

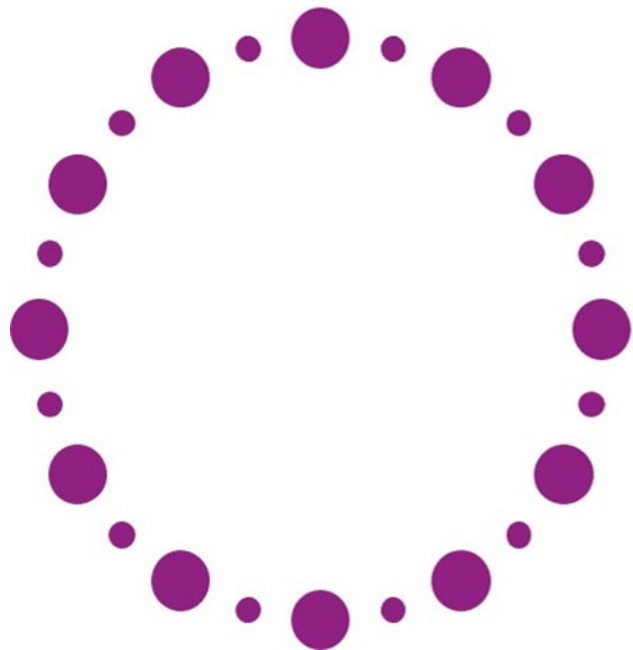
census
2021



Census 2021

Statement about data quality

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1. Introduction

The purpose of the census is to present a comprehensive picture of our population. A good census obtains complete and accurate responses directly from a high proportion of the population. This can be measured through two metrics:

- The first is the overall response rate – the number of responses received as a proportion of the responses expected.
- The second is the item response rate – this relates to how complete the responses are from those who made a return. Those who respond are asked a range of questions (or items), and the proportion who provide responses to each question is this measure.

Taken together, the response rate and the item response rate provide two independent measures of the quality of the census outputs. There are of course other aspects of quality associated with census outputs, and NISRA will publish a comprehensive quality report in due course. In the interim, this short paper aims to assist users by providing information on two aspects of quality: the response rate and the item response rate. More details on other aspects of quality can be found in the [Quality Assurance Strategy](#) and the [Quality Assurance Report](#) published in May 2022 with the first release of census outputs.

2. Response rate

On Census Day 2021 there were an estimated 1,903,200 usual residents living in Northern Ireland. Of this 1,844,500 people filled out a census return. The difference (58,700 people) was estimated using information from the field operation, administrative data, statistical modelling and the Census Coverage Survey. Thus it is estimated that 58,700 people were not included on a census return. This gives a final full census person response rate of 97% (1,844,500/1,903,200).

In 2011 the person response rate was 92% and in 2001 the person response rate was 95%. Thus the overall response rate to Census 2021 was the highest in recent times. As census users expect statistics to reflect the full population, Census Offices across the UK include modelled data in the 2021 Census to account for people who

did not respond¹. Thus locally 58,700 census non-response records (3%) have been modelled and the final results reflect the full estimated usual resident population.

The response rate can also be viewed in terms of households; on Census Day there were estimated to be 768,800 households in Northern Ireland, of which 746,900 provided a response with an estimated 21,900 non-responding households. This gives a household response rate of 97% (746,900/768,800). In 2011 the household response rate was 94% and in 2001 the household response rate was 95%.

Person and household response rates for each of the 11 Northern Ireland Local Government Districts are shown in [Annex 1: Northern Ireland Local Government District Response rate](#). The figures show that all Local Government Districts had person response rates of 95% or more and household response rates of 96% or more, reflecting the broadly even geographical distribution of participation.

3. Item response rate

Of the 746,900 responding households, just over 80% of returns were made online². On average online responses have a higher data quality than paper returns. This is due to a variety of reasons such as automated question routing, the presentation of one question at a time and the use of online validation.

Analysis of the first five questions on the 2021 questionnaire (first name, last name, date of birth, sex and marital status) showed the electronic questionnaires had a 99.5% item response rate while the paper questionnaires had a 96.4% item response rate.

Given the high level of online returns, the overall quality of the data collected in the 2021 Census was higher than in the 2011 Census. This differential in online and paper item response rates is common internationally and is a further argument for encouraging online census response.

¹ Modelled data for 'census not returned' was implemented in the 2001 and 2011 Censuses in all parts of the UK. For Northern Ireland 158,000 modelled records were added to the 2011 Census and 82,000 modelled records were added to the 2001 Census. In total 58,700 modelled records were added to the 2021 Census.

² In total, for persons 85% of returns were made online. The increase from household online percentage (80%) to person online percentage (85%) is due to households that contain more people tending to respond online. This position was to be expected, as households that contain fewer people tend to be older and thus more likely to respond on paper.

4. Imputation processes

Census outputs are designed to present a complete picture of the whole population. Census Office takes the 'enumerated' information provided from responding households and uses this data to estimate census outputs for the whole population. This adjustment, from enumerated data to final census estimates, involves two modelling processes called item imputation and person/household imputation (or coverage).

4.1. Item imputation

Consider first the 1,844,500 responding people (746,900 responding households). Any missing question or item responses were modelled using a donor imputation methodology designed and developed by Statistics Canada called CANCEIS³. This approach is an international standard and has been used in censuses in all parts of the UK and in other countries.

In this way, a complete census response is generated for all 1,844,500 responding people (746,900 responding households). At this stage, Census Office monitor the imputed responses to ensure that, within reasonable bounds, the distribution of the imputed responses is consistent with the distribution of the enumerated responses.

Taking part in the census is required by law, but there is no penalty for failing to complete questions on religion and sexual orientation. For both 'current religion' and 'sexual orientation', where a respondent filled in a return and the answer was missing, no modelling was undertaken. A count of the number of people who did not state their religion or sexual orientation are included in the Census 2021 outputs 'Not Stated' category for each question.

4.2. Person/Household imputation (coverage)

Now consider the estimated 58,700 people (21,900 households) from which a census response was not received. These were estimated and modelled using two processes.

³ More information on CANCEIS (CANadian Census Edit and Imputation System) is available in the online journal article - [Efficient methodology within the Canadian census edit and imputation system \(CANCEIS\)](#)

Through the field operation and access to high quality administrative data records, NISRA had evidence pointing to the presence of usual residents at a number of addresses with no census response. The Census 2021 Census Under Enumeration (CUE) process added 26,900 residents in 12,700 households.

As with the 2011 Census, this was only undertaken for completely non-responding addresses where Census Office considered that a response should have been received. The approach taken was cautious and is described in greater detail in the paper entitled '[Using an Administrative Primary Care Health Activity Indicator to Address Under-enumeration in the 2011 Census in Northern Ireland](#)', published after the 2011 Census. It should be noted that this method is now internationally recognised and has been used by New Zealand in their 2018 Census.

Separately, Census Office ran an independent Census Coverage Survey (CCS) immediately after the main census data collection of 16,000 addresses across Northern Ireland. The CCS results were matched to the 2021 Census and a capture-recapture statistical methodology was used to assess the numbers of households/individuals missed by the census enumeration. The statistical analysis showed that a coverage adjustment of around 31,900 people and 9,200 households was needed to create a complete estimate of the population and households in Northern Ireland.

The modelled CUE and CCS records were added to the census database. For both CUE and CCS addresses, the item distributions of the imputed households were monitored to ensure they were consistent with the distributions for enumerated households.

The end result is a census database with enumerated and modelled records covering 100% of the population, from which census outputs are produced. As a final check, for each item, the distributions of the enumerated cases were compared with the distribution of imputed cases.

5. Summary

In summary, the 2021 census data is based on 'enumerated' data provided by 97% of people and households, and using the imputation processes outlined in this paper, NISRA has generated a census database containing full census records (100% of items) covering 100% of usual residents and households, from which census outputs are produced.

6. Further work

The quantification of the response rate and the item response rate – and the steps taken to adjust for missing data and non-responding individuals and households – as outlined in this short note, gives users an indication of the quality of census outputs.

There are of course other aspects of quality. For example, extensive work has also been undertaken to compare the census estimates with appropriate administrative data sources, and the census estimates have been independently reviewed by a panel of four external experts, with experience of census and population estimates, who reported to the Registrar General.

A comprehensive census quality report, covering a wide range of quality issues, will be published in due course.

Annex 1: Northern Ireland Local Government District – Census 2021 response rates

The table below shows the person and household response rates for the Northern Ireland Local Government Districts, with the overall Northern Ireland rates shown for comparison.

Area	Person response rate	Household response rate
Antrim and Newtownabbey	98%	98%
Armagh City, Banbridge and Craigavon	97%	97%
Belfast	95%	96%
Causeway Coast and Glens	98%	98%
Derry City and Strabane	96%	96%
Fermanagh and Omagh	97%	97%
Lisburn and Castlereagh	98%	98%
Mid and East Antrim	98%	98%
Mid Ulster	97%	98%
Newry, Mourne and Down	97%	97%
Ards and North Down	98%	98%
Northern Ireland	97%	97%