

Article

Designing a digital-first census

How we designed a digital-first census to make sure everyone could take part and the response to this.

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1 . Main points

- Census 2021 was the first digital-first census and 88.9% of households in England and Wales responded online.
- 89.0% of all households were sent a letter with an access code asking them to take part in the census online, paper questionnaires were available on request; of those, 94.2% completed their census online and 5.8% on paper.
- Of the 11.0% of households sent paper questionnaires (including an access code to respond online), 46.4% completed it online.
- The digital-first approach improved people's experience completing the census, the quality of the data collected, and the way Census 2021 was carried out.

2 . Overview of the digital-first approach

Census 2021 was the first digital-first census in England and Wales. In the [2011 Census](#), all households were sent a paper questionnaire, which also included an access code to enable people to respond online. Just 16% of households chose this option. The use of digital services has increased dramatically since 2011. A digital-first design for the 2021 Census encouraged participants to respond to the Census online rather than on a paper questionnaire if able to do so. It provided several benefits, for both the respondent experience and the quality of the data. The digital-first approach also reduced impact on the environment and increased the efficiency of the data collection operation.

The priority for a census is to deliver population estimates that accurately reflect the makeup of the entire population. To do this, we needed to maximise response to the census and ensure that everyone was able to respond to the census in a way in which they were both willing and able. As such, the operational and [statistical design](#) for the 2021 Census was centred around an inclusive approach. From a digital inclusivity perspective, this meant providing:

- a user-friendly, accessible, respondent journey
- paper questionnaires via an appropriate means for those who needed them
- support via Census Support Centres, on the doorstep and via our contact centre

3 . Benefits of a digital-first approach

The digital-first design for the 2021 Census was built upon the intention to benefit both the respondent and the quality of the data.

Improved quality

“Soft validation” checks reduced the risk of respondents making errors, for example, when entering date of birth, the electronic questionnaire calculated the individual's age and asked for confirmation. [Search as you type and address look-up functionality](#) reduced the risk of error, maximised inclusion and made it quicker and easier for the respondent to complete the electronic questionnaire. Increasing online response also led to a reduced reliance on scanning hand-written responses on paper questionnaires and lowered the risk of problems encountered in previous censuses associated with scanning responses.

Reducing burden for respondents

Question routing meant that respondents were only presented with questions they needed to answer, for example if the respondent's main language was English (or was English or Welsh in Wales) the question "How well can you speak English?" did not appear when responding online.

If a household needed a new access code, they could go to the website and request an access code to be sent immediately to a UK mobile number via text message. This also made it easier for people helping others to respond. People were also able to obtain an individual access code in this way if they wished to respond separately from their household.

Timeliness of data

Receiving data about responding addresses as soon as they had submitted a census questionnaire online meant that we could monitor small area return rates daily. This meant that we could understand whether additional interventions were required (reminder letters, field visits, additional targeted communication) to increase response. Interventions could then be tailored to the demographics of the areas with lower levels of response.

Getting feedback quickly on any interventions and patterns of response meant that our field force was more efficient. A digital approach to managing the field force also meant we had access to data daily. For example, the number of visits made and the frequency with which they contacted householders, further optimising the field operation.

Environmental impact

Each household questionnaire covered 16 pieces of paper. With an excess of 27 million households contacted, and those in Wales getting both an English and a Welsh questionnaire, this would have meant using more than 450 million pieces of paper for a paper only census. An initial contact letter with an access code included just one piece of paper (as well as the supporting information leaflet also included with paper questionnaires) so required 15 fewer sheets than a paper questionnaire and avoided the additional costs and environmental impact associated with posting back a paper questionnaire, including additional envelopes, postage and processing and scanning paper forms.

4 . Paper strategy

Central to our digital-first design was our paper strategy. We wanted to provide paper questionnaires to those who needed them while encouraging people to respond online if they could. We also attempted to provide the most appropriate means for each household to respond to reduce the need for further contact. All households that had not completed a census questionnaire (online or on paper) after Census Day were visited by one of our census officers and sent one or more reminder letters.

Our [2017 Census Test](#) told us that households were more likely to respond on paper if sent a paper questionnaire and were more likely to respond online if sent a letter with an access code. Maximising the number of people responding online gave us the best chance to optimise the collection operation and improve the quality of the data. However, where many households were likely to need a paper questionnaire, we had to strike a balance between encouraging people to respond online if they could (by sending just a letter with an access code, rather than a paper questionnaire), and ensuring that those who were likely to need a paper questionnaire were able to get one easily. We therefore decided to send the majority of households a letter with an access code as their invitation to take part in the census. Paper questionnaires, however, were available for anyone who wished to use one.

5 . Ways of getting a paper questionnaire

Paper as first contact

In some areas of England and Wales, where the take-up of the online option was expected to be low but willingness to take part without further prompts (reminder letters or field visits) was high, the initial contact was a paper questionnaire, delivered by post. These paper questionnaires also included a unique access code to enable those who preferred to complete the census online to do so. Paper-first areas were [Lower Layer Super Output Areas \(LSOAs\)](#) in which all households were sent a paper questionnaire.

Paper questionnaire reminder

In some other areas, where paper questionnaires were judged to be more effective later in the operation, the initial contact letter included only a unique access code for online completion but a paper questionnaire was posted out at a later date to non-responding households as a reminder to respond.

Calling contact centre or requesting online

Anyone who wanted to complete a paper questionnaire could request one using the website or by calling our freephone helpline.

Handed out by field officers

Census field officers visited all addresses where no response had been received to remind people to respond and offer support if the household needed help to take part. At this point, field officers were able to supply paper questionnaires on the doorstep if requested (they could also help people to obtain an online access code).

Other assistance

For those who wanted to complete the census questionnaire online, but may have needed help to do so, face-to-face and over the phone assistance was offered through Census Support Centres in a variety of locations across the country. We also helped with completion at organised completion events (in person or virtually). Help was also available through our contact centre, including a service enabling people to complete the census by telephone, with interpretation support if needed.

6 . Online share of returns

We set a target of achieving at least 75% of responses to Census 2021 online. Our results far exceeded this target, with 88.9% of households across England and Wales that responded to the census choosing to do so online. The mode of initial contact (whether sent a paper questionnaire or a letter with an access code) strongly influenced whether people responded online or on paper, with 46.4% of households in paper-first areas responding online, compared with 94.2% of households in online-first areas. Therefore, it is important, that any interpretation of the online share of responses takes the paper strategy into account. As households that are sent paper questionnaires are more likely to respond on paper regardless of their digital skills, a lower online share of responses in paper-first areas is not necessarily indicative of a lower digital propensity.

Table 1: Percentage of online and paper Census 2021 responses
England and Wales

	England	Wales	England and Wales
Percentage of paper first households	9%	50%	11%
Online share for online first areas	94.2%	93.2%	94.2%
Online share for paper first areas	47.9%	42.1%	46.4%
Online share range for paper first areas	28.6% - 82.3%	28.6% - 64.4%	28.6% - 82.3%
Online share range for online first areas	74.9% - 100%	85.9% - 99.3%	74.9% -100%

Source: Office for National Statistics

Table 2: Top 10 local authorities by online share for online-first areas
England and Wales

Online share of responses for online-first areas

England local authority districts

Tower Hamlets	97.3
Newham	97.0
City of London	96.7
Slough	96.7
Hounslow	96.6
Wandsworth	96.5
Bracknell Forest	96.4
Lambeth	96.3
Hart	96.2
Harrow	96.2

Wales local authority districts

Cardiff	95.2
Newport	94.3
Vale of Glamorgan	94.2
Rhondda Cynon Taf	94.0
Flintshire	93.5
Wrexham	93.4
Caerphilly	93.4
Merthyr Tydfil	93.4
Swansea	93.3
Torfaen	93.3

Source: Office for National Statistics

Figure 1: Online share of responses by local authority

England and Wales

Download the data

[.xlsx](#)

7 . Census questionnaire returns over time

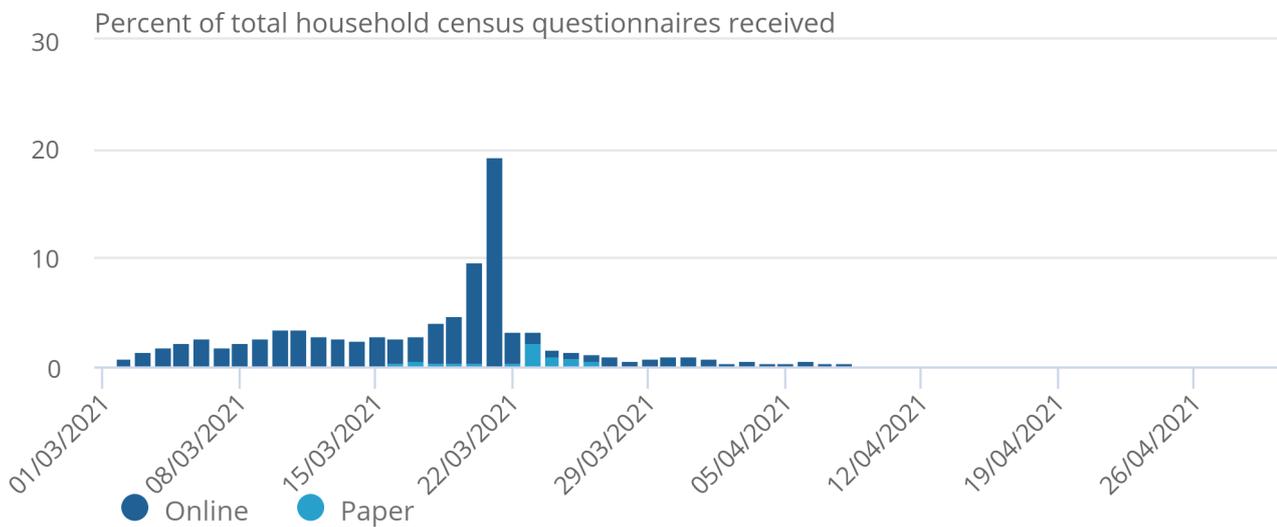
Just over 19% of all questionnaires from responding households were received on Census Day (21 March 2021), with over 80% received before 23 March. Over 85% of all households that responded online completed their questionnaire before 23 March. The daily peak for paper questionnaire receipting was on 23 March, when questionnaires from 19.6% of all households responding on paper were received.

Figure 2: The majority of Census questionnaires were received before 23 March

Percentage of total household Census questionnaires received by day by mode, England and Wales, 2021

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Percentage of total household Census questionnaires received by day by mode, England and Wales, 2021



Source: Office for National Statistics

8 . Paper questionnaire and access code requests

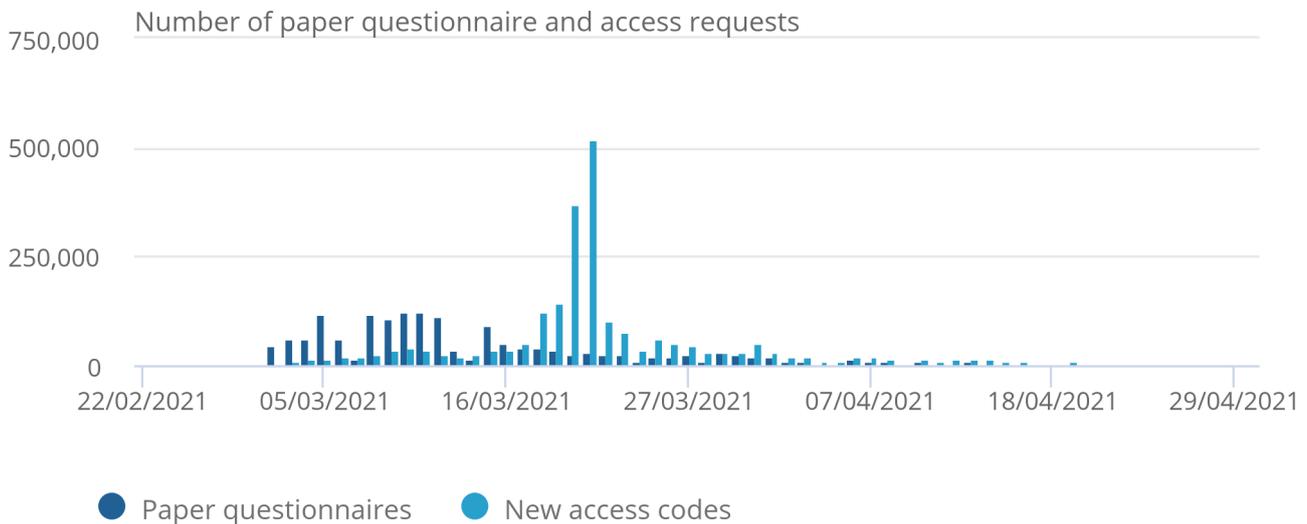
Households could request a paper questionnaire or new access code from the contact centre or website. Field staff were also able to give out or order these for households. Overall, in paper-first areas, 1.6% of households directly requested new paper questionnaires and 6.6% of households requested new access codes. In online-first areas, 7.5% of households requested paper questionnaires and 10% requested new access codes. In total, paper questionnaires were provided to 1.74 million households (excluding paper questionnaires delivered as initial contact or as a reminder). Field staff provided 239,000 households with paper questionnaires and ordered new access codes for 329,000 households.

Figure 3: Paper questionnaire and access requests over time

Number of paper questionnaire and access requests, England and Wales, 2021

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Number of paper questionnaire and access requests, England and Wales, 2021



Source: Office for National Statistics

Notes:

1. Census Day was 21 March 2021.

9 . Communal establishments

People living in communal establishments received either paper questionnaires or letters with access codes dependent on the type of accommodation. Residents of care homes, prisons, hospitals and hospices received paper questionnaires (with access codes to enable respondents to complete online), while students in halls of residence and people living in military establishments, hotels, boarding schools and religious establishments received letters with access codes.

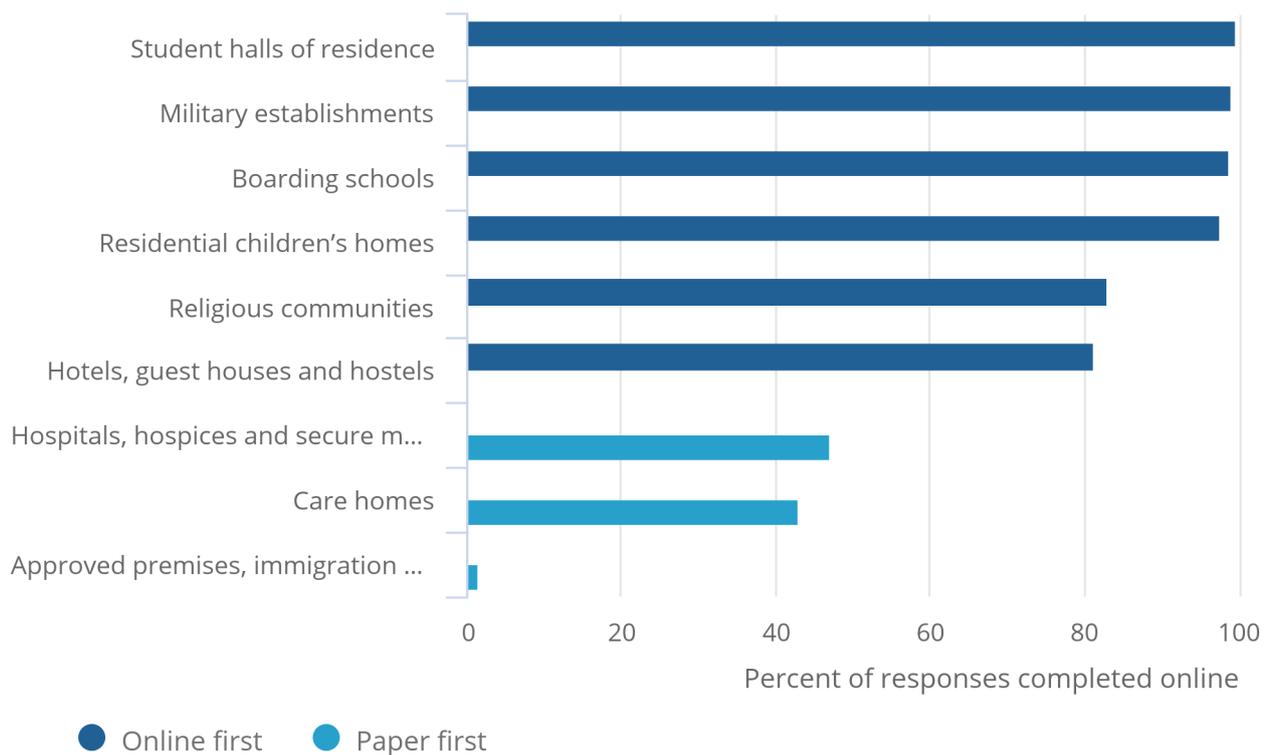
In establishments receiving paper questionnaires, 37.8% of residents responded online, while 98% of those in online-first establishments responded online. As with households, the mode of initial contact strongly influenced whether people responded online or on paper.

Figure 4: Online share of responses for residents in different types of communal establishment

England and Wales, 2021

Figure 4: Online share of responses for residents in different types of communal establishment

England and Wales, 2021



Source: Office for National Statistics

Notes:

1. Establishments where paper questionnaires were delivered are shown in light blue. Those in dark blue received invitation letters with access codes to enable them to respond online. Paper questionnaires were available on request for residents of all communal establishments.

10 . Designing a digital-first census data

[Census 2021 online share of household responses by Lower layer Super Output Area for England and Wales](#) Dataset | Released 4 October 2021 Proportion of households within each Lower layer Super Output Area (LSOA) that responded to the census online along with the LSOA codes and names, Local Authority codes and names, country name, paper first flag and hard-to-count digital and willingness indices.

11 . Data sources and quality

Paper as first contact

The areas that were sent paper questionnaires as initial contact were those where we assessed that households were likely to respond to the census without follow-up but may have had difficulty in doing so online. This is because these are the areas where households responded before our follow-up period in the 2011 Census but may not have done so without paper questionnaires in 2021. To ensure that we got the best level of response from these households without the need for follow-up activity, all households in these areas were therefore issued with paper questionnaires upfront. The decision about which areas would get paper questionnaires was not therefore based just on estimated levels of digital exclusion in an area, but importantly also considered how likely households in an area were to respond prior to follow-up.

The decision on whether households in each [Lower layer Super Output Area \(LSOA\)](#) would receive paper questionnaires or only the letter with online access code was based on their characteristics. All households within paper-first LSOAs thus received a paper questionnaire as initial contact (including an access code to enable online completion). Overall, 11% of households across England and Wales received paper questionnaires as initial contact, with all but fifty local authorities having at least some paper-first LSOAs and some local authorities having as many as 73% of households receiving paper questionnaires. The decision about exactly which LSOAs should be designated as paper-first was made based upon our hard-to-count index.

Paper questionnaires as a reminder

In addition to the paper questionnaires sent out as initial contact, households in some digital-first areas also received paper questionnaires later in the collection period as part of our reminder strategy. All households that had not yet responded to the census received at least one reminder letter as part of the follow-up operation in the three weeks following Census Day. In the fourth week following Census Day, an additional reminder was sent to households that had not yet responded, with some of these including a paper questionnaire. Both the reminder letters and paper questionnaires included new access codes to allow people to respond online. The areas (LSOAs) receiving paper questionnaires as a reminder were again selected based on our hard-to-count index.

Hard-to-count index

The hard-to-count index is based on models created to inform planning and resourcing assumptions. There are two parts to the hard-to-count index, the willingness index and digital index. The willingness index indicates the relative likelihood of residents in an area responding to the census without field visits or reminder letters. The digital index indicates the relative propensity of households in an area to respond to the census online. For each index (separately), every LSOA across England and Wales is ranked and then categorised as in Table 3.

Table 3: Hard-to-count group breakdown of ranked Lower layer Super Output Areas

Hard-to-count group Breakdown of ranked LSOAs

1 (Easiest)	Top 40%
2	40%
3	10%
4	8%
5 (Hardest)	Bottom 2%

Source: Office for National Statistics

The percentage of households in each hard-to-count digital and willingness grouping is shown in Table 4. Yellow cells represent those areas that received paper questionnaires as initial contact. The blue cells represent those areas where paper questionnaires were sent as a reminder to households that had not yet responded.

Table 4: Percent of households in each hard-to-count group

		Willingness Index				
		1	2	3	4	5
Digital Index	1	18.8%	12.7%	3.4%	3.8%	1.3%
	2	16.2%	17.1%	3.5%	2.8%	0.6%
	3	2.9%	5.1%	1.2%	0.7%	0.1%
	4	1.5%	4.0%	1.4%	0.7%	0.1%
	5	0.2%	0.8%	0.4%	0.4%	0.1%

Source: Office for National Statistics

The model underlying the hard-to-count willingness index was built upon the 2011 [hard-to-count index](#) and included the following variables as predictors of Census 2011 response before the follow-up period: ethnicity, accommodation type, age group, property price, region and social security benefits. The model used LSOA level 2011 census and administrative data for more recent years.

The digital hard-to-count index was based on a model using Driver and Vehicle Licencing Agency (DVLA) data on the completion of driving licence applications and renewals online or on paper (as this represents interaction with a government service with a similar digital-first approach), with OFCOM data on broadband connections, median age group and region as covariates in the model.

Testing and rehearsing the design

Whereas the willingness index was based on the hard-to-count index successfully used for the 2011 Census, the digital index was developed for the first time for Census 2021. We conducted a [large-scale census test](#) in 2017 to evaluate various aspects of the statistical design for the census, including the impact of sending paper questionnaires versus letters with access codes. We then rehearsed the final statistical design in a [large-scale census rehearsal](#) in 2019, including an evaluation of the hard-to-count indices and the paper-first strategy to ensure that we were using the best approach to maximise response and data quality and minimise respondent burden within an effective and efficient operational design.

12 . Related links

[Delivering the Census 2021 digital service](#) Article | Released 4 October 2021 How the technical aspects of the Census 2021 digital service were built.