor heating and was unable to recall what energy source powered the underfloor heating. This respondent selected 'other'.

Other respondents felt there were too many response options listed, making the question difficult to read. Some respondents initially missed their desired response upon first read, and took a second read to find it. One respondent selected 'Other gas...' at Version One and 'Mains gas' at Version Two, as they were unable to find the 'Mains gas' option whilst answering the first version of the question.

When asked whether they thought any response options were missing, some respondents commented that there were no options for solar and wind power - these respondents did not consider these types of power to fall under the 'Other renewable energy source..' option.

A further respondent thought that 'Other renewable energy source' should be reworded to say 'Renewable energy, such as solar power and geothermal' to make it clearer. Another respondent commented that there was no answer option for 'portable gas', such as propane canisters. These comments indicate that there is some confusion around the wording of the response options.

In total four respondents gave different answers to the two versions of the question, or indicated that they were not sure about the accuracy of their answer. The details of these respondents are summarised in table A1.

Table A1: Concerning respondent responses to central heating questions

Version one response	Version two response	Comments and concerns
(9) Other	(9) Other	This respondent understood central heating to be ' <i>a system that provides heating if you turn it on in some way</i> '. They did not know what kind of energy was used to power the underfloor heating in their flat, as they rented the accommodation and utilities were included in their rent.
(3) Other gas...	(2) Mains gas	This respondent understood central heating to be ' <i>anything that looked like a radiator in each room</i> '. They selected 'Other gas...' at version one as they could not see mains gas in the list of options. When reviewing the list for version two, they found 'Mains gas' and selected it instead.
(4) Electric (including storage heating)	(8) Other renewable energy source...	This respondent understood the two questions to be asking different things; they thought version one was asking about what type of energy the central heating in their accommodation used, and answered 'electric'. This respondent then understood version two to be asking for the source of the electricity their household used and so selected 'Other renewable energy source...'. This indicates a lack of clarity around what the question was intending to ask.
(4) Electric (including storage heating)	(1) No central heating	This respondent explained that the room they rent has a storage heater, and version one made them think of the heating in this single room. However, when answering version two they thought about the whole accommodation and said that as it does not have a boiler or radiators, so they selected 'No central heating'. This respondent had not taken on board the guidance that central heating is a system used to generate heat for multiple rooms in responding to version one of the question.

One respondent had recently moved into new rented accommodation and said that they felt unsure about their answer. They explained that whilst they knew they had a radiator in their room, they weren't completely sure how it was powered. For this reason, they selected two answers ('Mains gas' and 'Electric...'), as a 'catch all' guess.

Based on the above, cognitive interviews showed three key causes of error in respondents' response mapping:

- Uncertainty on the type of central heating in their accommodation - particularly prevalent amongst respondents who were renting their properties.
- Confusion over terminology - including either a lack of understanding, or misunderstanding, of the term 'central heating', as well as confusion over what the term 'fuel' meant in version two.
- An inability to locate the correct (or desired) answer in the list of response options.

Errors and confusion were noted in both versions of the question. There is no evidence that one version of the question will yield more reliable results than the other, based on the response mapping.

4. Findings on preference between question versions

Some respondents preferred version one, because they did not understand the term 'fuel' used in version two, and felt this wording made the question more confusing. Such confusion led to one respondent selecting an incorrect response at version two. Another reason given for preferring version one was that the question read more 'naturally'.

Other respondents preferred version two because they felt the use of the term 'fuel' helped to clarify what the question was asking and make the question more 'specific'. However in practice it is unclear whether the use of the word 'fuel' made any difference in quality of responses.

Despite perceived benefits attributed to both questions by respondents, errors or expressions of confusion occurred in both versions. Therefore, the use of the word 'fuel' in version did not improve clarity.

Annex B – Quantitative Testing – Central Heating

In 2017 NRS commissioned ScotCen Social Research to conduct cognitive and quantitative testing of selected questions for potential inclusion in Scotland's Census 2021. Information about this testing can be found in the [2017 Cognitive and Quantitative Testing Report](#) (PDF).

1. Questions tested and aims of testing

A question on central heating was asked in Scotland's Census 2011. However, the question and its guidance are currently under review in a bid to improve data quality.

One question on type of central heating was included in the household section of the quantitative questionnaire for testing.

The question specifically asked about the type of central heating in the respondents' accommodation.

Quantitative Test – Paper Version

6 What type of central heating does this accommodation have?

- ◆ Central heating is a central system that generates heat for **multiple** rooms
- ◆ If the central heating is available please tick the box, whether or not you use it

- No central heating
- Mains gas
- Other gas (including liquid petroleum gas and biogas)
- Electric (including storage heating)
- Oil
- Wood or biomass (logs, pellets, chippings)
- Other solid fuel (coal, coke)
- Other renewable energy source (including electric and air heat pump systems)
- Other

Quantitative Test – Online Version

Q6. What type of central heating does this accommodation have?

- Central heating is a central system that generates heat for **multiple** rooms
- If the central heating is available please select the type, whether or not you use it

- No central heating
- Mains gas
- Other gas (including liquid petroleum gas and biogas)
- Electric (including storage heating)
- Oil
- Wood or biomass (logs, pellets, chippings)
- Other solid fuel (coal, coke)
- Other renewable energy source (including electric and air heat pump systems)
- Other

As shown above, the question being tested includes more types of central heating than were previously included, and omits the write in option for the 'Other central heating' category.

The aims of testing this question were:

- Look at the distribution of responses, including similarities and differences in distribution by mode, and renting status in comparison with 2011 census data;
- Look at the prevalence and components of multi-selection;
- Analyse item non-response rates and invalid responses as measures of data quality.

2. Central heating distribution²

In total, 97% of respondents provided a valid answer to the central heating question. An invalid response was given by 3% of respondents.

As shown in Table B2, the answers provided by respondents largely reflected the distributions of central heating types from Scotland's Census 2011.

There was a slightly higher proportion of respondents who reported either mains gas or other gas central heating, and a slightly lower proportion reporting electric, than in the 2011 Census, though the differences are small.

Around 5% of 2017 respondents selected multiple types of central heating; the equivalent in the general population in 2011 was 3%, and uptake of 'other' remained at 1% in both years.

This shows that introducing more types of central heating into the question, and omitting the write in from the 'other' category, did not appear to have a detrimental effect on the data.

² Figures in this report have been rounded to one decimal place.

Table B1: Central heating, total responses from 2017 test (weighted)

		Total n (2017 Test)	%
Central Heating	No central heating	25	2
	Mains gas	1,074	74
	Other gas (including liquid petroleum gas and biogas)	14	1
	Electric (including storage heating)	132	9
	Oil	63	4
	Wood or biomass (logs, pellets, chippings)	12	1
	Other solid fuel (coal, coke)	5	<1
	Other renewable energy source (including electric and air heat pump systems)	4	<1
	Other	8	1
	Multiple	64	4
	Total valid responses	1,401	96
Not applicable	0	0	
Invalid responses	53	4	
Total responses	1,454	100	

Table B2: Total valid responses to central heating, comparison between 2017 testing and 2011 Census (weighted)

		2017 (%)	2011 (%)
Central Heating	No central heating	2	2
	Mains gas	77	74
	Other gas (including liquid petroleum gas and biogas)	1	
	Electric (including storage heating)	9	13
	Oil	5	6
	Wood or biomass (logs, pellets, chippings)	1	1
	Other solid fuel (coal, coke)	<1	
	Other renewable energy source (including electric and air heat pump systems)	<1	
	Other	1	1
	Multiple	5	3
	Total valid responses	100	100

Central heating by mode

The proportion of respondents reporting that they had 'No central heating' did not differ greatly by mode (around 55% of respondents with 'No central heating' responded online and the remaining 45% on paper).

For respondents selecting multiple types of central heating, online responses accounted for around 42% of multiple selections, whilst paper accounted for around 58%, showing a slightly higher tendency to report more than one type of central heating on paper.

For types of central heating that indicated a larger mode preference, base sizes were very small and so any association is unlikely to be significant.

Table B3: Central heating by mode (as a percentage, based on weighted estimates of total valid responses)

		Mode		
		Number of responses - Online	Number of responses - Paper	Total
Central Heating	No central heating	55%	45%	100%
	Mains gas	53%	47%	100%
	Other gas (including liquid petroleum gas and biogas)	28%	72%	100%
	Electric (including storage heating)	54%	46%	100%
	Oil	46%	54%	100%
	Wood or biomass (logs, pellets, chippings)	23%	77%	100%
	Other solid fuel (coal, coke)	24%	76%	100%
	Other renewable energy source (including electric and air heat pump systems)	88%	12%	100%
	Other	49%	51%	100%
	Multiple	42%	58%	100%
	Total valid responses	51%	49%	100%

Central heating by renting status

Those who did not rent their accommodation accounted for 72% of valid responses to the question on tenure, compared with 28% of those who rented their accommodation - findings that are largely in line with the proportions of renters and non-renters in the testing sample.

Uptake of 'Other' was slightly higher amongst those who rented their accommodation, than those who did not. While base sizes amongst this group are small, and this finding has not been tested for significance, it could be indicative of a link between renting and uncertainty of central heating type. This finding was present during the strand two cognitive testing, during the first stage of this project.

Table B4: Central heating by renting status (as a percentage, based on weighted estimates of total valid responses, rows)

		Tenure		
		Rents	Doesn't Rent	Total valid responses
Central Heating	No central heating	2.1%	1.7%	1.8%
	Mains gas	70.9%	79.1%	76.8%
	Other gas (including liquid petroleum gas and biogas)	0.1%	1.4%	1.0%
	Electric (including storage heating)	17.9%	6.2%	9.4%
	Oil	2.3%	5.4%	4.5%
	Wood or biomass (logs, pellets, chippings)	0.7%	0.7%	0.7%
	Other solid fuel (coal, coke)	0.0%	0.5%	0.4%
	Other renewable energy source (including electric and air heat pump systems)	0.7%	0.1%	0.3%
	Other	1.0%	0.3%	0.5%
	Multiple	4.3%	4.7%	4.6%
	Total valid responses	100.0%	100.0%	100.0%

Central heating multi ticks

As shown in Table B5, there were 57 cases of respondents selecting two types of central heating, and nine cases of respondents selecting three or more types³.

When looking at the most common central heating types (mains gas, electric and oil), mains gas and electric are commonly selected in combination with each other.

Around 82% of people who selected oil in combination with another type of central heating selected it in combination with wood or biomass.

Interestingly, it should be noted that respondents only reported having 'Other solid fuel' as a type of central heating in combination with at least one other type.

³ Figures are unweighted counts

Table B5: Central heating multi ticks (unweighted counts)

		Mode		
		Number of responses - Online	Number of responses - Paper	Total
Number of Central Heating Ticks	Ticked 1 only	597	745	1,342
	Ticked 2 only	20	37	57
	Ticked 3+	6	3	9
	Total valid responses	623	785	1,408
	Not applicable	0	0	0
	Invalid responses	22	24	46
	Total responses	645	809	1,454

3. Invalid responses to central heating question

All types of invalid response

The majority of invalid responses (3% of total cases) to the central heating question were non-response, that is, the respondent did not answer the question. This includes those who had dropped out of completing the questionnaire. The remainder of invalid responses (1%) were the result of an invalid combination of responses, that is, where a respondent selected 'No central heating' and a valid type of central heating, e.g. 'Mains gas.'

Invalid responses to central heating by mode

While all cases of dropout prior to this question occurred online, the remaining invalid responses were attributable to the paper version of the questionnaire with a total of 16 item-non response and eight invalid combinations.

It should be noted, however, that all instances of invalid combinations were attributable to the paper questionnaire as this type of invalid was not technically possible on the online mode.

Table B6: Invalid central heating by mode (unweighted counts)

	Mode		
	Number of responses - Online	Number of responses - Paper	Total
Item non response – full completions	0	16	16
Item non-response – partial completions	22	0	22
Invalid multi-tick – paper only, single tick questions			
Invalid combination	0	8	8
Routing error	0	0	0
Total invalid responses	22	24	46
Not applicable	0	0	0
Total valid responses	623	785	1,408
Total responses	645	809	1,454

Invalid response by tenure

A total of 14 invalid responses were attributable to respondents who provided a valid response to tenure. Of these, five were attributable to respondents who rented their accommodation whilst nine were attributable to respondents who did not rent. Due to very small numbers, it is not possible to comment on any association here.

Table B7 Central heating by tenure (unweighted counts)

		Tenure					
		Number of responses - Rents	Number of responses - Doesn't Rent	Total valid responses	Not applicable	Invalid responses	Total responses
Central Heating	No central heating	6	17	23	0	0	23
	Mains gas	196	831	1,027	0	5	1,032
	Other gas (including liquid petroleum gas and biogas)	1	19	20	0	0	20
	Electric (including storage heating)	50	81	131	0	1	132
	Oil	10	89	99	0	0	99
	Wood or biomass (logs, pellets, chippings)	1	12	13	0	2	15
	Other solid fuel (coal, coke)	0	9	9	0	0	9
	Other renewable energy source (including electric and air heat pump systems)	2	3	5	0	0	5
	Other	4	2	6	0	1	7
	Multiple	14	52	66	0	0	66
	Total valid responses	284	1,115	1,399	0	9	1,408
Not applicable	0	0	0	0	0	0	
Invalid responses	5	9	14	1	31	46	
Total responses	289	1,124	1,413	1	40	1,454	

Non-response only⁴

As mentioned above, non-response accounted for 3% of total responses to the central heating question. Non-response in the 2011 Census in Scotland was 2%.

⁴ Note item non-response to the 2017 test and item non-response to the 2011 census are not directly comparable; there was no questionnaire drop-out or partial completion rate estimated for the 2011 census, which was primarily a paper questionnaire.

4. Feedback

The questionnaire was split into four sections online. At the end of each of the four sections respondents were asked to state if they found any questions within the section difficult to answer, and to provide feedback on why this was the case in an open text box. For the paper questionnaire, feedback questions were all included at the end of the full questionnaire.

When asked “Did you find any of the following questions difficult to answer?” 25 respondents selected that they found the central heating question difficult to answer.

When looking at response to the feedback question by validity of respondents response to the central heating question, we can see that of the 25 respondents who answered ‘yes’ that they found the question difficult, 24 provided a valid answer to the central heating question, while only one respondent did not.