

**census**  
2021



# Census 2021

# General Report

## December 2024



## Foreword by the Registrar General

The Census is the single largest, most prominent and most complex statistical exercise undertaken by government. Usually held once every decade, the information it collects provides a rich and detailed picture of the population and society of Northern Ireland, covering every individual and every household at a specific point in time.

The comprehensive nature of the census makes it crucial in a wide range of different settings. Census results are widely used by both central and local government to help to formulate policy, to plan services, and to allocate resources. Census data provides a critical benchmark for our population estimates and social survey data and is among few sources of accurate and detailed information for local areas and minority population groups. It provides a historical record, a source of genealogical information, and is an important asset for research. In these ways, the census is more than a source of data: it is a part of our statistical and data infrastructure.

This General Report reviews the entire Census 2021 operation – arguably the most successful ever carried out in Northern Ireland. It considers the planning, consultation and design stages, through to data collection and processing, to the production and dissemination of outputs. It provides a wealth of detail about how the census was carried out, what its key successes were and what has been learnt, in order to take forward plans for any future censuses.

Although every census has unique features – reflecting new developments in technology, methodologies and evolving socio-demographic and economic circumstances – the success of Census 2021 makes it a rich study in data collection.

As this report sets out, Census 2021 was the first census that actively encouraged the public to complete their census online. Our data collection systems were specifically designed to be easy to access and straightforward to use. And as a result, just over 80% of households opted to return their questionnaires online.

Technology and new methods also played a pivotal role in how our census fieldwork was carried out. All field staff were provided with a hand-held device which helped them to better manage their workload as they followed up non-responding households – significantly reducing the need for paper-based systems and increasing the efficiency of our operations. We also used a much more strategic approach to the data collection operation by utilising targeted enumeration to maximise response rates. This approach – known as the ‘wave of contact’ – helped us to focus delivery and collection activities on particular groups based on need.

As the census returns came in, changes in our internal processes gave us the capacity to examine the quality and content of the resulting data in more detail. NISRA staff took the lead on the processing of all census data in Northern Ireland, something which had been facilitated in past censuses by the Office for National Statistics (ONS). This investment gave us the chance to react in real-time when issues arose that affected the data collection and has played an important role in the success of subsequent census data led projects. Working in partnership with the ONS ensured that Census 2021 benefited from both a robust data collection infrastructure and our local, on-the-ground knowledge and provided excellent value for money.

Innovations in the way that data were collected were matched by changes to our suite of census outputs. NISRA produced a steady flow of Census 2021 insights from May 2022 onwards. A wide range of information is available in various formats through the NISRA website – providing headline results and more detailed tables to meet a wide range of user needs.

The development of the [Flexible Table Builder](#), also marks a watershed moment. This new, online tool allows users to create and download their own Census 2021 tables at various levels of geography and detail. This innovation provided a rich resource for all types of users to access census data on demand: replacing a slower, more burdensome commissioning process and making more of the data we collected available for public use.

Alongside the Flexible Table Builder, NISRA also published Census 2021 information in an interactive area based digital product known as the [Census Area](#)

[Explorer](#), a useful innovation for anyone looking to obtain census statistics for specific areas of geography by selecting them on a map.

These innovations have been delivered while maintaining the highest standards of data security to ensure the privacy, security and confidentiality of the information collected: something which is critical in ensuring respondents are happy to provide their information. An independent review commissioned jointly by the Office for National Statistics (ONS) and the Northern Ireland Statistics and Research Agency (NISRA) concluded, among other things, that “both the ONS and NISRA have comprehensive security programmes in place designed to reduce the risk of compromise to the delivery of the census and citizen data”. NISRA continues to strive to meet this high standard and to prioritise data security at all times.

Ultimately, however, the success of a census depends most heavily on the response and engagement of the public. Census 2021 achieved an overall household return rate of 97.1%, which compares very favourably to a return rate of 93.6% a decade earlier. Conducted against the background of a global pandemic – with all its challenges and restrictions – and at a time when response rates for surveys have fallen internationally, this is a remarkable outcome which likely sets a historic benchmark in census taking here.

In view of this achievement, I am hugely grateful to all those NISRA staff who were involved in delivering Census 2021 for their dedication and commitment, as well as to the approximately 1,900 temporary field staff ‘on the ground’. Significant thanks are also due to our colleagues at the ONS and the National Records of Scotland (NRS), as well as our many stakeholders, service providers and suppliers. And ultimately, I am very grateful to the general public for their astonishing and superb response, which provides the very strongest platform for many kinds of analysis, research and policy-design work for the next decade and beyond.

**Philip Wales**  
**Chief Executive and Registrar General for Northern Ireland**  
**NISRA**

## Contact details

Northern Ireland Statistics and Research Agency

Colby House

Stranmillis Court

Belfast

BT9 5RR

Telephone: +44 (0)300 200 7836

Email: [info@nisra.gov.uk](mailto:info@nisra.gov.uk)

Web: [www.nisra.gov.uk](http://www.nisra.gov.uk)

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## **1. Introduction and background**

### **1.1. Introduction**

The Census of Population and Housing is the most important single source of information about the size and characteristics of the country's most valuable resource – its population. All across the UK, very similar census questions are asked, and the information is collected, recorded and reported in the same way – allowing analysis and comparison of the population at both national and local levels. It also provides the opportunity to inter-relate various characteristics of the population. Change over time is important in terms of population so censuses are designed with as much consistency as possible between one and another.

### **1.2. Historical background**

The census is the largest and most complex statistical exercise undertaken in Northern Ireland. Since 1951, a census has taken place in Northern Ireland at the same time as the rest of the UK, at ten yearly intervals. There are two exceptions to this – an additional mid-term census was taken in Northern Ireland in 1966, while Scotland moved their most recent census to 2022, due to the COVID-19 pandemic.

### **1.3. Reasons for a Census**

The census has a unique role in providing wide-ranging and robust population statistics. Census data have many important uses and are essential in areas such as policy development, service planning and ensuring effective use of resources in the right areas. The data collected must be trustworthy, accurate and comparable across all parts of Northern Ireland. Currently, only a census provides this range of data on a consistent and uniform basis, both about Northern Ireland and about local areas and sub-groups of the population as a whole.

The following are some examples of the use of census data:

- allocation of public funds and resources;
- shaping government policy;

- informing delivery of services;
- planning by businesses;
- benchmarking for social and economic indicators;
- equality monitoring (age, sex, ethnicity, religion, and disability);
- academic research; and
- local investment.

#### **1.4. Legal basis and the UK context**

The statutory authority for taking a Census of Population and Housing in Northern Ireland is the Census Act (Northern Ireland) 1969. The Act gives the Registrar General for Northern Ireland powers for taking a census in any year that is at least five years from the year of the previous census. In recent decades, a decennial census pattern has been chosen. More details of Census 2021 legislation and parliamentary procedures are described in [section 2.3](#).

#### **1.5. Recommendations from Census 2011 and strategic aims and objectives for Census 2021**

Census 2021 was designed with a number of key strategic objectives:

- to provide high-quality, value-for-money, fit-for-purpose statistics that meet user needs, and which are consistent, comparable and accessible across the UK;
- to protect, and be seen to protect confidential personal census information;
- to deliver a high-quality online census data collection operation;
- to maximise overall response rates and minimise differences in response rates in specific areas and among particular population groups;
- to secure public and user confidence in the final results and deliver them in a timely manner; and
- to encourage wider use and exploration of census results to facilitate greater benefits from census outputs.

The design of Census 2021 in Northern Ireland took account of lessons learnt from the review and evaluation of the important processes that underpinned Census 2011. It also considered the development work happening in traditional census-taking countries, both within the UK and internationally. In summary, the important issues arising highlighted the need to:

- consider preparing different field strategies to maximise response rates for 'hard to reach' population groups;
- create a central team to collect returns from Communal Establishments (CEs) (for example, care homes) and secure accommodation addresses;
- ensure that the development of post-collection data processing systems was undertaken earlier, so that a full end-to-end test could be undertaken; and
- develop a community liaison strategy earlier in the census cycle.

#### **1.6. Key elements and innovations of Census 2021 design**

To achieve the key strategic aims and objectives as well as a need to respond to societal change since the last census, elements of the design needed alteration. Census 2011 was significantly different from any of its predecessors and Census 2021 continued this natural progression with further innovations introduced.

Changes in the makeup of society were not unexpected, having been evident in Census 2011, and these continued through into Census 2021, including:

- an increasingly ageing population;
- a more mobile population with more complex living arrangements;
- a more diverse population;
- increasing numbers of migrants; and
- greater numbers of single-person households.

The key elements of design were:

- Census 2021 would cover everyone usually resident in Northern Ireland on census night, with a subset of information collected on visitors;
- information would be collected from households and residents in Communal Establishments (CEs);
- information would be collected on vacant dwellings with no usual residents;
- the public would be encouraged to complete the census online and around 80% of households would receive an initial invitation to do so;
- paper questionnaires would be delivered to the remaining 20% of households (for example, in areas of limited broadband connection);
- option available to complete either online or on paper (irrespective of the initial contact);
- help would be available to anyone who had difficulty in completing the census questionnaire (whether completing online or on paper);
- reminder letters would be issued, and field staff would follow-up if no response had been received;
- census-type statistics would also be produced on former members of the UK armed forces – using administrative data;
- stringent confidentiality and security procedures would be used to protect the information gathered in the census;
- initiatives would be put in place to measure the quality of the information collected; and
- the statistical outputs from the census would be designed to meet user requirements, and dissemination would be to a pre-arranged timetable.

### **1.7. Impact of the COVID-19 pandemic**

Census 2021 was conducted against a backdrop of a worldwide global pandemic, in circumstances that were both difficult and unprecedented. This brought a number of challenges, not least the decision as to whether the census should even go ahead in 2021. Having taken the decision to proceed with Census 2021, several logistical

challenges then had to be overcome, as plans were regularly subject to change and often at short notice, due to COVID-19 restrictions. The operational areas most affected were those that should have involved direct face-to-face contact with the public. These included:

- community engagement – planned face-to-face meetings and events with councils, community groups, statutory bodies, schools etc. all moved online;
- recruitment and training of temporary staff – interviews and training events were all conducted online;
- field operations – follow-up with householders was more restrictive and had to be carried out in line with government guidelines on social distancing;
- address check – a physical check was to be carried out by field staff but was replaced with a desk-based exercise undertaken by NISRA (Census Office) staff;
- provision of help/support for completion – planned completion events and ‘assistance to complete’ initiatives did not take place due to the restrictions at the time and unavailability of the necessary facilities (for example, public libraries); and
- planned face-to-face meetings with delivery partners and stakeholders had to be carried out online.

NISRA followed relevant government advice in place at the time, consulting with the Public Health Authority (PHA) and engaging with the Chief Medical Officer (NI) as required.

Individual sections below will provide additional detail on the effects of COVID-19, where appropriate.

## 2. Planning and design

### 2.1. Introduction

Advance planning for a large-scale operation such as the census is essential. Extensive preparations were required, including putting the necessary legislation in place, understanding user need, developing the questionnaires and setting up and testing the mechanisms by which the census would be undertaken.

Planning for Census 2021 began in 2014 when NISRA recommended to the then Minister of Finance that a modernised census in 2021 was the best way to meet the need for collecting information required by government. This was accepted and NISRA published [The Future Provision of Census of Population Information for Northern Ireland](#) in October 2014.

Formal planning for Census 2021 started in September 2015. Overall, the design and content for Census 2021 were shaped by:

- successes and lessons learned from the 2011 Census;
- developments and lessons learned from international census taking;
- requirements from the user community about the types, quality, frequency and detail of outputs required ([topic consultation](#));
- changes in technology, in particular the opportunities offered by the internet;
- changes in the likelihood for the public to interact with government digitally, enabling a move away from a traditional mainly paper-based census;
- improvements in administrative data sources, giving potential for their increased use in the production of official statistics;
- the continued and ongoing need to make the most effective use of public money; and
- the completion of Equality Impact Assessments.



## 2.2. Date of Census and UK harmonisation

The choice of the date for the census is central to much of the planning and directly affects the quality of the data collected. The date of the census is set in secondary legislation and needs to be determined well in advance so that all aspects of the census can be planned accordingly. Although the census does not have to take place on a specific day of the week, a Sunday has traditionally been regarded as the most likely day that people will be at home. The date must be chosen to maximise the number of households present and to ensure minimum interruptions to the delivery and collection of the questionnaires. In selecting the date, a number of factors had to be taken into consideration including:

- avoiding holiday periods to:
  - maximise the number of people present at their usual residence;
  - maximise the number of students present at their term-time address; and
  - maximise recruitment/retention of field staff.
- avoiding elections (when the publicity messages may become confused);
- allowing sufficient hours of daylight for field work;
- managing anticipated volumes of online traffic;
- harmonisation across the UK; and
- ensuring a similar time of year to previous census (for comparability).

The UK Census Offices jointly agreed to hold the 2021 Census on Sunday 21 March 2021. However, in July 2020, due to the COVID-19 pandemic, the Scottish Government announced that their census would take place in March 2022. After careful consideration, NISRA and the ONS decided to continue with March 2021 as planned.

The three UK Census Offices worked closely throughout the 2021 (England, Wales and Northern Ireland) and 2022 (Scotland) Censuses. This close working was articulated through a Statement of Agreement on harmonisation and joint working

between the National Statistician and the Registrars General for Scotland and Northern Ireland ([Conduct of the 2021 Censuses in the UK](#)). This agreement was reviewed periodically, and updates were published outlining the progress made by the three Census Offices towards aspects of harmonisation.

Although the official date for the census was agreed as Sunday 21 March 2021, the recommendation of a digital-first approach meant that consideration had to be given to managing demand for the online service. Contrary to the approach taken in Census 2011, when the public were asked to complete their census questionnaire on census night, people were able to make their 2021 return prior to Census Day and indeed were encouraged to respond as soon as they were notified. Therefore, the census was effectively carried out over a three-month period from March to May 2021.

### **2.3. Legislation and NI Executive (Assembly) engagement**

Censuses in Northern Ireland are governed by legislation, the primary legislation being the [Census Act \(Northern Ireland\) 1969](#). The responsibility for making the necessary arrangements for planning, conducting and reporting on the census rests with the Registrar General for Northern Ireland. The conduct of the 2021 Census in Northern Ireland also required a [Census Order](#) and [Census Regulations](#) to be passed by the Northern Ireland Assembly. In preparation for this, NISRA published a [proposals document](#) in 2019 that described the planned census process from end-to-end. Alongside this, a number of [impact assessments](#) were published and these focussed on the identified requirements for each question and how NISRA would ensure that census data would be kept secure.

The content of the questionnaire was formally legislated for by the Assembly, with the topics to be covered being listed in a Schedule to [The Census Order \(Northern Ireland\) 2020](#), and a copy of the final questionnaire being included as a Schedule to [The Census Regulations \(Northern Ireland\) 2020](#).

UK harmonisation was achieved through close liaison and co-operation between the three UK statistics organisations (NISRA, the ONS and National Records of Scotland (NRS)), and through the agreement between the National Statistician and the

Registrars General to work together to achieve consistent and comparable census outputs.

It is considered that the statutory authority to require information to be provided on each of the questions proposed for the 2021 Census was fully compliant with both the European Convention on Human Rights and the Human Rights Act 1998 in respect of the individual's right to privacy.

### 2.3.1. Amendments to the primary legislation to enable Census 2021

As stated previously the [Registrar General's 2021 Census Proposals Document](#), published on 3 April 2019, set out plans for Census 2021 in Northern Ireland. It proposed that a question on sexual orientation was asked for the first time and therefore an amendment to the Census Act (Northern Ireland) 1969 was required. Due to the absence of a Northern Ireland Assembly at the necessary time, the [Census \(Return Particulars and Removal of Penalties\) Bill](#) was introduced in the House of Lords on 1 May 2019. The Bill amended the Census Act (Northern Ireland) 1969 to add sexual orientation and gender identity to the Schedule as matters on which questions can be asked in the census and to remove the penalty for not responding to these questions if they were asked. The Bill passed unamended and gained Royal Assent as the Census (Return Particulars and Removal of Penalties) Act 2019 on 8 October 2019.

## 2.4. Accessibility

One of the key aims was to ensure that Census 2021 was as accessible as possible for everyone. As such accessibility was a key consideration in all elements of the design and planning of the census. How this was incorporated is described in various relevant sections throughout this report. For example, [section 5.5](#) describes the help and assistance provided to those with various barriers to completion.

Accessibility was key in the design of the online systems, ensuring that they met the Government Digital Services (GDS) guidelines and standards at the time. Along with system design considerations, a variety of services were put in place to provide all respondents with the help and assistance they required. Assistance was available

online, via a Contact Centre with a dedicated telephone number, via social media and through field staff calling door-to-door. Sitting alongside this assistance were several products that enhanced accessibility, such as the availability of the census questionnaire in Braille and large print, as well as in 17 languages. This is covered in more detail in [section 5.5](#).

NISRA developed a community liaison plan for the 2021 Census. The objective of this plan was to improve awareness and coverage amongst communities which are traditionally 'hard to reach'. Further details on community liaison are included in [section 5.3](#).

## **2.5. Impact Assessments**

An [Equality Impact Assessment \(EQIA\) screening exercise](#) was carried out for the Northern Ireland 2021 Census and was published on 27 October 2020. It looked at all aspects of the census and included the potential impact of the questions asked as well as operational issues such as the emphasis on online collection. The EQIA screening sought to identify both positive and adverse impacts. Where an adverse impact was identified, potential mitigations were proposed to address the issues. The result of that screening exercise was that the census would generally have a positive impact on section 75 groups and any minor negative impacts had mitigating actions in place. Therefore, a full EQIA was not required.

A [Data Protection Impact Assessment](#) was also published on 27 October 2020. This included consideration of the proposed questions to ensure that asking people to disclose information did not breach their privacy rights contained in the Human Rights Act 1998.

## **2.6. Consultation and Engagement**

A major part of the planning for a census is consulting and engaging with stakeholders (including the public and users of census data). In order to understand the needs of census data users, NISRA carried out a consultation on topics to be asked in the 2021 Census. The paper [2021 Census: Topic Consultation for Northern Ireland](#) was consulted on between 25 September 2015 and 17 December 2015. The

paper presented NISRA's initial view on the topic content of the 2021 Census questionnaire and included some new topics for consideration by users. The aim of the consultation was to promote discussion and encourage the development of strong cases for topics to be included.

The consultation was issued to over 1,400 key users who were identified by NISRA with the support of the Equality Commission for Northern Ireland, the Northern Ireland Council for Voluntary Action (NICVA) and Machinery of Government Branch within the Northern Ireland Civil Service (NICS). The consultation document was also passed to a wide range of NISRA online users.

The list of consultees included:

- leaders of the main political parties in Northern Ireland, MLAs, MPs and MEPs;
- key advisory groups such as the Demographic Statistics Advisory Group (DSAG), the Statistics Advisory Committee (SAC) and the Statistics Co-ordination Group (SCG);
- bodies such as the Education Authority, Health and Social Care Board, local councils and Local Strategy Partnerships;
- key officials within government departments; and
- other census users known to NISRA.

To ensure that the general public were aware of the consultation it was promoted on the NISRA website and through official social media channels. Public information events were held in Omagh and Belfast in October 2015. A total of 46 responses were received.

A common approach across the UK was used to assess the responses to the Northern Ireland consultation exercise and NISRA published the findings of the topic consultation in a report entitled [2021 Census: Topic Consultation for Northern Ireland – Assessment of the responses received](#) in August 2016.

Consultation and engagement continued throughout the census process, details of which can be found on the [consultation section](#) of the NISRA website. In addition to events such as public meetings, NISRA also consulted regularly with its key advisory groups (as mentioned previously).

## **2.7. Question development**

Extensive stakeholder engagement, research and testing was conducted to inform the design of the questions and the questionnaires for Census 2021. This included working with the ONS and NRS in seeking to harmonise questions across the UK censuses where possible, while recognising that each country had its own user and respondent needs.

The content of the census questionnaire in Northern Ireland was developed continuously from the first [topic consultation](#) in 2015.

As part of a UK wide project led by the ONS, NISRA participated in a programme of question development and testing, to ensure that Census 2021 would meet as many user requirements as possible. Questions were developed for topics where there was a new demand for information. Additionally, existing questions were redeveloped to account for increasing or changing user requirements.

A series of topic specific UK working groups were formed to manage the development of questions. In addition to highlighting the demand for new questions, representatives from these groups provided detailed advice and feedback on the comprehensive programme of question testing and evaluation. Additionally, the NI Demographic Statistics Advisory Group, NI government departments and those non-departmental public bodies with whom they worked were also consulted on the census questions, particularly with regard to variations and the addition of new questions specific to Northern Ireland.

In deciding on a set of proposed questions, it was important to balance the need for change against continuity and the burden on the public. Users indicated an ongoing need for the vast majority of topics covered in the 2011 Census as well as a range of requirements for additional topics. Three broad sets of evaluation criteria (covering

user requirements, operational requirements and other considerations) were used to assess the evidence put forward by users and were broadly comparable to those used during the development of the 2011 Census questionnaire.

The user requirement criteria covered a number of interrelated factors including:

- the purpose of user need;
- the need for reliable information at small area level or for small groups of the population;
- the suitability of alternative sources;
- the requirement for multivariate analysis;
- the need for comparability beyond Northern Ireland; and
- the need for continuity with previous censuses.

In addition to user requirements, other considerations were taken into account. These were data quality, public acceptability, respondent burden, financial concerns and questionnaire design.

A number of operational factors also affected the decision on the content of Census 2021. The most important of these was their effect on coverage (for example, questions relating to defining the types of usual resident that live in the household are important to improve coverage as they aid respondents in identifying who should be included in the response), since the primary aim of the census was to provide a robust count of the population of Northern Ireland.

The questions included were developed and tested between 2015 and 2020. This process involved public testing of questions and stakeholder engagement with groups such as NISRA statisticians, policy colleagues, the Northern Ireland Housing Executive, Equality Commission and the Public Health Agency, together with leading academics.

The rationale for inclusion of the topics, including new questions, on the census questionnaire is set out in Chapter 3 of the [2021 Census Proposals document](#), published in April 2019.

### 2.7.1. New questions for Census 2021

Three new questions were introduced to the Northern Ireland census questionnaire in 2021. In the household section a new question relating to renewable energy systems was included, and within the individual section of the questionnaire there were new questions relating to sexual orientation and apprenticeships.

A user need was identified for information on renewable energy systems to help inform progress toward achieving government targets on renewable energy and establishing a detailed benchmark for the number of domestic properties in Northern Ireland with renewable energy systems.

A user need was identified to gather data on sexual orientation to inform policy development and enable organisations to meet and monitor their statutory obligations stemming from [Section 75 of the Northern Ireland Act 1998](#) and other relevant legislation. Research was taken forward regarding privacy, public acceptability, data quality and the effect on the overall response rate for the census, before it was recommended that a question on sexual orientation be included in Census 2021. To maximise response rates, given the sensitive nature of a sexual orientation question:

- the question was only asked of those aged 16 and over;
- the question included a 'prefer not to say' option, to facilitate those who view sexual orientation as a private matter; and
- mechanisms were put in place to allow those who wished to make an individual return, as opposed to a household return, to do so.

More detail is available in the [Topic report on sexual orientation](#) published alongside the Census 2021 proposals document.

In the 2015 Topic Consultation there was some limited user demand for information on gender identity/transgender status. Alongside this there was a continuing strong user need for a sex (female or male) question. NISRA had assessed options around amending the sex question to gather this information but considered that to do so would risk the quality of data collected on a person's sex. In addition, there had only



been limited research and testing of a separate gender identity/transgender question in population surveys. However, recognising the more limited user need and as a first step, NISRA has included a separate gender identity/transgender question in the [Continuous Household Survey](#) from April 2019. More detail is available in the [Topic report on gender identity](#) published alongside the Census 2021 proposals document.

The new question on apprenticeships was added to the question set relating to qualifications as part of a restructuring based on extensive engagement and testing. This was in response to analysis of the 2011 Census results that suggested some respondents had difficulty with the qualifications question.

### 2.7.2. Questions removed since Census 2011

Four topics covered in previous censuses were excluded from the Census 2021 questionnaire, as there was no longer a sufficient case for their inclusion. In the household section the question on self-contained accommodation was omitted, as was the question on number of rooms. Within the individual section of the questionnaire, the question on short-term migration was not included for 2021, nor was the question on voluntary work.

### 2.7.3. Questions modified since Census 2011

NISRA also made a number of changes to the retained questions from 2011 to create the 2021 question set. These included updating or rewording question stems to ensure better and more consistent public understanding, as well as updating response options to reflect changes in both the respondent and user needs over time.

For example, the sex question was subject to a change where the order of the tick boxes in 2011 'Male, Female' was reversed in the 2021 question to reflect the fact that there are more females than males in Northern Ireland. In addition, the order of this question was swapped with the question on 'date of birth' to harmonise with the ONS approach where they had changed the order following user testing. In addition, the Irish and Ulster-Scots questions were extended to gather frequency of use of these languages.

Additional detail on differences between the Census 2021 questions compared to Census 2011 questions are available in the [2021-2011 Census in Northern Ireland questionnaire comparability report](#).

## **2.8. Questionnaire design**

The content of the questionnaire was formally legislated for by the Northern Ireland Assembly, with the topics to be covered being listed in a schedule to [The Census Order \(Northern Ireland\) 2020](#), and a copy of the final questionnaire being included as a schedule to [The Census Regulations \(Northern Ireland\) 2020](#).

Census 2021 was developed so the online questionnaire was the primary mode of completion. Although Census 2021 would be conducted primarily online, the questionnaire design still had to meet the requirements of a paper questionnaire.

Due to the need to manage overall costs and printing requirements, the 2021 paper questionnaire was limited to 32 pages (to cover the household questions, six usual residents and three visitors). It also had to meet scanning requirements set out by the questionnaire management supplier, for example, the size of tick boxes and space between questions had to meet exacting standards.

In total, the Census 2021 questionnaire contained 57 questions (13 household questions and 44 individual questions), compared with the Census 2011 questionnaire which contained 59 questions (14 household questions and 45 individual questions) – several questions were removed or updated, while others were added.

The same data were collected on both the online and paper questionnaires. However, the question designs were optimised separately for each version of the questionnaire to ensure that the best quality data was collected. It was also important to design the questions so that respondents could interpret them and answer consistently across all modes.

Copies of the [Census 2021 questionnaires](#) are available on the NISRA website.

### 2.8.1. Features of the Online Questionnaire

The online questionnaire was developed according to Government Digital Service (GDS) standards. NISRA worked closely with the ONS and GDS to ensure that Census 2021 met the required standards. NISRA ensured that:

- questions could be easily understood;
- accessibility standards were met, including for both online and offline parts;
- research was carried out with participants who represented the potential respondents, including people with access needs;
- people were not excluded because they lack digital skills or internet access; and
- appropriate assisted digital support was provided.

The online system included a number of features which were designed to make the questionnaire easier to complete and so reduce the burden on the respondent.

These features included:

- a hub to allow the respondent to keep track of their progress;
- specific design to allow the household address and the name of the respondent to display in certain questions, and
- response drop-down lists for a number of questions.

All of these features were designed to help the user better understand each question and minimise the time spent completing the questionnaire, and had undergone rigorous user testing with the public.

For example, Census 2021 included a question on passports held. The question allowed the respondent to select multiple responses if they held multiple passports. The question is shown in Figures 1 (online) and 2 (paper).

Figure 1: Census 2021 question on passports held – online

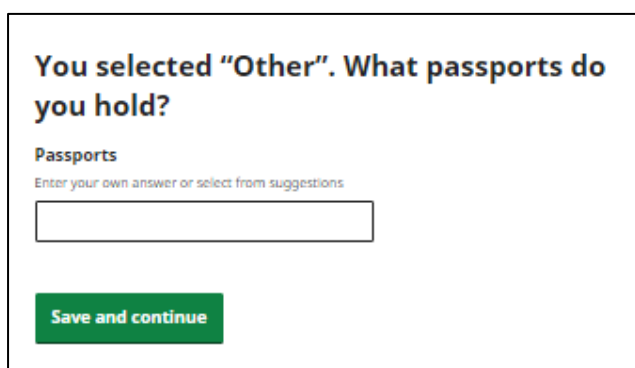
The screenshot shows a digital form titled "What passports do you hold?". Below the title is a blue link: "> [What passports and travel documents to include](#)". The instruction "Select all that apply" is followed by three stacked checkboxes: "United Kingdom", "Ireland", and "Other". The "Other" checkbox has a sub-instruction: "You can enter your passports on the next question". Below these is the word "or" and a "None" checkbox. At the bottom is a green "Save and continue" button.

Figure 2: Census 2021 question on passports held – paper

The screenshot shows a paper questionnaire question numbered "10". The question is "What passports do you hold?". The instruction is "Tick all that apply." There are three checkboxes: "United Kingdom", "Ireland", and "Other, write in". Below the "Other, write in" checkbox is a long, empty rectangular box for writing. At the bottom is a "None" checkbox.

The question on the paper questionnaire included a write in box to fill in if 'Other' was selected. However, for this question in the online questionnaire if 'Other' was selected a follow up write in question as shown in Figure 3 was asked. This meant that for online respondents the initial question appeared simpler (or less cluttered) and when respondents were given the follow up question, suggested answers appeared as they started to type.

**Figure 3: Census 2021 question on ‘Other’ passports held follow up – online**



The screenshot shows a digital form with the following text: "You selected 'Other'. What passports do you hold?" Below this is a sub-heading "Passports" and a prompt "Enter your own answer or select from suggestions". There is a rectangular input field for the answer. At the bottom left of the form is a green button with the text "Save and continue".

A small number of questions had to be presented differently on the online questionnaire from the paper questionnaire due to space constraints (on paper) and the difference in the modes of completion.

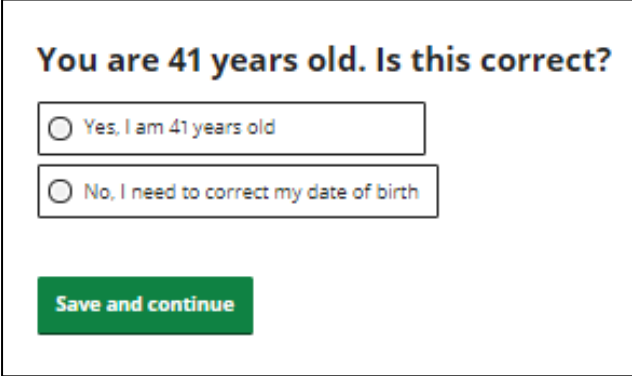
Other additional features of the online questionnaire included:

- address lookups that let the respondent select their address from a list. These were added to reduce respondent burden (once the initial characters of an address were entered by the respondent, a list of possible addresses was presented);
- the option for an individual to request a separate Unique Access Code (UAC) that would let them, for privacy reasons, complete an individual response, separate from their household/family response;
- online help that provided additional guidance when answering questions;
- the option for the respondent to complete it on a range of different devices/operating systems; and
- the ability to switch between English, Irish and Ulster-Scots versions of the questionnaire – for those that wished to complete in these other languages (see [section 4.7.2](#)).

It was also possible to build in checks on the online questionnaire. For example, Census 2021 included a question on date of birth which asked the respondent to fill in day, month and year of birth.

The online questionnaire prompted a follow up question as shown in Figure 4, whereby the age corresponding to the date of birth given could be stated and the respondent asked if it was correct.

**Figure 4: Census 2021 question on date of birth – online**



**You are 41 years old. Is this correct?**

Yes, I am 41 years old

No, I need to correct my date of birth

**Save and continue**

### 2.8.2. Communal Establishment Questionnaires

Historically, as well as the main questionnaires, there have been two separate types of census questionnaires for Communal Establishments (CEs):

- the CE Questionnaire (CE4) – which in the 2011 Census gathered basic details for each establishment (number of residents, type of accommodation (care home, hospital, prison etc.);
- for each resident in the establishment an Individual Questionnaire (I4) – this questionnaire was the same as the individual section of the household questionnaire and collected the personal demographic details of each CE resident.

For Census 2021 a new initiative was implemented within Communal Establishment enumeration to minimise the risk of under-counting residents. The CE questionnaire included a section which required CE managers to provide core demographic details of all residents in their establishment (first name, last name, date of birth and sex). An example of this is shown in Figure 5 for the paper CE questionnaire (CE4 2021). As with household questionnaires, the CE questionnaires were accessible online and on paper. Detailed written and digital guidance were also supplied to CE managers on how to complete these listings.

**Figure 5: 2021 Communal Establishment Questionnaire – Resident listing element**

6 List the names, date of birth and sex of all usual residents.

➡ If preferable, you can attach a printout containing the names, date of birth and sex of all usual residents and ➡ **GO TO 7**

**Resident 1**

Name:

Date of birth:    Sex:  Female  Male

## 2.9. Respondent-centred testing and research

Following on from the census content consultation in 2015, NISRA carried out a programme of testing and research. This was carried out to better understand the public's perception of the census, question wording, questionnaire design and response channels (online and paper).

Comprehensive planning, testing and evaluation were essential processes for the success of the 2021 Census. The programme of testing and research prior to a census was designed to:

- ensure that all questions included met user requirements and were publicly acceptable;
- trial new technology;
- test procedures and processes;
- plan dissemination; and
- test different facets of the whole census operation.

NISRA carried out a substantial amount of testing including public acceptability testing, cognitive testing of question wording and response categories and testing of questionnaire design.

Public acceptability testing sought to understand the acceptability of asking a particular question, including the acceptability of answering the question on behalf of others in the household. It was important to understand if the inclusion of a question

might impact on the overall response rate for the census. Questions needed to be acceptable and understandable to the general population.

In addition, NISRA conducted qualitative testing in 2017 to develop knowledge of the best local terminology around various census topics. As the questionnaire was developed, later versions of specific questions were tested with members of the public. As part of this round of testing NISRA conducted a large-scale, voluntary census test in Northern Ireland in autumn 2017. The test involved sending a census-type questionnaire to a sample of 15,000 households, who were invited to respond online or on paper. The main objective of the census test was to inform decisions about the possible inclusion of a sexual orientation question for Census 2021. This included an understanding of how such a change in the questionnaire might affect the distribution of responses to the two established questions on religion. A secondary objective was to test the structure of the knowledge of Irish and Ulster-Scots questions. The test was also used to trial other potentially new questions and test operational procedures.

In relation to the main objective, findings from the analysis of the data collected suggested that the response to the religion questions had not been affected by the positioning of a potential question on sexual orientation. The analysis of responses to questions on frequency of use of Irish and Ulster-Scots showed that the questions performed well, and that valid and reliable outputs could be produced. Sixty-one percent of all responses were made online in the census test. The findings from the [2017 census test](#) are available on the NISRA website.

## **2.10. Rehearsal**

A rehearsal for Census 2021 in Northern Ireland took place on 13 October 2019 and was particularly important given the major design changes from the previous census in 2011. These included the move from traditional paper-based data collection to online data collection, the associated modernisation of field processes, the use of administrative data to underpin the census process and the commitment to conducting post-collection data processing within NISRA.

The main aims of the rehearsal were to:



- confirm the viability of the proposed census field methodologies, data collection services and management arrangements. This was to help ensure that these elements were fit-for-purpose and met the strategic aims of the census;
- assess the quality of the collected data arising from the new and innovative methodologies and systems being developed for Census 2021; and
- provide NISRA, its partners and suppliers with exposure to, and experience of, the range of situations likely to be met in the census operation so that improvements could be implemented where necessary.

The rehearsal sample size was just over 19,000 households – a substantial increase from the 5,000 households sampled in 2009 for the 2011 Census Rehearsal. There were three rehearsal locations within the following Local Government Districts (LGDs):

- Belfast;
- Armagh, Banbridge and Craigavon; and
- Fermanagh and Omagh.

The rehearsal areas were divided up into 47 Enumeration Districts (EDs), 18 of which were in Fermanagh and Omagh LGD, specifically in West Fermanagh. Regions along the border with the Republic of Ireland were chosen, with a view to testing how mobile communication devices worked in rural areas.

An area in Armagh, Banbridge and Craigavon LGD (in and around Craigavon) was selected and split into 16 EDs with the primary purpose to test the engagement and communications with the migrant population in the area.

Finally, two areas in Belfast LGD were selected – an area around Queens University and a suburban area around Ravenhill. The Queens area included 8 EDs and was used to test student engagement and enumeration. The Ravenhill area included 5 EDs and was chosen as a baseline group of historically high response areas.

Of the 19,000 households included in the rehearsal, around 9,500 returns were received, giving a response rate of 50%. This was higher than the 29% response rate in the 2009 Rehearsal prior to the 2011 Census. Around two-thirds of respondents completed the questionnaire online and the remaining one-third completed a paper questionnaire. Key lessons to be taken forward for Census 2021 were documented in the [Census rehearsal evaluation](#).

## 3. Managing the Census

### 3.1. Introduction

Carrying out a census is a large and complicated task, and planning for one takes a considerable length of time. After the completion of Census 2011, NISRA and the two other UK Census Offices (ONS and NRS) spent time exploring different methods for gathering and utilising census information. In 2014, NISRA proposed to the then Finance Minister that a modernised census was the most effective approach to fulfil this need. This proposal was accepted and NISRA published [The Future Provision of Census of Population Information for Northern Ireland](#) in October 2014.

### 3.2. Initiating the project

Following the decision in 2014 to conduct another census, the Census 2021 project was initiated with design and delivery spread across 6 distinct phases:

- research and design phase – review of operational design options and proposed topics (see [section 2](#));
- assessment phase – a small-scale test was conducted in 2017 (see [section 2.9](#)) to look at question options, along with an address check to assess progress with the development of the address register;
- rehearsal and testing phase – an end-to-end rehearsal took place in October 2019 (see [section 2.10](#)) along with further Operational Readiness Testing (ORT) throughout 2020;
- data collection phase – this spanned the ‘go live’ of all systems and services in late 2020/early 2021 right through to the end of capture and coding of paper questions in summer 2021 (see [section 4](#));
- data processing phase – this started prior to the end of data collection and continued into early 2023 (see [section 6](#)); and
- outputs phase – production and dissemination of planned census outputs, commencing in May 2022 with the first release of population and household estimates (see [section 7](#)).

Funding for Census 2021 was obtained from the Department of Finance (DoF) through the medium sized business case process. This started with an outline business case in 2015 with a final business case update in 2019. The funding was profiled over the 10 years of the census cycle from 2015/16 up to 2024/25. Details of the costs are included in [section 3.4](#).

### **3.3. Governance and project support**

#### **3.3.1. Governance**

To deliver the census project and all its components, as well as ensuring effective decision-making, appropriate multi-level governance was set up as follows:

- Census Oversight Board (COB) – this board was chaired by the Director of Census and Population Statistics and included all senior management in Census Office. It was a decision-making board where members were collectively responsible for the delivery of the census project. To do this, each of the main work areas reported, in an agreed format, so that progress of the overall project could be tracked against key milestones. COB focused on those areas that were key to the success of the project, such as, risk & issue management, dependency and interface management, adherence to plans and financial management.
- Northern Ireland Census Operations (NICO) group – similar membership to COB but with work stream members, where necessary. This group was responsible for the management and delivery of specific census operational activities including:
  - project support and delivery;
  - field operations;
  - stakeholder engagement and communications;
  - address register and data processing;
  - outputs and content;
  - census administrative data (CAD); and

- data collection services.

Subsequent working groups were set up as required, to cover various aspects of the census operation. This included NICO-Processing, NICO-Outputs and Northern Ireland Optimising Response Group (NI-ORG). Membership of these groups was determined by the priorities at that particular point in the project.

In order to ensure seamless coordination and alignment at a UK level, a multi-tier governance structure was established between the three UK Census Offices. This structure was used to effectively manage and coordinate policies and operations, promoting harmonisation across all three UK Census Offices. The UK governance structure consisted of:

- Statement of Agreement – an agreement between the National Statistician and the Registrars General for Scotland and Northern Ireland on the conduct of the 2021 round of censuses. The first version of this was published in [October 2015](#) and subsequently updated in [January 2021](#) to reflect the change in the date of the census in Scotland. Three progress updates were published in [2016](#), [2019](#) and [2020](#). The agreement sets out the principles the three UK Census Offices would adhere to, in order to ensure each of the censuses were successful in providing high-quality population and housing statistics which would meet needs of users, as well as meeting the international requirements set out by organisations such as the UN Economic Commission for Europe (UN-ECE) and Eurostat;
- UK Census Committee (UKCC) – this committee was chaired by the National Statistician and comprised the Registrars General for Scotland and Northern Ireland, the chief statisticians in Scotland and Wales, and senior officials from each of the three UK Census Offices. The UKCC's role was to ensure the fulfilment of the Statement of Agreement. They were a decision-making committee with responsibility for harmonisation of end-to-end census activities across the UK;
- UK Harmonisation Working Group – this group reported to the UKCC. The group had members from the Census Offices and statistics bodies for

Scotland, Northern Ireland, England and Wales. Meeting once a month, their role was to manage relationships and ensure collaboration across the UK Census Offices and the work streams taking forward all aspects of the census projects. The group was used to identify potential areas of joint working and collaboration as well as managing any risks to UK harmonisation. This included considering the scope, quality and coherence of statistical outputs, statistical methods, user engagement, quality assurance and opportunities to collaborate across the UK; and

- working level groups (approximately 22) that promoted UK census harmonisation – the [November 2020 update](#) on the Statement of Agreement outlined the names, purposes and membership of these various working groups. These all included the ONS, NRS and NISRA, also many included Welsh Government officials, and some included other organisations.

As well as the UK governance there were International Census Forum Communities of Practice. These covered a range of topics including:

- field operations;
- risk and issue management;
- communal establishments;
- coverage;
- testing; and
- quality assurance.

### 3.3.2. Project support and management

The project support team were there to support the running of the overall census project. They had responsibility for aspects such as governance, risk and issue management, business case updates along with financial management. The project support function was handled by a team reporting to the project manager. The team had a varied role which changed as the project progressed – for example, prior to the start of the operational period, the team monitored progress with project

milestones, timelines and design. Their focus then shifted to tasks such as incident management and operations management during the live data collection phase.

Initially its main functions were to:

- develop and maintain the project plans, control processes and tools for use throughout the project;
- provide support to the census project staff in the application of project management and control through active day-to-day support; and
- provide a secretariat for the main governance boards and any subsequent sub meetings – COB, NICO, NICO-Processing, NICO-Outputs, NI Optimising Response Group (NIORG).

The primary project management methodology adopted was PRINCE2 (PRojects IN Controlled Environments). However, some of the individual work strands, for example the development of the field staff payroll system, used Agile methodology as it was deemed more suitable.

As mentioned previously, the support team had responsibility for a number of management processes to support the overall census project and operations. These included:

- risk and issue management;
- budget monitoring and control;
- incident management and change control;
- documenting decisions made and lessons learned;
- project reporting and records management;
- business continuity and accommodation planning; and
- data security and declarations (for example, census confidentiality undertakings).

The team also continued to cover the census customer services function, and this role grew during the live operations period when contact from the public increased

significantly. They also assisted with numerous other key tasks, for example, investigating and recording details of vacant properties during the live field operation.

### **3.4. Financial management and cost**

The Northern Ireland 2021 Census will have cost around £34.7 million by the end the 2024/25 financial year. This covers the 10-year period from 2015/16.

Expenditure over the course of the project was closely monitored in line with the outline business case that was developed in advance. The largest annual costs associated with the census related to the data collection operation in financial years 2020/21 and 2021/22. In terms of the overall project, significant proportions of the costs related to:

- NISRA staff employed to plan, manage and undertake the census (61.5%);
- contracts and in-house work streams that NISRA carried out in partnership with the ONS, or that the ONS carried out on NISRA's behalf, including questionnaire management and the public Contact Centre (21.8%); and
- the field force operation – which included the recruitment, pay and training of field staff (7.2%).

### **3.5. Suppliers and contracts**

As outlined previously, NISRA worked very closely with the ONS and partnered on many of the key contracts to deliver Census 2021. Due to changes in procurement practices, no large contract covering the majority of supplies/services was awarded; instead a wider range of suppliers was used across the work streams, with the ONS developing the census website, the online questionnaire as well as the Response Management (RM) system.

The main contracts awarded to external suppliers for Census 2021 included:

- census questionnaire management – the contract was awarded to Leidos on 22 October 2018. The elements included in the contract were paper



questionnaire production, returned questionnaire processing, data capture & coding and secure destruction;

- census public Contact Centre – the contract was awarded to Serco on 18 October 2018. The main element of this contract was to provide a multi-language omni-channel public Contact Centre solution. The solution allowed the public to gain assistance and make a response by a variety of routes including voice, webchat, webmail, and Short Message Service (SMS) as well as making a census response via telephone capture;
- census print and post – the contract was awarded to HH Associates on 31 October 2018. The main elements of this contract were for the production and post out of initial contact letters and reminders, as well as printed materials to support the data collection operation, including public facing materials and materials to support the field staff;
- census field operational devices – the contract was awarded to XMA Ltd on 25 March 2019. This contract was for the provision of devices for all field staff. It was for a 'white glove' service that included the set-up and support of the devices throughout the operational period. They also coordinated the collection and return of devices after the operation was completed. Devices included smart phones and chrome books for various levels of field staff as well as tablets for use at completion events;
- census field force logistics and replenishment – the contract was awarded to Granby Marketing Services Ltd on 14 December 2018. The contract was to provide all supplies for the field staff as well as the logistics service to get all these supplies to where they needed to be;
- census fieldwork management tool – the contract was awarded to Totalmobile on 9 January 2018. The contract covered the development of a tool to schedule field staff workloads in carrying out non-response follow-up as well as recording outcomes of all of these visits;
- census marketing and advertising – the contract was awarded to Genesis Advertising Ltd on 25 June 2019. This contract was locally run and covered

the public facing advertising and promotion of Census 2021 in Northern Ireland; and

- census Lone Worker Solution - the contract was awarded to Mitie Security Ltd on 02 May 2019. This contract covered a lone worker app that field staff could use to call for help if a situation arose. The call monitoring service was based in Northern Ireland.

Other smaller contracts included:

- BSL & ISL video production for Census 2021 was awarded to the Royal Association for Deaf people (RAD) on 28 July 2020;
- the census paper questionnaire return service contract was awarded to Royal Mail on 31 October 2018; and
- the Census Translation (Non-Welsh) contract was awarded to K International Ltd on 10 May 2018.

Some contracts were managed locally by NISRA, these included the marketing and advertising contract which was operated in conjunction with the Government Advertising Unit (GAU), and Census at Schools.

In addition, the recruitment and payment of temporary field staff was managed by HR Connect, the contracted providers for all NICS recruitment, HR and payroll. Working alongside local advertising agency, Anderson Spratt Group, HR Connect also had responsibility for overseeing the recruitment advertising campaign for all temporary posts.

## 4. Data collection

### 4.1. Introduction

The purpose of the Census 2021 data collection operation was to plan and conduct the live census operation in Northern Ireland, focusing on the proposed enumeration methodology, associated systems, while also supporting public engagement services and aspects of data processing. The data collection operation was central to the successful running of Census 2021 in Northern Ireland.

The data collection operation encompassed a diverse set of work streams, beyond simply distributing and collecting questionnaires. The public needed to be made aware of the census, as well as be able to make a return in whatever way was easiest for them, with appropriate support provided if they needed it. All these were essential to ensure the successful completion of the operation. Some of the key tasks included were:

- providing support for the public and census field staff in order to maximise response during the data collection operation;
- provision of key information to enable effective operational management;
- capture, coding and delivery of information collected from the public for use by the data processing systems;
- field staff recruitment and payroll services;
- field staff training and logistical support;
- provision of support to the public to assist in the completion of their census return; and
- integration of the systems and services so they all worked together.

As already highlighted, Census 2021 was carried out during a worldwide pandemic that had not been anticipated and this resulted in widespread changes to the overall census data collection plan. Any significant changes are addressed in the relevant sections in this report.

As well as the pandemic, at the end of 2020 there was still much uncertainty about the outcome and impacts of Brexit. So as a result, there were regular reviews to ensure any risks to the data collection operation were mitigated against. For example, in anticipation of changes due to Brexit, deliveries were rescheduled prior to Christmas 2020 to ensure they were in Northern Ireland in time for the start of the operational period.

#### **4.2. Census Address Register**

The development of a complete and accurate Census Address Register (CAR) was essential to ensure the success of the digital-first census. The CAR is a list of domestic and habitable addresses with an accurate positional reference, linked to higher level geographic areas for management, reporting and output purposes. A fit-for-purpose CAR was needed to ensure that every household and Communal Establishment were included in Census 2021. The CAR was needed to:

- provide the basis for contacting the public to invite them to participate in the census;
- populate the system required to monitor responses made to the census and creation of daily management information;
- inform the field operation during the follow-up of non-responding addresses; and
- populate the online questionnaire where address details were either presented or requested.

It also formed the basis of the back-end resources needed to allow for continual updating of addresses during the census operational phase, through information received from the public, census field staff, or other sources.

#### 4.2.1. Development of the CAR

The main source of addressing information for the CAR was the Land & Property Services (LPS) POINTER<sup>1</sup> database, as was the case previously for the 2011 Census. The development of the address register for Census 2021 built on lessons learned from the 2011 Census and tests/rehearsal undertaken in the interim period. For Census 2021 the development of the CAR was supplemented with additional address level information available through government or administrative/utilities data. The main purpose of this was to get the most accurate reflection of habitable domestic and Communal Establishment addresses available, such that postage and field follow-up procedures were as efficient and cost effective as possible, whilst maximising coverage of the Northern Ireland population.

The aim for any address register is to maximise accuracy and coverage. Having an accurate register minimises the risk of sending letters and/or questionnaires to addresses that don't exist or sending them inadvertently to the wrong address. A register that has high coverage also reduces the risk of people not being invited to take part in the census. The overarching priority in creating the CAR for 2021 was to limit under-coverage as much as possible. For example, where there was uncertainty over an address, the decision was generally made to include it.

To mitigate against the risk that coverage had not been maximised in areas where housing development had taken place or was planned to take place, NISRA adopted three approaches:

- every enumeration district in Northern Ireland was subjected to detailed desk-based checking to make sure that there were no significant pockets of buildings/properties where NISRA didn't have address records;

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<sup>1</sup> POINTER is the address database for Northern Ireland which is maintained by Land and Property Services with help from local councils and Royal Mail. Information on this dataset can be found on the [NI Direct](#) website.

- NISRA utilised the Census Area Managers (CAMS) to work with local representatives to determine the status of buildings based on information gleaned from building application data; and
- each of the 11 Northern Ireland Local Government Districts were also supplied with lists of addresses for their area and asked to review them, including providing feedback on any additional addresses they thought should be included.

All information gleaned from these processes was fed through to the CAR development project in advance of finalising the dataset in the autumn of 2020.

As part of the initial plan for CAR development, NISRA was considering the merits of performing a 100% field address check in advance of Census 2021. When the COVID-19 pandemic struck it became much riskier to plan for such an exercise so as a result, a decision was taken not to perform an on-the-ground address check in favour of a fully desk-based approach.

Increased access to administrative datasets, coupled with the availability of robust Geographic Information System (GIS) data and software, meant that NISRA could perform much more verification and validation of address records using a desk-based approach rather than having to rely on expensive and risky on-the-ground operations.

The revised plans focused on a deterministic rules-based approach to selecting addresses for the CAR from POINTER based on evidence of the validity of address records when linked to other sources. This was supplemented by thorough desk-based address checking using GIS as a vehicle for providing checkers with both address and spatial information to determine the validity of addresses. Around 55,000 addresses were checked in this manner.

A cautious approach to desk-based checking was adopted, in recognition of the fact that the data and maps could potentially be out of date in some areas. As such, a decision was taken to maximise coverage over accuracy to ensure that, as far as possible, nobody was missed from the census. That meant that where there was uncertainty over an address, the decision was generally made to include these

addresses – noting that these types of addresses could be ‘fixed’ (for example, invalidated if they were non-residential or derelict) by census field staff during the planned follow-up phase of the census enumeration.

The CE addresses were developed independently from household addresses. The CE address development began by identifying the main categories of CEs to be enumerated in the census and sourcing address information for each of them, for example, CE websites, Tourist Board, direct contact with CEs and the Regulation and Quality Improvement Authority ([RQIA](#)) register.

Once the development work had concluded, both the household and CE addresses were combined to create the CAR. The contractual deadline for the delivery of the CAR was September 2020, which was well in advance of Census Day on 21 March 2021. Realising that housing development and changes to people’s living circumstances could affect the accuracy of the CAR between the contractual deadline and Census Day, a top up list of addresses was delivered in December 2020, resulting in 843,100 household addresses and 1,510 CE addresses being identified for inclusion in the 2021 Census.

#### 4.2.2. Changes to the CAR during live operations

During Census 2021 live operations, inevitably there were alterations required to the address register. For example:

- members of the public contacting NISRA to say they didn’t get a questionnaire (and therefore an address needed added);
- members of the public changing their address (either on the system or by phone);
- census field staff confirming addresses no longer exist; or
- census field staff finding new addresses.

A Response Management (RM) system operated to track such fulfilment requests and as part of this, any address additions, deletions or changes that were notified were reflected on the CAR, if deemed valid. The decision on validity was made

through a central Address Resolution service which operated to ensure that each change was managed appropriately, and that the CAR was maintained to a high standard throughout the operational phase.

During this phase approximately 8,400 addresses were added to the register and 31,100 were deactivated (for example, houses under construction that were not occupiable by Census Day). At the end of the census operational phase, the maintained CAR had 820,300 household addresses and 1,420 CE addresses.

#### 4.2.3. Changes to the CAR during data processing

After the operational phase of the census closed and data processing began, a number of consolidation activities and refinements took place which affected the overall count of distinct addresses in the CAR. These included:

- linking of a small number of returned unlinked paper questionnaires. If an address was not available on the system, one was created;
- reconciling placeholder returns to create a record for every non-responding, valid address so that the census dataset included records for all domestic addresses in Northern Ireland;
- deduplication: On occasion it was necessary to consolidate addresses where duplicate responses had been received from the same household with slightly different addresses. This usually happened where addresses shared official and vanity strings (for example, '1 Broad Street' versus 'The Cottage, Broad Street'); and
- location information: During processing all addresses were reviewed for locational accuracy. On occasion this required addresses close to the boundary of Local Government Districts to be reclassified into the neighbouring district.

At the end of data processing the census database consisted of 821,100 household addresses and 1,420 CE addresses.



#### 4.2.4. Non-domestic addresses

Lists of non-domestic addresses, such as businesses and education establishments within Northern Ireland were also developed using the POINTER database, the Inter-Departmental Business Register and from Department of Education public lists of educational establishments.

The primary use of the non-domestic lists was to facilitate address lookups in the online questionnaire (for example, selection of workplace address). As such, these addresses needed to have a high degree of quality and accuracy – and there were many steps to achieve this, including excluding duplicates and non-addressable records (for example, ATMs, advertising signs, garages etc).

The lists of non-domestic addresses added a further 67,200 business addresses and 1,200 educational addresses to the existing household addresses.

#### 4.2.5. CAR outcome

The Census 2021 addressing project met its main objective of providing a comprehensive and accurate list of addresses. The approaches taken to achieve high coverage and accuracy worked well with coverage measured at the end of the operational phase at around 99% and accuracy measured at around 96%.

The [Census 2021 addressing information paper](#) provides more details on the stages of development and creation of the CAR, including its maintenance and continued development during the operational phase of Census 2021, and its finalisation during data processing.

### 4.3. Digital-first strategy

For Census 2021, one of the key design elements was to have a census that was primarily online, or digital-first. The principal design was that most households would receive an initial contact letter containing a Unique Access Code (UAC), with remaining households receiving paper questionnaires. A 'Wave of Contact' (WoC) strategy was designed to determine what type of household would qualify to receive a paper questionnaire instead of an initial contact letter. It also set out a series of

dates for the post out of reminder mailings and follow-up visits by field staff to non-responding households.

#### 4.3.1. Wave of Contact

The Wave of Contact (WoC) strategy was central to the operational design of Census 2021. It formed an important function in helping to:

- balance field staff workload;
- target appropriate enumeration of respondents;
- minimise costs associated with reminder mailings and follow-up; and
- achieve the targeted response rate.

The initial WoC model was trialled during the rehearsal in 2019 and adjusted using lessons learned ahead of the final design for Census 2021, although late adjustments had to be made due to the COVID-19 pandemic. The final WoC model determined that approximately 80% of households should receive an initial contact letter, which was an invitation to complete the census online and contained a UAC for that household. The remaining households would receive a paper questionnaire. By targeting addresses in this way, the needs of householders could be met, whilst reducing burden on support services, such as the Contact Centre and field staff. However, it did not prevent any householder from completing the census using either method (online or paper) if they wished, since a UAC was provided on each paper questionnaire and respondents could request a paper questionnaire if they required it.

The potential need for a paper questionnaire in the household was based on a range of factors, such as:

- age (if older);
- broadband (if access);
- previous engagement with government services online (if none);
- sheltered or supported households (if in such accommodation); and

- households in rural Fermanagh (postal issues if addressed to the householder).

In addition to this, the design was to assign approximately 20% of households into an early follow-up group, where visits by field staff would take place for non-responding households earlier in these areas than in the other 80% of Northern Ireland. These addresses were considered to be 'hard to reach' households in mainly deprived areas, or those with low response rates in Census 2011.

For Communal Establishments and special population groups (SPGs), the design strategy was to assign paper questionnaires to CEs or SPGs with residents that were likely to require them (for example, care homes, prisons and Irish Traveller sites), and initial contact letters to establishments that were likely to have residents who had access to the internet (for example, student halls of residence and hotels). The split between paper questionnaires and initial contact letters for these groups was approximately 50/50.

There was a high degree of accuracy of the assignment of addresses to a WoC. Of the households invited to respond using the online questionnaire initially, 93.1% used that method, while 68.3% of households invited to respond by paper questionnaire initially, did so.

#### **4.4. Tracking responses**

Being able to closely monitor the census operation in almost real-time was a significant development for Census 2021. The ONS designed and built the Response Management (RM) system, and this was key to the planning and scheduling of the entire data collection operation.

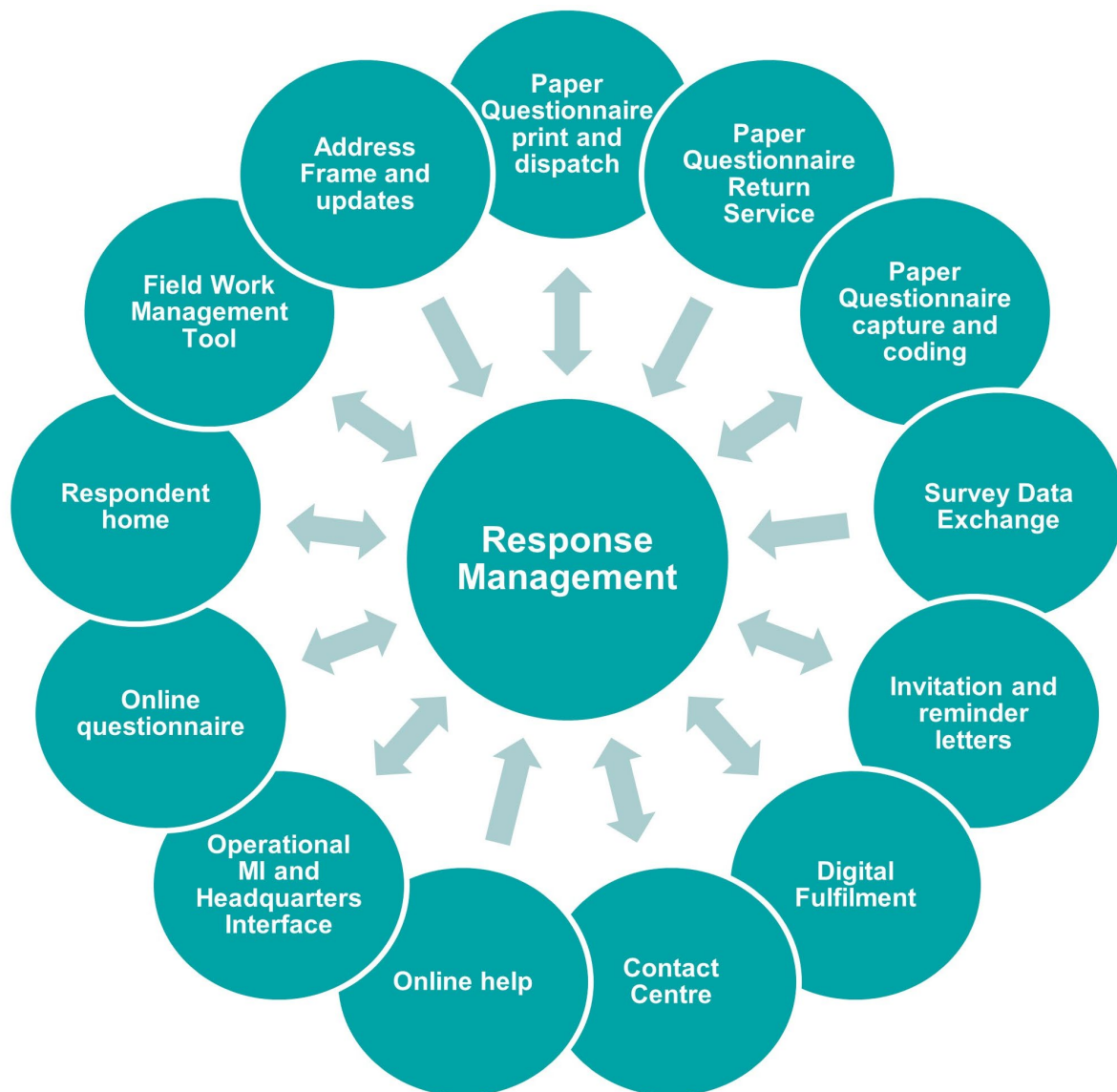
RM provided information and instruction for all aspects of the operation, from lists of UACs and addresses going to the printers, to providing information on all non-respondents, to the fieldwork management tool allowing workloads to be scheduled for field staff and keeping a record of all activity at an address. It allowed NISRA to closely monitor what was happening across the operation in terms of response as

well as the types of census activity at an address. RM went live in the last quarter of 2020 and was operational until July 2021.

The system operated at individual address level, maintaining a record of all activity at that address with records of fulfilment requests, returns made, mode of return and information from the Contact Centre. Figure 6 shows how there was a 2-way exchange of information between RM and many of the other census systems, for example, the Fieldwork Management Tool (FWMT) and Contact Centre. This information could then determine future actions at an address. For example, follow-up of the address could be paused if a new access code was requested to give the householder time to respond, or the address could be closed if a response was made. NISRA also used the information from RM to optimise response across Northern Ireland as it allowed for the real-time interrogation of data at the local level which previous censuses were not able to do as effectively.

The tracking of responses was a significant improvement and advancement from previous censuses and allowed for closer monitoring of the operation. It allowed for quicker and more efficient decision making as well as better control over the operation.

**Figure 6: Flows of information in and out of the Response Management system**



#### **4.5. Delivery of census materials to households**

For Census 2021, a post out solution was the primary method for distributing census materials. This approach built on the success of its implementation in the 2011 Census. The main difference from the 2011 methodology was the addition of post out responsibility into the print and post out (letters) and questionnaire management (paper questionnaires) contracts. Those print suppliers had well developed relationships with postal providers and could offer more cost-effective mailing solutions.

#### 4.5.1. Door-drop postcards

NISRA issued a series of unaddressed postcards to almost 820,000 households, using Royal Mail's domestic door drop listing.

The first postcard was issued during week commencing 22 February 2021. Its aim was to inform householders that the census was taking place and that they would soon receive an invitation letter to take part.

This was followed by another postcard, during week commencing 15 March 2021, reminding households to take part in the census. This was timed to be just prior to Census Day on Sunday 21 March 2021.

A final postcard issued week commencing 22 March 2021, again reminding households to take part in the census and thanking them if they had already done so.

#### 4.5.2. Initial Contact Letters and Paper Questionnaires

As mentioned in section 4.2, initial address list of 843,100 properties was compiled and provided to the relevant suppliers to create initial contact mailings. Households then received either an initial contact letter pack with a UAC to complete online, or a paper questionnaire pack during week commencing 1 March 2021.

The post out of initial contact census materials to 843,100 households was successfully managed by both the print and post out supplier and questionnaire management supplier, within agreed timescales. The vast majority of materials landed with households in the week commencing 1 March 2021.

#### 4.5.3. Reminder mailings

Reminder mailings were separated into three parts:

1. This comprised of two letter types which were issued week commencing 29 March 2021. One was to respondents who started the online questionnaire but had not submitted (almost 11,000 letters 1.3%) and the other to all other non-respondents (over 188,000 letters 22.3%).

2. This mailing was a reminder paper questionnaire pack and was issued to over 79,000 (9.4% of initial addresses) non-responding households during week commencing 19 April 2021.
3. The final reminder mailing was issued on week commencing 10 May 2021. This letter went to just under 58,000 (6.9% of initial addresses) non-responding households.

#### 4.5.4. Managing post out risks

The main potential risk to post out in Census 2021 was the introduction of new HM Custom arrangements in January 2021, as a result of the Windsor Framework. At that time it was an unknown whether census mailings would be caught up in delays at the main ports. To help minimise this risk, the initial census mailing materials were moved to Northern Ireland a few days ahead of normal operating timelines and securely stored. As a result, there was no delay to the post out of the initial contact letters or questionnaires. There was no adverse impact to subsequent reminder mailings.

Previous censuses had monitored the potential risk of industrial action by Royal Mail staff over the census operational period, and Census 2021 was no different. Mitigation measures were discussed; however no industrial action was threatened during the Census 2021 operational period.

#### 4.5.5. 'Undelivered as Addressed' mail

'Undelivered as Addressed' (UAA) is a term used by Royal Mail to refer to mail that has been returned to the sender without successful delivery. This can occur for various reasons, including:

- addressee absence;
- incomplete address information;
- inaccessible address;
- unknown addressee;
- refusal of delivery;

- unclaimed mail; or
- non-existent address.

Furthermore, if a recipient marks an item of mail with 'return to sender' or a similar message and returns it through a post box, it is categorised as UAA.

Out of approximately 932,000 letters issued, around 3.75% resulted in UAA items, and out of the 247,000 paper questionnaires that were issued around 4.05% resulted in UAA items. UAAs were processed through two separate routes. Initial contact and reminder letters through the print and post out contract and paper questionnaires through the questionnaire management contract. Both routes used automated barcode scanning to help increase turnaround. However, this was not always possible due to the envelope window being obscured by the return sticker or defaced. On these occasions the items were manually scanned.

The UAAs from the initial post out were flagged to field staff for further investigation to determine if they were valid addresses or not. If the field staff member could not locate the address or deemed it uninhabitable then the address was deactivated on RM and the address register, and no further communications went to that address. There were approximately 3,500 addresses for which this was the case. For those UAA addresses that the field staff found to be habitable, they hand delivered a census questionnaire to this address and it remained on the address register and RM for further non-response follow-up if required.

#### **4.6. Return of completed Paper Questionnaires**

NISRA planned for 80% of households to complete their census return online, with the remaining 20% of households completing a paper questionnaire.

The post back operation was the main method of returning completed paper questionnaires. This project was contracted to Royal Mail. They were required to securely collect and 'receipt' questionnaires, deliver them to the paper processing site, and provide daily receipt information to the RM system.



The main difference for Census 2021, from previous censuses, was the anticipated decrease in volumes of completed paper questionnaires given the promotion of a digital-first approach. Whereas the 2011 Census post back solution required a bespoke process using dedicated sorting machines, the process in Census 2021 generally aligned to a business-as-usual model for Royal Mail.

Paper questionnaires continued to be returned to the paper processing site until 9 July 2021, after which any completed questionnaires were redirected to NISRA in Belfast.

Overall, the post back process performed well in terms of delivering completed questionnaires to the paper processing site, ensuring a collaborative approach with suppliers to develop and manage delivery schedules, procedures and requirements.

Post Census Day there were increased reports from the field staff and via the Contact Centre that paper questionnaires had been returned but householders were still being followed up for non-response. These addresses were also still live on RM and showing that their questionnaire had not been returned or receipted. To allow time for an investigation and remedial action follow-up was paused, lines to take were given to the Contact Centre and reminder letters were postponed. This minimised the impact on the operation as a whole and any further negative reports. The issue was quickly addressed, and the field operation continued with only some households who returned paper questionnaires being impacted. The incident had slightly more impact due to a significant above-plan volume of returned questionnaires in the week following Census Day which had not been forecast. This higher return rate was good but increased the impact of the receipting issue.

## **4.7. Online resources for the Operational Phase**

### **4.7.1. Census 2021 website**

The Census 2021 website was hosted for NISRA by the ONS, who worked closely with NISRA during its development to reflect Northern Ireland specific requirements. During the census data collection period, the Census 2021 website served as the host for the secure online questionnaire, through which households and individuals

across Northern Ireland, and England and Wales were able to complete their census.

The Northern Ireland website was located at [census.gov.uk/ni](https://census.gov.uk/ni) and had three main elements:

- respondent home;
- online questionnaire; and
- online help.

The website was a one stop shop where people could complete their census return and access a variety of supporting information to facilitate the completion process. The support ranged from being able to order a replacement access code, to providing general information about the census and its importance, as well as guiding people on how to complete the various questions. This [archived version](#) shows the census website on Census Day 21 March 2021.

Whilst the website, and particularly the online questionnaire, were initially developed prior to the pandemic, several updates to improve the user experience were required at a late stage due to impacts of the pandemic.

For more details on the use of the census website and related elements refer to the [Operational Report](#). Also further information on the digital services of the census and their design may be found on the Office for National Statistics website at [Delivering the Census 2021 digital service](#).

NISRA developed a separate online questionnaire for data collection at Communal Establishments (CEs). More details are available in [section 2.8.2](#).

#### 4.7.2. Online Questionnaire

The digital-first approach for Census 2021 gave prominence to the online questionnaire as the main method for households to make their census return. This followed on from the successful deployment of an online completion option in Census 2011. The implementation of the online questionnaire resulted in significantly

less paper questionnaires being returned by mail and needing to be scanned manually.

The ONS Digital Services Team (DST) lead on the development of the online questionnaire for both Northern Ireland, and England and Wales. From a presentational and operational standpoint, each survey was largely identical. However, in some places the content of each questionnaire was slightly different.

NISRA leaned heavily on DST for the build of the system. The team contained qualified web developers and online survey experts which NISRA liaised with to build in Northern Ireland specific requirements. This work included the delivery of both Northern Ireland questionnaires (household and individual) in three languages.

For the first time in Northern Ireland, the census offered households and individuals the opportunity to access their census questionnaire in Irish or Ulster-Scots, as well as English. Within the online system, the respondent could select to complete in English, Irish or Ulster-Scots but they were also able to toggle between English and Irish/Ulster-Scots at any time during their online completion. Paper responses should have been completed in English only however Irish and Ulster-Scots responses were accepted.

Whilst the census website went live early in 2021 the online questionnaire didn't open until 1 March 2021. It remained open until 24 May 2021 which was later than planned. The extension was to support a longer modified field operation, with the aim to maximise response. Use of cloud architecture allowed it to be scaled up to meet the very high demand experienced on Census Day, when at the peak it was receiving just under half a million census submissions per hour.

The online questionnaire was extensively tested for defects and bugs, and constantly reviewed during live operations. COVID-19 had no major impact on the delivery of the online questionnaire. NISRA was able to work remotely with DST on the development of the online questionnaire, therefore, the move to home-based working did not harm progress.

The success of the Census 2021 digital service shows that large government digital services can be securely delivered in-house using cloud architecture and Agile development. It also allows better understanding of the willingness of citizens to interact with national government services online and how they do so.

Further information on the [digital services of the census](#) and their design may be found on the Office for National Statistics website.

#### 4.7.3. Online Help and Language Support

Online help was available to support respondents and provide answers to any queries. It covered details about how community groups and external organisations could get involved in promoting the census. There were sections in the online help covering:

- About the Census – this was background information about the census and its importance and usefulness;
- Get Involved – provided information on the [Let's Count](#) initiative with schools as well as promoting how groups could get involved in promoting the census within their communities. It also included resources to help everyone take part, for example, sign language videos, easy read and student leaflets etc;
- Keeping your data safe – this provided information about how data was kept safe and all the legislation in place relating to data security;
- Help – this covered all aspects of help relating to the completion of the questionnaire. It provided guidance on the questions, help with languages and accessibility, how to order replacement codes or paper questionnaires as well as guidance for Communal Establishments; and
- Contact Us – information on how to access help via the various channels at the Contact Centre.

As well as online help a variety of language and accessibility support was provided or could be accessed through the census website. The website hosted information about the census in 17 languages including downloadable translation booklets,

which contained a translated copy of the paper questionnaire. Table 1 shows what type of support was available in each of the 17 languages.

**Table 1: Assistance available in 17 languages**

Language	Language helpline	Translation booklets (digital and paper)	Engagement leaflets	Online Questionnaire	Promotional social media
Arabic	✓	✓	✓		✓
Bulgarian	✓	✓	✓		✓
Cantonese	✓	✓	✓		✓
Czech	✓	✓	✓		✓
Hungarian	✓	✓	✓		✓
Irish	✓	✓	✓	✓	✓
Latvian	✓	✓	✓		✓
Lithuanian	✓	✓	✓		✓
Mandarin	✓	✓	✓		✓
Polish	✓	✓	✓		✓
Portuguese	✓	✓	✓		✓
Romanian	✓	✓	✓		✓
Russian	✓	✓	✓		✓
Slovak	✓	✓	✓		✓
Somali	✓	✓	✓		✓
Tetum	✓	✓	✓		✓
Ulster-Scots	✓	✓	✓	✓	✓

To assist anyone with queries during Census 2021, respondent home, online help and a Contact Centre were available from 22 February 2021 to 24 May 2021, and

these were advertised on leaflets, websites and through advertising and social media.

As the operation progressed, information on the online help was updated to reflect what was happening at that time. For example, in July 2021 it was updated to include details of the Census Coverage Survey (CCS) and then in May 2022 it was updated again to direct people to the census outputs.

## **4.8. Support for completion (other than online self-help)**

### **4.8.1. Public Contact Centre**

The public Contact Centre provided various channels for respondents to get support with the completion of their census return, including the means of requesting paper questionnaires and other materials (Braille, translation booklets, large print questionnaires), an interpretation service via a dedicated language line, and telephone capture of census responses where appropriate.

The Contact Centre provided support to Census 2021 and the Census Coverage Survey via telephone advisers, webchat, SMS and webmail.

For more details on the operation of the Contact Centre, refer to the [Census 2021 Operational Report](#) which provides key metrics and details of the operation of the Contact Centre. In total the Contact Centre dealt with 161,616 calls up to 8 July 2021.

### **4.8.2. Census Customer Services**

Census customer services has the primary function of assisting users with access to information and statistics relating to census outputs. However, during the operational phase this function was enhanced to assist, as necessary, with any queries received in NISRA HQ. The majority of the enquiries received by the team based in NISRA were received by telephone, email or letter – with a small amount originating from social media. There was a range of enquiries received, from basic census related questions to taking a census return over the phone.

### 4.8.3. Face-to-face assistance

This is one area which was more impacted by the pandemic than any others. The aim of Census 2021 was to make it as easy and as accessible as possible for everyone to make a return. The support strategy had been designed to provide face-to-face assistance with completion. Libraries NI and ad hoc ‘completion events’ were to be used to facilitate this, however due to the pandemic and restrictions in place at the time, it was not possible to hold these sessions. Field staff were able to provide some of this support on the doorstep when they carried out their follow-up visits but it didn’t fill this gap completely.

## 4.9. Field Staff

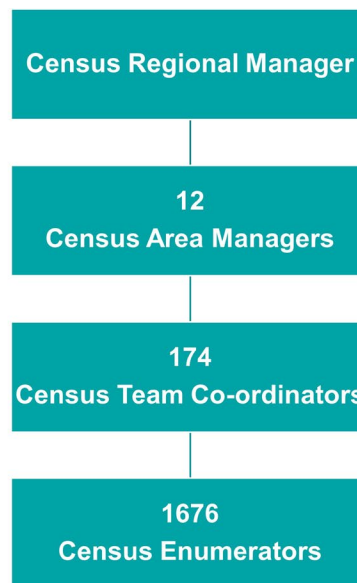
Field staff have always played an important role in the data collection phase of a census, most notably in following up with non-responding households to maximise coverage. Ultimately their contribution to the overall success of any census cannot be understated, and as such the importance of recruiting and retaining the requisite number and calibre of temporary field staff was recognised from the outset.

For the purpose of managing field operations on-the-ground, Northern Ireland was split into a number of geographical areas, and this effectively determined the number of field staff required. The number of field staff required for Census 2021 was 1,862 – this was broadly reflective of the number used in the previous census (1,925).

The largest census areas were LGDs and it was agreed that each LGD would be managed by a Census Area Manager (CAM). The exception to this was Belfast LGD which, given the number of households, was managed by two CAMs. Each LGD was subdivided into smaller census areas, managed by a Census Team Co-ordinator (referred to as CTC areas), with further subdivisions of those CTCs into Enumeration Districts (EDs), to which a Census Enumerator was assigned. As was the case for Census 2011, the geographical size of EDs varied, with rural areas naturally tending to be larger, but with less households.

All field staff fell under the command of the Census Regional Manager, a member of the Field Operations Team based at Census HQ. The field staff structure is shown in Figure 7.

**Figure 7: Census 2021 Field Staff structure**



#### 4.9.1. Recruitment of Field Staff

It was agreed at the outset that HR Connect, the contracted HR and payroll provider for the Northern Ireland Civil Service (NICS), would take the lead in the recruitment of all field staff. The Recruitment & Payroll Team within NISRA (Census Office) worked closely with HR Connect to determine and agree the approach and methodology to be adopted for each recruitment competition. NICS HR were also heavily involved throughout the recruitment process, providing advice and guidance where necessary, while the NI Public Service Alliance (NIPSA) trade union were consulted at the appropriate stages. The Departmental Solicitor's Office also provided timely advice on the Terms and Conditions laid out in the field staff handbook.

The advertising campaign for all field staff posts was managed by Anderson Spratt Group (ASG), contracted provider for all NICS recruitment advertising. ASG were approached at an early stage and asked to produce a media plan, outlining their proposals to maximise advertising opportunities for temporary census posts. While TV and radio advertising were considered, they were ruled out, primarily on cost. It was agreed that temporary field posts would be advertised through some of the usual channels, including:



- local and regional newspapers;
- digital (websites and social media); and
- 'out of home' (for example, bus shelters).

Posts were also advertised internally across NICS platforms and adhered to the NICS recruitment policy.

Due to COVID-19 restrictions, interviews for CAM and CTC positions were conducted online (using CISCO Webex, as recommended by HR Connect). In addition pre-employment checks for enumerator positions also had to be carried out online, rather than through face-to-face sessions. Candidates were invited to complete an online form, which contained a declaration confirming that they satisfied all eligibility criteria. The form also provided an opportunity to gather some additional pre-employment information.

As a condition of offer, successful candidates across all competitions were subject to the appropriate pre-employment checks carried out by HR Connect and Access NI.

Both the CAM and CTC competitions ran quite smoothly, with the requisite number of candidates appointed to their chosen census area. Given the volume of applicants for the enumerator competition, it came as no surprise that there were some issues arising. A significant number of candidates dropped out either during this selection process or in some cases, not taking up a post, when offered. As far as was possible, HR Connect attempted to backfill such vacancies as they arose but given the short duration of enumerator contracts (9 weeks) and the pre-employment checking procedures, it was simply not feasible to backfill after an agreed cut-off point, beyond the agreed start date. As a result, NISRA was unable to recruit the requisite number of enumerators in some census areas, with this shortfall being exacerbated by a lack of applications for the Fermanagh and Omagh LGD.

To counter the shortfall NISRA took the decision, in agreement with HR Connect, to make offers to successful candidates in the areas affected, inviting them to cover a second enumeration district. This ensured that all EDs were covered either by

another enumerator, or in some cases, by a CTC. In all cases additional fees were paid, based on the amount of extra work being undertaken.

#### 4.9.2. Fees and expenses

All temporary field staff were employed on short term contracts and paid a set fee, dependent on the role. Travelling expenses were paid at the appropriate NICS rate, along with other necessarily incurred receipt-based expenses.

Fees were calculated for each role using an hourly rate derived from the lower end of the pay scale of the relevant NICS grade and based on the estimated hours to be worked over the duration of the contract. However, paying field staff a set fee meant they could not be placed on a point on the regular NICS pay scales, administered by HR Connect. Instead, a separate process had to be devised; this involved NISRA collaborating with colleagues from DOF's Digital Development Services, to devise a web-based application (known as Census Staff Time and Expenses Recording System (CSTERS)), which was to be used by all field staff to record their hours and expenses.

#### 4.9.3. Training

Training for Census 2021 was delivered on a cascade basis, in the same way as the 2001 and 2011 Censuses. It was made available to field staff in various formats including:

- self-study reading;
- self-study e-Learning;
- videos;
- online presentations; and
- in-person training.

Prior to COVID-19 the plan was for all field staff to attend in-person training events, including their Appointment and Briefing session and other census specific training. However, contingency planning had to be incorporated into the training plan when

restrictions came into place due to COVID-19. Considering social distancing measures, the CAMs were the only field staff able to meet in-person for their Appointment and Briefing session as there were only 12 of them. All other in-person training events were moved to online presentations.

In addition to enumeration procedures, the training for CAMs included:

- field organisation and management;
- pay and expenses for their CTCs and enumerators; and
- stakeholder engagement.

The training for CTCs included:

- more detailed enumeration procedures;
- supervision of, and pay and expenses for enumerators; and
- use of the Fieldwork Management Tool (FWMT).

Enumerators' training focused, in the main, on the detailed enumeration procedures and the use of the FWMT. All training materials were designed to be able to be used by people with minimum experience of delivering training. The materials were intended to complement the written instructions and to provide a forum to allow interaction between trainer and trainee.

Table 2 shows the full set of written instructions and training materials developed for all field staff. The material was designed initially for the 2019 Rehearsal, before being revised and finalised for Census 2021. Where necessary, the instructions and training were updated throughout the process to meet any changes or ad hoc issues that arose.

**Table 2: Field staff training materials**

Material	CAM	CTC	Enumerator
CAM Technical Guide	✓		
CAM Operational Guide	✓		
CTC Technical Guide	✓	✓	
CTC Operational Guide	✓	✓	
Enumerator Technical Guide	✓	✓	✓
Enumerator Operational Guide	✓	✓	✓
Enumeration Pocket Guide	✓	✓	✓
Enumeration Sample Pack for Training	✓	✓	✓
Generic e-Learning courses (Health and Safety Awareness for all staff, GDPR awareness, etc.)	✓	✓	✓
Census specific e-Learning courses (Lone Worker Awareness and Follow-up)	✓	✓	✓
Videos (Totalmobile, Manual Handling, Confidentiality and Security, etc.)	✓	✓	✓
Online presentations	✓	✓	✓

To ensure that the training was uniform, and a consistent message regarding roles and responsibilities was being cascaded to all field staff, NISRA (Census Office) staff attended training events, primarily in an observation role, but also to clarify any field and operational queries that arose.

#### 4.9.4. Logistics and supplies

Each member of census field staff was issued with all the necessary materials and equipment to enable them to fulfil their role. Most of the field materials were supplied through a joint contract with the ONS.

The technical equipment was supplied by XMA Ltd. CAM equipment was delivered to NISRA for distribution at the Appointment and Briefing event. CAMs were sent the

CTC equipment and CTCs were sent the enumerator phones for distribution after the relevant Appointment and Briefing events.

The non-technical equipment and materials were delivered to Granby (the logistics company). Granby picked, packed, and shipped the materials to NISRA and the relevant field staff on pre-arranged dates.

A few documents were produced locally by NISRA staff and DOF's Digital Print Services (DPS), which were distributed to the field by Parcelforce.

Any unused branded materials were collected at the end of operations.

#### 4.9.5. Health and Safety

It was recognised from the outset that any job that involves a mixture of working alone, travelling and having direct contact with the public carries an element of risk, and as such the health and safety of census field staff was considered at all times.

A number of measures were taken to help minimise the risk and ensure the safety of staff, including a comprehensive training package and carrying out risk assessments. A Lone Worker Solution (LWS) application was installed on mobile devices issued to all field staff. The LWS allowed staff to raise alerts if they felt at risk, an amber alert flagging a potentially risky situation and a red alert an immediate risk. It had a safe check system for lone workers to log in regularly to confirm that they were safe, with an alert activated if they did not. This provided both a proactive and reactive approach in safeguarding field staff. Given that there were over 375,000 visits made to households during the follow-up period, there was actually a very small number of incidents/accidents recorded.

#### 4.9.6. Roles and responsibilities

The overriding objective for all field staff was to encourage householders to complete their census questionnaire. More specifically field staff roles were defined as follows:

- CAMs were employed for approximately eight months from 5 October 2020 to 18 June 2021, and were responsible for helping promote the census as well

as managing field operations across a local government district. Essentially, they had two roles; during the first few months of their employment the focus was very much on community engagement, working closely with the Stakeholder Engagement and Communications team at Census HQ, to help promote and raise awareness of the census (see [section 5](#)). It had been hoped to carry out much of this work on a face-to-face basis, however due to COVID-19 restrictions, this was not possible with most of the contacts being carried out online or by phone/email. In January 2021, the emphasis for CAMs turned more towards the field operation and preparing for field staff to come on-board in February 2021. CAMs were responsible for training, managing and supporting a team of approximately 12 - 16 CTCs, and it was their job to ensure that all elements of the field operation in their area were being carried out in line with agreed procedures, reporting back to the Census Regional Manager on a regular basis. CAMs also performed a range of line manager functions including the checking and approval of CTC hours and expenses.

- CTCs were employed for almost three months, from 17 February to 11 May 2021, and their role was to train, manage and support a team of approximately 8 - 10 enumerators, across a pre-defined census area within a LGD. This included carrying out regular checks on how the enumeration was progressing, supporting staff and dealing with queries, and similar to CAM role, they also performed line manager functions such as the checking and approval of enumerator hours and expenses. Regular updates were also provided to their CAM.
- Enumerators were employed for approximately two months, from 6 March to 7 May 2021, and assigned to an ED within their chosen area. They were very much the face of the census on-the-ground, as they had responsibility for following up with non-responding households to encourage completion.

#### 4.9.7. Follow-up

As previously mentioned, following up with non-responding households was important in increasing the return rate. A strategic approach was adopted, for

example, in student areas ‘student specific’ postcards were delivered by enumerators during the ‘soft’ follow-up period (prior to the regular follow-up period commencing). The follow-up operation was split into phases, broadly tying in with the WoC (see [section 4.3.1](#)), and there was a requirement on enumerators to make at least one visit to non-responding households during each phase.

While early evenings were generally considered the best time to make contact with householders, enumerators were encouraged to visit at different times of the day and on different days of the week when returning to the same address, in order to maximise the chances of a successful visit.

Although Census Day was 21 March 2021, enumerators only started the ‘soft’ follow-up phase by visiting non-responding addresses from 26 March 2021. During the ‘soft’ follow-up, enumerators assessed non-responding properties and, where necessary, delivered a targeted postcard indicating that no response had been received. Due to COVID-19 restrictions, there was no direct engagement with householders during this ‘soft’ follow-up phase, as agreed with the CMO (see [section 11.5](#)).

Given the Easter holidays and the desire to allow the first posted reminder letters to have an impact, a pause in field operations was implemented from 2 – 7 April, with the regular follow-up period starting on 8 April. Table 3 shows the details of follow-up phases for Census 2021.

**Table 3: Census 2021 follow-up phases**

Phase	Dates	Follow-up visit
Phase 1	26 March – 1 April	Soft follow-up
Phase 1 (cont.)	8 – 18 April	Regular follow-up
Phase 2	19 – 25 April	Regular follow-up
Phase 3	26 April – 2 May	Regular follow-up
Phase 4	3 – 9 May	Regular follow-up

The outcome of all visits was recorded on the FWMT, and if no contact was made, the appropriate reminder postcard was left.

#### 4.9.8. Fieldwork Management Tool

This was the first census operation to use a digital solution, known as the Fieldwork Management Tool (FWMT), for managing field visits. This was accessed by field staff through their mobile devices and allowed them to identify the days and hours they were available for work across the incoming week. Then each night the scheduler downloaded the addresses requiring follow-up visits to enumerators.

The FWMT was designed to deliver daily dynamic workloads to enumerators, allowing them to capture new addresses and record the outcomes of their visits to households, manage workloads, and deliver 'real-time' management information to enable HQ teams to monitor progress and manage resources. It was made up of three elements, developed by Totalmobile:

- a case management system;
- the user-interface (Totalmobile Manager); and
- the Totalmobile App used by field enumerators on their mobile devices.

The system dealt with huge volumes of cases and household dynamic workloads were created and delivered daily by 8am without issue.

#### 4.9.9. Impact of COVID-19 pandemic on Field Staff

As alluded to previously, the COVID-19 pandemic had a significant impact on many elements of the 2021 Census, not least with field operations (from recruitment and training of field staff, address check through to follow-up processes). Lockdown restrictions, and the need to keep both staff and members of the public safe at all times, meant some changes to the way field staff, enumerators in particular, carried out their role.

Field staff were given bespoke training to align with government guidance, with the doorstep routine designed to be carried out in accordance with social distancing



protocols. Staff were issued with personal protective equipment (PPE), including a supply of facemasks, sanitiser wipes, and 500ml sanitiser hand gel pumps. Both ONS and NISRA worked closely with the Department of Health and Social Care (DHSC) to include field staff in a pilot initiative for COVID-19 testing. As part of this Lateral Flow Test (LFT) kits were supplied to staff although testing was on a voluntary basis only.

#### **4.10. Special enumeration**

In Census 2021, the vast majority of people in Northern Ireland were counted through the approaches described previously. However, there are specific population groups for whom alternative arrangements are necessary in order to count them effectively in a census. The majority of the population covered by these alternative arrangements live in Communal Establishments (CEs) – these comprise a range of managed accommodation units, such as prisons, military bases, university halls of residence, care homes, hospitals and hotels.

Typically, CEs accommodate higher numbers of harder-to-count populations, such as young adults, older people or more transient people. They may also include a high proportion of vulnerable groups, who may find it particularly difficult to participate, but whose data could be used to inform social policy. In addition, there are many large CEs, such as university halls of residence and military bases, whose residents represent a significant proportion of a particular local community.

The key factor determining who was to be included or excluded was that, if an individual had already spent, or would be expected to spend, six months or more in a CE, then for census purposes this counted as their place of usual residence. However, other specific definitions were in place for certain establishments.

In recent censuses, CEs were enumerated either by NISRA staff (large CEs with more than 100 people and secure accommodation, such as prisons and military establishments) or by the Census Team Co-ordinator (CTC) allocated to the local area. Evaluation of those exercises highlighted that a lack of knowledge and training on the relatively few CEs encountered by CTCs sometimes led to quality issues. This

resulted in a CE team being set up in NISRA HQ to take responsibility for the enumeration of all CEs in 2021.

Developing special enumeration procedures was a complex process, because different measures were needed for different types of establishments. Personal contact remained the preferred method for enumerating CEs, although the post out method was to be used for hotels, holiday parks, youth hostels and religious establishments. This approach was adopted to allow CE team staff to support CE managers who may be responsible for large numbers of residents.

In addition, these staff would be able to guide CE managers through the often-complex definitions on who to include. The overall strategy was therefore to provide well trained staff for special enumeration who were responsible for the hand delivery of questionnaires and for providing support to the CE managers.

In 2021, each CE was provided with a CE questionnaire (CE4) for the manager to complete, detailing the nature of the establishment and the number of usual residents. The manager was also asked to provide the name, date of birth and sex of each resident. This was known as “Listing information” and was the first census where this type of information was collected from CEs. An Individual questionnaire (I4) or Initial Contact letter (with a code for online completion) was also provided for each CE resident.

#### 4.10.1. General Communal Establishments

The majority of CEs fell into this group, which included hotels, care homes, hospitals, hostels and religious establishments. The planned enumeration procedures were fairly straightforward. A member of staff from the CE team would liaise with the CE manager and hand deliver or post out the relevant number of resident questionnaires or initial contact letters. They would also provide the CE manager with any support they needed. The number of resident packs issued depended on the number of expected usual residents.

#### 4.10.2. Student Halls of Residence

Counting full-time tertiary level students in a census is challenging. They are more transient in nature as well as being less likely to engage with official events such as the census. There can also be confusion for students on where they should include themselves (i.e. at home or at their term-time address. For the census, students should be counted at their term-time address.

To ensure that students were counted fully in Census 2021, NISRA decided additional steps were needed. A key decision was to collect information on students both at their home and term-time addresses, with these later resolved to a single response. To facilitate this, engagement materials were developed specifically for students to provide guidance on completion.

Developing the procedures for this group required liaison between CE team staff and the student halls accommodation managers. The overall approach was again to hand deliver CE manager questionnaires and initial contact letters for the students using CE team staff. Students were able to submit their individual returns online.

#### 4.10.3. Secure accommodation

From a census perspective, secure accommodation is classed as establishments where there is either an element of security in gaining access to residents, or the addresses are of a sensitive nature, or both. Included in this group are all military bases, prisons and other detention accommodation. In terms of military bases, only residential accommodation located inside perimeters of bases (i.e. behind the wire) was classed as secure accommodation. Any military accommodation outside the base perimeter was enumerated in the same way as other households. The CE team was only responsible for the enumeration of single living accommodation (SLA). Family accommodation behind the wire were issued with household questionnaires (H4) as part of the print and post out contract.

Secure accommodation is also associated with a range of complex definitions on who should be included as a usual resident. For example, military personnel away on operations with no family address, needed to have questionnaires completed for

them by proxy at their home base. Prisoners on remand, needed to have questionnaires completed for them at their home address.

NISRA worked with the various agencies to produce written census instructions for base commanders and prison governors. Once agreed, these organisations arranged for distribution across their establishments.

#### 4.10.4. Rough sleepers

NISRA engaged with Northern Ireland Housing Executive (NIHE) to ensure that homeless and rough sleepers were recorded as much as possible. NIHE supplied location details of temporary accommodation on a number of dates in the run up to Census Day.

Limited details were supplied for homeless people that had been provided with temporary accommodation. This was achieved as part of a Memorandum of Understanding during COVID-19 pandemic between the NIHE, Department for Communities and Department of Health, which assisted those persons from abroad/ineligible for housing assistance who had been rough sleeping. Separately, limited details were supplied for rough sleepers at Census Day, these cases were added to the nearest homeless CE in the respective LGDs.

#### 4.10.5. Impact of COVID-19 on Communal Establishments

The main impact of the COVID-19 pandemic was a substantial change to the delivery of CE packs. It had been hoped that during the hand delivery phase of the operation, CE team staff would have been able to engage with the CE managers to explain what was in the packs and answer any queries the managers may have had. This was altered to a pre-engagement telephone exercise where one member of the team contacted the relevant CE managers to explain when the packs were being delivered. Managers were advised that any queries they had could be emailed to NISRA. The member of staff delivering the packs spent as little time as possible at each CE address, adhering to strict COVID-19 protocols including hand sanitation and mask wearing.

The delivery of CE packs was due to take place between 1 and 20 March 2021 but this was changed to 23 February – 10 March 2021 so that packs were delivered earlier and within as short a timescale as possible.

Assurances were made to the Chief Medical Officer that no member of census staff would visit care homes due to the possible risk of infection. Therefore, plans were changed last minute to allow all CE packs for care homes to be delivered by Royal Mail. This was a major change in the planned process and involved creating extra instructions to ensure the care home managers knew what was required of them.

A separate engagement exercise was also completed with students as many of them were accessing lectures online at the time. This meant they could be studying from anywhere and were not necessarily at their term-time address. Since students needed to be enumerated at both their home and term-time addresses, this exercise was undertaken to ensure the message got out to all students. The census admin data team contacted the universities and colleges to ask them to issue an email to all their students. The email and the associated information videos were developed by the Stakeholder Engagement and Communications team within NISRA (Census Office).

#### **4.11. Enforcement of legal requirements to complete census return**

Under the provisions of the Census Act (Northern Ireland) 1969 (see [section 2.3](#)), it is an offence for any person to fail to comply with the Act or any Order or Regulation made under the Act by refusing to make a census return. In such circumstances, that person may be prosecuted and fined up to £1000.

A refusal to complete a return could be categorised in one of two ways; firstly a 'hard' refusal where the householder simply refused to make a return, and secondly an 'extraordinary' refusal, whereby mitigating circumstances, such as a recent bereavement or ill-health, meant the householder was unable to complete a return.

As a result of the COVID-19 restrictions in place at the time of the census, it was not possible to adopt the non-compliance process which had been used in previous

censuses. As it was not possible for these face-to-face interviews to take place, a bespoke process had to be devised and implemented for Census 2021.

NISRA (Census Office) assumed full responsibility for managing the 'non-compliance' process; this primarily involved investigating the circumstances of a refusal, issuing letters to non-responding households, collating all relevant information and evidence, and preparing files for onward transmission to the Public Prosecution Service NI (PPS). Ultimately, any decision to prosecute lay entirely with PPS.

## **5. Communication and engagement**

### **5.1. Introduction**

Raising awareness and promoting the census were crucial to the success of Census 2021, and NISRA worked closely with the DoF Press Office, particularly with regards to the promotional elements.

Census communication and engagement consisted of the following:

- community liaison;
- design of the wave of contact (WoC) products;
- accessibility and languages;
- websites;
- social media;
- advertising;
- census at schools – Let's Count resource;
- merchandise; and
- promotional and instructional videos.

### **5.2. Aims and objectives**

There were two overarching goals for communications and engagement;

- to encourage everyone to participate through educating the population on the value of the census and its importance; and
- to explain the available means for response to make it easier for everyone to participate.

These goals were further underpinned by the following key objectives:

- raise awareness of the census across the whole population, highlighting why the census matters;

- encourage the population to complete their questionnaire, ensuring that they are aware of their legal obligation to make a return;
- maximise overall response rates and minimise non-response levels across geographic areas;
- maximise participation for population sub-groups that have been traditionally 'hard to reach';
- provide assistance to groups with barriers to completion, such as language barriers and accessibility;
- promote a digital-first approach;
- provide assurances around data security and privacy to the public;
- provide information to the public about how they can get advice and assistance;
- build user and public confidence in the census results;
- identify key stakeholders and the most effective method by which to disseminate information and to ensure accessible and appropriate support is available; and
- encourage stakeholders to be advocates for the census and to promote it within their networks.

### **5.3. Community liaison**

The main aims of community liaison were to raise awareness and understanding and to gain support for Census 2021 through active engagement with stakeholders; all with the intention of raising overall response rates and minimising differences in response rates in specific areas and among particular population groups.

Community liaison was achieved through:

- producing a comprehensive database of voluntary and community groups who provided local information and support to the census programme, developed constructive working relationships and raised awareness of



Census 2021 - explaining how to take part including encouraging people to complete online;

- developing a similar database at a local council level for Census Area Managers (CAMS) to carry out engagement at this level;
- highlighting the importance and value of census outputs both within the local community and the wider context – giving people a reason to take part;
- communicating with groups to understand existing partnerships, facilities and services and identify potential barriers to accessing and completing the census;
- establishing structures to support access, participation, information flow and sharing within and across communities and groups;
- providing help and guidance to local community groups and individual members of the public – directing people to the help service available; and
- assisting with the development and distribution of language and accessibility products.

#### **5.4. Design of Wave of Contact products**

The Wave of Contact (WoC) strategy required products to complement each stage of contact – see [section 4.5](#). The Stakeholder Engagement and Communications (SEaC) team were responsible for bringing the WoC products to a print ready state, with the landing date managed by the head of Data Collection Services and final approval resting with the Census Oversight Board (COB). The Fulfilment Product Matrix was used as a tool to manage requirements and delivery of all Census 2021 products, including those which comprised the WoC. NISRA had a designer imbedded in the ONS team, and this helped ensure the NISRA materials matched the look and feel of the England and Wales census materials as well as the required design specifications.

## **5.5. Accessibility and languages**

### **5.5.1. Accessibility**

The aim of the accessibility products was to make the census as accessible as possible to everyone by providing help and guidance in a number of mediums. This included the provision of the census questions and supporting information in large print, Easy Read, Braille, as well as British and Irish Sign language. The guidance was primarily to support respondents to understand the census questions and then complete the questionnaire in English, Irish or Ulster-Scots.

NISRA worked closely with the ONS Census Engagement Team on developing the accessibility products and were included in the ONS contractual obligations with the supplier.

All accessibility products were available on the [census.gov.uk/ni](https://census.gov.uk/ni) website to view or download, or on request via the call centre.

### **5.5.2. Languages**

NISRA provided census help and guidance in 17 languages. The guidance was primarily to support respondents whose first language was not English, to understand the census questions in their own language and then complete the questionnaire in English, Irish or Ulster-Scots. Table 1 in [section 4.7.3](#) shows what help was available and in what languages.

## **5.6. Advertising**

The aim of the Census 2021 advertising campaign was to raise awareness of the census across the whole population, highlighting why the census mattered. The advertising contract was awarded to a Belfast based advertising agency Genesis.

The campaign had five phases and contained key messaging with changes in focus as the census operational period progressed. These are shown in Table 4:

**Table 4: Census 2021 advertising campaign key messaging**

Phase	Objective	Dates
Phase 1	Awareness: The Census is coming	22 February – 5 March
Phase 2	Motivation: The Census is almost here	6 – 18 March
Phase 3	Act now: Census is here	19 – 21 March
Phase 4	Reminder: There's still time to complete your census	22 March – 11 April
Phase 5	Obligation: Complete it now	12 April onwards

The campaign ran from 22 February to 9 May 2021 and covered:

- TV (UTV, Sky Adsmart, Channel 4, ITV Breakfast, ITV Hub and All4);
- radio (Downtown, Cool FM, Downtown Country, Q radio and U105);
- press (Belfast Telegraph, Newsletter and Daily Mirror, Irish News and regional press);
- outdoor (for example, bus shelters, billboards); and
- online (Google search, programmatic skins, Video on Demand, Facebook/Instagram, Twitter (now X), TikTok, Snapchat, Spotify, digital partnerships: Mail Online, Cool FM, Belfast Live and Belfast Telegraph).

Branded merchandise with the Census 2021 logo and website address was also purchased to help promote the census as widely as possible.

## **5.7. Social Media**

To further promote Census 2021, accounts were set up (@NICensus2021) across two of the main social media channels, Facebook and Twitter (now X). The channels had been set up during the Census Rehearsal in September 2019 and these built upon the audience in the run up to and throughout Census 2021.

The channels were used for both organic and paid posts to encourage audiences to take part in the census. Digital advertising was present across both Facebook and Twitter (now X), along with other platforms mentioned in [section 5.6](#).

### **5.8. Census in Schools – Let’s Count**

A ready to use primary school resource was developed in conjunction with CCEA to raise awareness of Census 2021 and complement the NI Curriculum.

The resource, available at [www.ccea.org.uk/census](http://www.ccea.org.uk/census) used data to support the development of skills relevant to Mathematics and Numeracy, The World Around Us, and Personal Development & Mutual Understanding. The 12 Let’s Count ready-to-use lessons were based around the themes of Population, Settlements, Transport, and Occupations, with materials tailored to the needs of Foundation Stage, Key Stage 1, and Key Stage 2 learners. They included presentations, activities, interactive games, chart creators, and posters. Irish Medium versions of all pupil resources were also available.

The resource initially used data from Census 2011 and was updated in autumn 2023 to include Census 2021 results within the lessons.

### **5.9. Promotional and instructional videos**

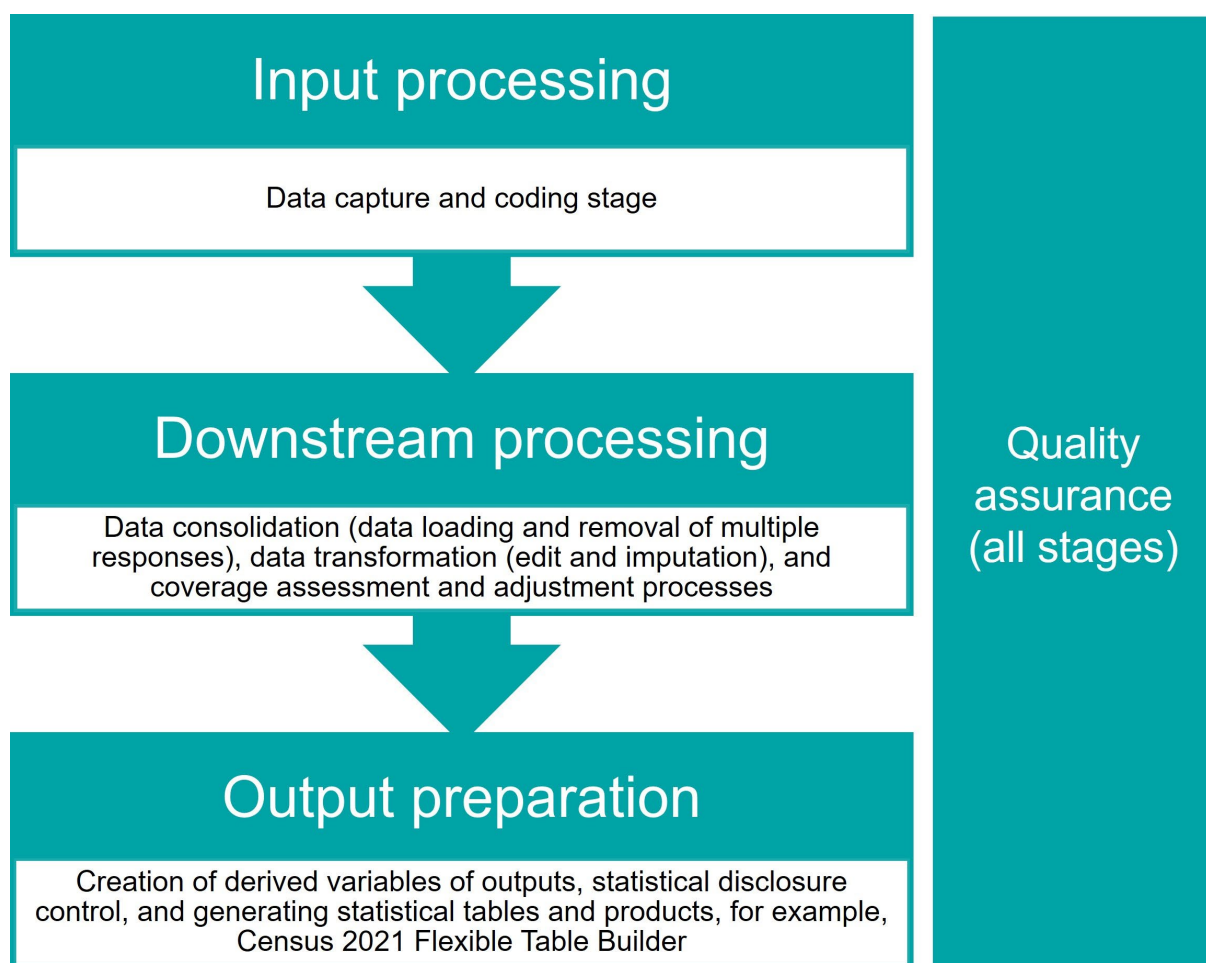
During the planning and live operational period, the SEaC team also produced a number of training, promotional and instructional videos. Training videos were produced in conjunction with the Field Operations team as a training aid for field staff. Promotional and instructional videos were primarily used on the census website and social media channels.

## 6. Data processing

### 6.1. Introduction

It is understood that the allocation of time and resources towards conducting a census is only deemed worthwhile if the findings are promptly and effectively disseminated to users in an accessible and user-friendly manner. Processing the completed census questionnaires in a timely manner has always been a challenging task, given the vast amount of information to be processed. Advancements in innovation and technology from the previous census were utilised and further developed to enhance accuracy, efficiency, accessibility, and user-friendliness of published outputs. Similar to previous censuses, Census 2021 followed a three-stage processing approach, as shown in Figure 8.

**Figure 8: Three stage Census 2021 processing approach**

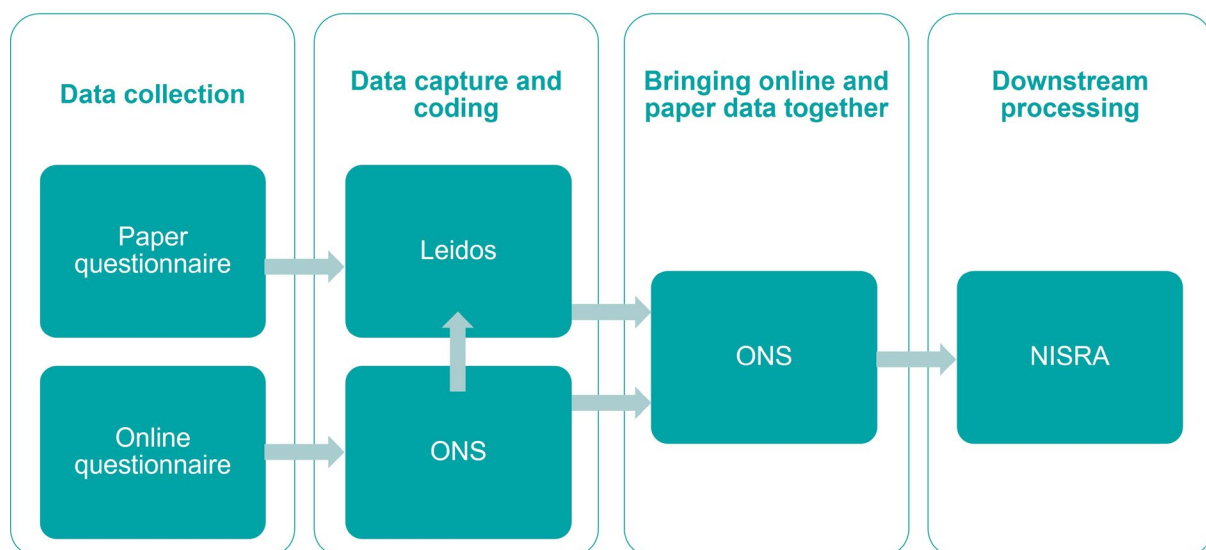


The first stage involved input processing, which included the main tasks of data capture and coding. The second stage, known as 'downstream' processing, consisted of statistical processes such as data consolidation, data transformation, and coverage assessment and adjustment. For the 2021 Census NISRA completed the downstream processing of Northern Ireland census returns locally, in full for the first time, using a processing system that was based on tried and tested principles used in Census 2011. Finally, output processing involved generating statistical tables and other products, applying statistical disclosure procedures, and the dissemination of these products to users. Quality Assurance was an integral part of all stages of processing.

## 6.2. Input processing

To generate outputs from the census, it is necessary to capture and code all of the responses provided on the questionnaires. This includes converting these responses into coded data and thoroughly cleaning the information to ensure high quality outputs. As was done for previous censuses, a set of processes were implemented to capture and code all of the ticks and text on the online and paper questionnaires. This was provided under the paper data capture contract with an external company.

**Figure 9: Simple diagram of data flow through input processing to NISRA for downstream processing**



A range of testing was carried out on the paper questionnaire and online questionnaire data supply pipelines including test cases being input to cover all response options for each question. These test cases were then followed through the various pipelines to validate all the pre-processing steps. This helped to check the accuracy of capture and coding of the information prior to its delivery to NISRA.

### 6.2.1. Online Questionnaire

During the census data collection period, the Census 2021 website served as the host for the secure online questionnaire, through which households and individuals across Northern Ireland, and England and Wales were able to complete their census. In total, just over 80% of returns for households were made online<sup>2</sup>. Online responses tend to have a higher data quality due to automated routing and lower levels of 'missing items', compared to returns made on paper questionnaires. Analysis of the first five questions on the 2021 questionnaires (names, date of birth, sex and marital status) showed the online questionnaire had a 0.5% level of 'missing items' while the paper questionnaire had a 3.6% level of 'missing items'. Given the high level of online returns, the overall quality of the collected data in the 2021 Census was significantly higher than in the 2011 Census.

### 6.2.2. Paper Questionnaire

To also ensure efficient and accurate processing, a bespoke secure paper processing site was required along with hiring a significant number of temporary staff, as well as having thoroughly tested computer processing systems. This was crucial in order to avoid any errors, breakdowns, or delays during this critical process. In addition to the normal operating and security procedures, a number of measures were introduced at the paper processing site to allow the operation to

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<sup>2</sup> 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 less people tend to be older and thus more likely to respond on paper.

continue in the wake of COVID-19 restrictions, whilst limiting the risk of infection to approximately 600 staff employed over the operating period.

Paper questionnaire processing began by scanning the questionnaires and capturing the data using optical character recognition. At the data capture stage, coding was used to assign numerical values to written text and tick box responses. This involved the use of coding rules, indexes and standardised national coding frames, such as SIC2007 (Standard Industrial Classification 2007) and SOC2020 (Standard Occupational Classification 2020), which allow data to be easily compared between different sources.

Targets were set to ensure that the captured and coded data were of sufficiently high quality. The minimum required level of accuracy for capture and coding varied by field type, depending on the complexity of the data in the field. The captured and coded data underwent a series of statistical processes before outputs were produced from the data. Before this happened, the data needed to be cleaned to ensure they were in the correct format required for the statistical processes.

For paper questionnaires, all the ticks and text were captured using a data capture process consisting of four components:

- scanning – to create online images that were the basis for all subsequent Paper Data Capture processes;
- image checking – to assess image quality, enhance captured images, and analysis of suspected poor-quality images;
- recognition – to capture handwritten textual responses and tick marks from questionnaire response fields; and
- keying – to manually capture the fields that could not be recognised automatically with sufficiently high accuracy.

The text responses, from paper questionnaires, were converted into coded data at the processing site, using a coding process consisting of three components:



- automatic coding – attempted to match the captured response, using machine logic, against entries in the indexes, if a match was found the corresponding code was assigned;
- Artificial Intelligence (AI) coding – attempted to code responses based on the observed behaviour of interactive coders. The AI learnt to code responses from responses that were coded consistently by interactive coders. This was a new process for Census 2021; and
- interactive coding:
  - frontline coding – the system was designed so that the bulk of the interactive work would be completed by the frontline coders. The coders would be able to see the captured response (as scanned), an image of the write in response and an image of that page of the questionnaire, to enable them to code a response; and
  - expert coding – if frontline coders were unable to code the response it would be sent to an expert coder. These coders would have access to additional reference materials to aid in assigning a code.

All scanned images captured and coded were securely transferred to NISRA for the next stage of data processing.

### 6.2.3. Coding Online Responses

Automated text coding methods were used for write-in text responses from the Census 2021 online questionnaire. Developing an in-house coding tool for Census 2021 was a new approach, but it had many advantages, including that the coding tools could be adapted.

A second benefit was that automated coding enabled data to be available earlier than usual, speeding up analysis and updates to the tool. As the census online questionnaire was available approximately four weeks prior to Census Day, data were available to identify new terms that were not encountered before Census 2021, meaning that the coding indexes were up to date.

Subject matter experts undertook real-time analysis of the most frequently occurring records that failed to code; this determined whether responses were suitable for inclusion in the coding indexes, and updated indexes could then be adopted into the pipeline for subsequent runs, ensuring the index was evolving in real time.

Updating the indexes promptly meant that fewer records were sent externally for clerical resolution, ensuring timeliness and cost efficiency. Those records that could not be coded were passed to the questionnaire management supplier for clerical resolution.

More information about the automated coding methods for write-in text responses from the Census 2021 online questionnaire and their results are available at [Automated text coding: Census 2021](#).

#### 6.2.4. Bringing Online and Paper Questionnaire data together

Once processed, the data relating to scanned paper questionnaires were transferred to the ONS to be reconciled with the data from the online questionnaires in preparation for downstream processing.

Following receipt of the paper questionnaire data, the ONS carried out a large reconciliation exercise to ensure that data for all paper questionnaires were received. The ONS merged this data with data from the online system prior to it being delivered securely to NISRA. There were established processes for checking the data, both prior to transfer from the ONS and following receipt of data by NISRA to ensure the data satisfied the agreed requirements for downstream processing and that NISRA could reconcile information received against what was sent.

NISRA progressed data processing from this point onwards.

### 6.3. Downstream processing

The main aim of downstream processing was to clean, correct and format captured data in preparation for output production. Downstream data processing involved many detailed data preparation and analysis steps. The three main steps were:

- data consolidation (consolidating responses, removal of false persons and reconciling of multiple responses – i.e. deduplication);
- data transformation (cleaning responses and item imputation on any missing responses from individual items/questions); and
- coverage estimation and adjustment (person imputation to bring the population up to 100%).

Administrative data was used throughout downstream processing where it was available and relevant to do so. The [Future provision of census of population information for Northern Ireland](#) report discussed the advantages and disadvantages of using administrative data to support a census and proposed ‘administrative data could be used to supplement the 2021 Census process and to quality assure outputs’. More detailed proposals on how administrative data could be used in Census 2021 downstream processing were published in the [Use of administrative data in the 2021 Census](#) document, including:

- demographic data cleansing;
- measures of Hard-to-Count (HtC) for use in coverage assessment;
- in coverage assessment/adjustment for use in a Census Under-Enumeration (CUE) project;
- item imputation; and
- quality assurance.

There were also areas where NISRA didn’t plan on using administrative data but did, for example utilising university data to move students to their term-time address during the pandemic. Details of administrative data use are included in the sections that follow, with further information available in the [Census 2021 data processing overview paper](#).

### 6.3.1. Data consolidation

There were four steps involved in data consolidation:

1. consolidate all the different sources of data, identify and remove any inconsistencies. All individual and continuation returns were associated with their household or Communal Establishment return;
2. removal of false person process (RFP), removed any census returns that did not contain sufficient information to be treated as a valid response;
3. reconciling multiple responses (RMR), identified and removed duplicate census responses; and
4. student moves - this process identified all students in the dataset and utilised administrative data to assess both the coverage and location of the students.

### Removal of False Persons

The process for removal of false persons (RFP) catered for spurious or limited responses in the census by removing any returns that were clearly not real people or did not contain sufficient information to be treated as a valid response. In order to decide if the response was valid and therefore not a “false” person, at least 2 of the following 5 variables had to be present:

- name on individual questions;
- name on household members table (paper questionnaire only);
- date of birth;
- sex; and
- marital status.

For 2021 this process was enhanced with the incorporation of administrative data. Here, if the failing raw census data could be linked to an administrative record, the raw census record was enhanced with this data and therefore these raw census records had a greater chance of being retained, rather than disregarded.

Enhanced records were only retained where they didn't create a duplicate of an existing response. In total the false persons process removed around 1.7% of all records (1.0% could not be enhanced or were spurious; 0.7% were enhanced but would have introduced duplicates).

The risk of inadvertent removal of student records under this process was mitigated by the inclusion of the university data and the Communal Establishment manager data – both of which allowed for student records to be adequately completed where information was missing from any individual returns.

### Reconcile Multiple Responses

The process to reconcile multiple responses (RMR) was the tried and tested census approach taken to identify and remove duplication in the census dataset. This process has now been used across the last three censuses (2001, 2011 and 2021). However, it was enhanced for 2021 to include extra modules that matched the entire Northern Ireland dataset to itself, allowing duplicates to be removed across the whole database (in previous censuses duplicate records were only removed within the same household or Communal Establishment). This is a significant improvement in overall quality for Census 2021 and was particularly important for students as they were more likely to be recorded on multiple responses and at different locations due to the capture methodology adopted.

This process removed around 2.6% duplicates (of which 0.4% was attributable to student de-duplication).

### Student moves

In recognition of the fact that students are historically hard to enumerate at their term-time address, and particularly since Census 2021 was undertaken during a time when restrictions relating to the COVID-19 pandemic were still in force, an extra step was introduced into processing to move students to their term-time address based on administrative data available at the time.

Specifically, the student moves process identified students (respondents in full time education aged 19 and over, or listed in educational Communal Establishment manager listing forms) in the census response dataset and utilised administrative data to assess their coverage and location – and moved them to an appropriate term-time address if information was available. A list of priority rules were developed for this process based on the different scenarios present within the data.

As a result, 2,800 student records were moved to their usual ‘term-time’ address in Northern Ireland. An additional 11,300 records were flagged as non-usual residents because the term-time address was outside Northern Ireland. More information on the process is available in the [Census 2021 Student information paper](#).

### 6.3.2. Data transformation

Data transformation is designed to correct for inconsistencies and ‘missing items’ within census responses.

Inconsistencies can arise from people not following the routing on the questionnaire, (this was only possible on the paper questionnaire). A process called ‘filter rules’ was applied to the data to correct any inconsistency or ambiguity relating to this issue. For example, when the online questionnaire is being completed for a person aged under 5, the carer question (question 22) is not shown, as routing built into the online questionnaire moves the respondent onto the next question. Therefore, a filter standardises online and paper questionnaire responses by setting all responses to those questions to ‘no code required’ for persons recorded as aged under 5 years. Some rules were also applied to the data to correct ‘invalid’ scenarios. These rules were applied to address any issues found – as an example, one rule corrects for a parent being younger than a child.

Any ‘missing items’ in responses were statistically imputed using a donor imputation methodology designed and developed by the Canadian Census Bureau called CANCEIS<sup>3</sup>. The primary objective of the 2021 process was to produce a complete and consistent database, and to adjust for non-response bias by estimating the non-responses.

The following three key principles were adhered to during the edit and imputation processes of data transformation:

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<sup>3</sup> 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 \(CANCEIS\)](#)

- all missing data (except the voluntary religion and sexual orientation questions) would be imputed to provide a complete and consistent database;
- the number of changes to inconsistent data would be minimised; and
- any changes made to observed data would not result in a loss of quality of the data.

Overall, the methodology implemented in the imputation system was successful in meeting the main objectives within the timescales available.

### 6.3.3. Coverage estimation and adjustment

While completion of a census questionnaire is a legal requirement, the reality is that a very small number of individuals will not comply fully with the census. As has been applied since 2001, statistical processes are used to assess and address the coverage issues that arise as a result of this, in order to make adjustments to the census counts to ensure that the outputs provide the best estimate of the true population.

The 2021 coverage estimation process followed methodology developed for the 2001 and 2011 Censuses with only minor differences. Improvements in the technical capacity of digital processing allowed Northern Ireland to be treated as a single area for estimation in 2021, rather than being split into three areas as was the case in the two previous censuses. This allowed for more statistically robust estimates to be generated.

The [Census 2021 coverage information paper](#) describes the approaches taken to adjust for under-coverage and over-coverage in Census 2021, and the quality assurance undertaken to validate the robustness of the data.

Coverage was measured and adjusted in four stages. These were:

1. Census Under Enumeration (CUE)
2. Census Coverage Survey (CCS)
3. Very young children adjustment

## 4. Coverage Adjustment

### Census Under Enumeration

For 2021, NISRA further developed the CUE project implemented in the 2011 Census. 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 where no census response was received. Where this occurred, NISRA inserted person records from administrative data into the census database. 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](#).

The Census 2011 CUE project utilised records from the Health Card Register, adding a total of 67,000 persons in 30,000 households. NISRA built on this for 2021 to use multiple, linked administrative data sets for the Census 2021 CUE project. The final Census 2021 CUE dataset contained 26,900 residents in 12,700 households. These records were added to the census database with a limited number of known characteristics taken from administrative data. The rest of the information was imputed using data transformation techniques outlined previously.

### Census Coverage Survey

The Census Coverage Survey (CCS) is the statistical methodology used to assess under-coverage. It involves a re-capture of selected census information from a representative sample of households across Northern Ireland. Once captured, the CCS information is then matched to the census results to estimate which household and/or individuals have been missed. Estimates are calculated from this process using robust statistical methodologies that extrapolate the results across the entire population. This is in addition to the CUE process which added information from high quality administrative data records. Once estimated, the records required to adjust for under-enumeration are then added to the census data with minimal socio-demographic information. These records are then subsequently fully populated using the data transformation process.



NISRA ran an independent CCS immediately after the main census data collection. It was an voluntary interviewer-led survey, where interviewers were in the field from 12 May 2021 to 29 June 2021. The CCS sample included approximately 16,000 households (or around 2% of residential addresses in Northern Ireland) and the data collected were processed in a way that closely mirrored that of the census to reduce potential bias from processing methods (consolidating responses, removal of false persons and reconciling of multiple responses).

The statistical analysis showed that a coverage adjustment of around 31,000 people and 9,000 households was needed to create a complete estimate of the population and households in Northern Ireland.

Further details on the CCS are available in the [Census 2021 coverage information paper](#).

### Very young children adjustment

During quality assurance of coverage estimates, the number of very young children were compared to administrative data sources as it is acknowledged that people can forget to include very young children on their census questionnaires. To assess the extent of the issue, NISRA compared the census database with birth registrations in Northern Ireland in recent years and also linked responding mothers in the census to the parental information provided within those birth registrations.

As a result of this analysis just under 1,000 young children (aged 0-2) were identified to be added to households in the census database as a 'very young children' adjustment.

### Coverage adjustment

The records inserted for both CUE and the 'very young children' adjustment came largely from administrative data, while the records for residents and households estimated from the CCS were inserted using donor imputation from within the census database. The CCS 2021 adjustment process followed the methodology applied in 2011, modelling the probability of a resident with a given set of characteristics (for example, age and sex) being missed from the census, either from an enumerated

household, or missed from a household that did not respond (i.e. a missing household).

Donors with similar characteristics were copied from the census database and inserted into the appropriate addresses – controlling for characteristics collected in the CCS. Locations were determined using information gathered by field staff, administrative data signs of life and minimum distance calculation.

Imputation of residents and households was examined in detail at lower geographic levels to look for spikes in imputation and compare to other available data sources prior to acceptance of the adjusted population.

In total 30,900 residents and 9,200 households were added to the NI population by statistical methods to reflect the final CCS estimates. These records were added to the census database with limited variables, with the rest being imputed using data transformation techniques outlined previously.

Table 5 summarises the sources and totals for those records added to the census database.

**Table 5: Adjustment record sources and totals**

Method	Record source	Residents	Households
Census Under Enumeration (CUE)	Administrative data	26,900	12,700
Very young children adjustment	Administrative data	1,000	0
Census Coverage Survey (CCS)	Donor from census database	30,900	9,200
<b>All adjustments</b>	<b>All sources</b>	<b>58,700</b>	<b>21,900</b>

#### 6.4. Output preparation

Once the downstream processing had concluded and the data had been quality assured, not only in terms of Northern Ireland and sub-Northern Ireland population estimates, but also for consistency across characteristics and in terms of population coverage (i.e. that the database represents the complete population), the database was ready for output processing.

The steps to prepare the data for outputs were broadly the same as those adopted in 2011. They were:

- add geographies;
- apply statistical disclosure control methodology; and
- apply derived variables for outputs (DVOs)

#### 6.4.1. Add geographies

The step to add geographies took address information collected in the census (such as usual residence, workplace address, one year ago address) and used address matching to ensure all address fields were complete. Geographic Information System (GIS) software was then used to attach output geographies to allow for aggregate outputs at local and statistical geography levels.

#### 6.4.2. Statistical Disclosure Control – Targeted Record Swapping

The Targeted Record Swapping statistical disclosure control method was applied to the microdata within processing to protect individuals and households with unique or unusual characteristics. This method achieves a high degree of confidentiality while maintaining the integrity of the data. More information can be found in the [Census 2021 Statistical Disclosure Control Methodology](#) paper.

#### 6.4.3. Derived Variables for Outputs

In addition to the individual question responses from the census questionnaire (for example, ethnicity, religion, passports held, age, sex etc.), a range of Derived Variable for Outputs (DVOs) were calculated to create additional variables that were required for output tables. These were required to consolidate tick/text responses, to aggregate or group response categories, or to combine question responses to create more complex variables.

While the majority of DVOs were created to provide aggregate versions of the tick and text responses to certain questions (for example, Country of Birth, Ethnicity, or Main Language), some were created to provide more complex counts/classifications.

A [Census 2021 variable index](#) document details each variable and contains information such as the variable definition and categories. This document allows users to find terms and definitions to help gain a broader understanding of census topics, and has been updated with each data release.

## 7. Output production, dissemination and analysis

### 7.1. Introduction

A key objective for Census 2021 was to provide flexible, timely, accessible, and relevant census outputs. Ensuring that a wide range of data was readily available at the lowest geographic levels, and easily accessible for users. The aim was to accommodate various user preferences, whilst being mindful of the need to protect confidentiality and achieve value for money. It was recognised that the true value of the census can only be achieved if users can access the high-quality reliable statistics that they need, promptly and in an open and equitable way.

This chapter sets out how NISRA developed and delivered its main census statistical releases from May 2022 onwards, including the introduction of new interactive products for Census 2021, improved accessibility, and the provision of a range of supporting and quality assurance information for users.

### 7.2. Strategic aims

Census 2021 has endeavoured to build on the success of the 2011 Census outputs. Using lessons learned from the 2011 Census, user feedback, and undertakings given in the [Statement of Agreement](#) (between the Registrars General for Northern Ireland and Scotland, and the National Statistician), a number of strategic aims were developed for Census 2021 outputs that focussed on:

- accessibility and flexibility;
- timeliness;
- user acceptability; and
- public confidence.

### 7.3. Consultation and engagement

Census users were consulted with on a number of occasions in developing Census 2021 outputs plans.

### 7.3.1. Outputs strategy consultation

The [outputs strategy consultation](#) was launched on 18 October 2018 asking users of census statistics for their views on the proposed strategy for producing and disseminating Census 2021 results. The consultation closed on 9 January 2019 and the following high-level feedback was received:

- Access/Timeliness: respondents wanted to access data earlier via an online flexible dissemination system rather than waiting for tables to be developed by NISRA;
- Timetable: respondents were in favour of the proposed release schedule;
- Geography: respondents had a preference to create a new geography that aligned with the new administrative boundaries; and
- Accuracy/Disclosure Control: respondents felt that accuracy of the data was a key concern, however respondents indicated that they would be content with slightly inconsistent table totals in support of the use of cell key perturbation.

### 7.3.2. Census 2021 outputs consultation

The [Census 2021 outputs consultation](#) was launched on 1 October 2021 asking users of census statistics for their views on the content, design and release phase proposals for Census 2021 outputs. This further consultation ran until 26 November 2021 and was used to finalise outputs planning. Through this consultation the following high-level feedback was received:

- respondents planned to access Census 2021 results via the ready-made tables, with half of respondents stating that they had planned to access data via the build-your-own table system;
- respondents felt that the proposed publication plans met their needs, with a large proportion of them indicating that the proposed release dates met their requirements; and
- respondents were positive about the products being released with all topics deemed sufficient to meet their requirements.

Based upon this consultation the initial Outputs prospectus was developed and launched in January 2022 – this included indicative dates for each planned release. The prospectus has subsequently been updated when each date was confirmed, and the current version of the [Outputs prospectus](#) can be found on the NISRA website.

## **7.4. Census 2021 output geographies**

### **7.4.1. New statistical geographies for Census 2021**

Census statistical outputs need to be produced for a variety of geographies in Northern Ireland to maximise the utility of the data and realise key benefits. These geographies range in size from neighbourhoods to large administrative units, such as LGDs.

The outputs strategy consultation garnered a user preference for a revision to the Census 2011 Small Area (SA) and Census 2011 Super Output Area (SOA) geographies in order to align with the current administrative geographies.

The SA and SOA areas were designed around the time of the 2011 Census and were broadly based on the postcode geography available at that time. One of the aims of the statistical geography was for them to be broadly equal in size and for them to contain broadly similar housing types in terms of tenure (for example, owned, rented) and accommodation type (for example, detached, flat/apartment). The purpose of this approach was to make the areas socially-similar.

Since then, there has been significant administrative and demographic change, resulting in the areas becoming less equal in size and becoming less socially similar – this impact is particularly stark in areas that have seen concentrated housing development. In addition, there were a number of topographical issues with the SA geography that needed to be addressed, such as:

- boundaries intersecting building polygons;
- irregular shaped boundaries;
- presence of geographic slivers;

- centre-points lying outside of area boundaries (due to irregular shape); and
- areas not aligning with higher-level administrative boundaries.

All of these issues supported the user-led preference to revise the output geographies. Further detail is included in the [Census 2021 outputs geography paper](#).

As a result, two new statistical output geographies were developed for Census 2021 to replace the 4,537 SAs and 890 SOAs. They were named Data Zones (DZ2021 – 3,780 areas) and Super Data Zones (SDZ2021 – 850 areas). These nest directly into District Electoral areas and LGDs, with the added benefit of the Data Zones being closely aligned to large settlements in Northern Ireland. They are the primary statistical geography by which local level statistics are reported from Census 2021, and are available to browse in the [Census Area Explorer](#).

In February 2023, digital boundaries for the new geographies were published alongside [information papers](#) on their development and how particular administrative geographies can be created or approximated from Data Zones. The new geographies were also added to the NISRA Central Postcode Directory released in February 2023.

#### 7.4.2. Census 2021 Grid Squares

In addition to the Data Zone and Super Data Zone geography hierarchy, the [Census 2021 Grid Square product](#) was released in December 2023 to support the examination of trends over time for consistent spatial units.

NISRA has published Grid Square statistics for the last five censuses in Northern Ireland (since 1971). The geographic base for Grid Square outputs is the Irish Grid, and census statistics are produced for 100m and 1km grids in Northern Ireland. Grid square census statistics include population and household counts along with a range of pre-defined census variables. Comparability of previous grid square outputs is retained where possible; however, changes over time in definitions and questions asked in the census result in some comparability limitations.



Suppression is applied where the counts in particular grid squares are below an acceptable threshold (to protect the confidentiality of individual census returns), and where this has occurred, household counts are available in order that users can map the broad spatial distribution of households in sparsely populated areas.

Further information on the Grid Square product is available in the [Grid Square Guidance Note](#).

### 7.4.3. Other geographies

The overarching requirement to protect respondent confidentiality and to reduce the risk of data disclosure necessitates that there is a limit on the number of small area geographies which census results are disseminated for. For Census 2021 the lowest level of geography available for most outputs is Data Zones. As mentioned, Grid Square outputs are available but only for a set number of census variables.

Postcode level information is also available from Census 2021, but this is limited to population and household counts.

The new Data Zone geography provides the ability to aggregate to many higher level geographies – both within the administrative hierarchy (i.e. District Electoral Areas and Local Government Districts) but the Data Zones can also be used to approximate additional non-standard geographies, and indeed custom geographies.

Geographies outside the main hierarchy are considered suitable for Data Zone approximation if they were within a 5% accuracy threshold for both the usual resident person and household counts from Census 2021. NISRA has already produced census data for these non-standard geographies and released them either on the NISRA website or within the Flexible Table Builder (see [sections 3 and 4 of Aggregating Data Zones to produce statistics for higher-level geographies](#)). Most notably, Census 2021 outputs were produced for the new parliamentary Constituencies which came into effect in the 2024 general election.

In addition, the Grid Squares can be used as a base geography (or building block) to build or approximate non-standard and custom geographies, for which Census 2021 statistics can then be produced – but only for variables contained within the Census

2021 Grid Square product. As for Data Zone approximations, an accuracy threshold of within 5 % applies. To date, NISRA has produced Grid Square approximations for the current Electoral Wards, smaller Settlements, Neighbourhood Renewal Areas and Sure Start Areas.

### **7.5. Accredited Official Statistics (formerly National Statistics Accreditation)**

Ahead of the publication of the first results in May 2022, the Office for Statistics Regulation (OSR) published their confirmation of the National Statistics designation for Census 2021 in Northern Ireland, this designation was achieved following extensive evidence gathering and assessment carried out by the OSR. The accreditation process is described on the [National Statistics accreditation page](#). This accreditation validated the quality and trustworthiness of the data and statistics produced from Census 2021.

### **7.6. Census 2021 outputs and data releases**

The main census outputs for Northern Ireland were published in a series of releases, from May 2022 to late 2023. This represented a considerable improvement in the timeliness of the releases compared with the 2011 Census, particularly for the more detailed releases in 2014 and 2015.

The high-level release schedule for Census 2021 is shown in Table 6:

**Table 6: High-level release schedule for Census 2021 to date**

Title	Release Date	Details	Supported by commentary
Population and household estimates	24 May 2022	<b>Headline Census 2021 population statistics</b> by age and sex (rounded)	Yes
Main Statistics – phase 1	22 September 2022	<b>Census 2021 results for key topics at NI and LGD level:</b> Ethnicity; Country of Birth; Passports Held; Religion; National Identity; and Language.	Yes
Main Statistics – phase 2	15 December 2022	<b>Census 2021 results for key topics at NI and LGD level:</b> Health, Disability and Unpaid Care, and Housing and Accommodation	Yes
New 2021 Statistical Geographies	21 Feb 2023	<b>Census 2021 population counts for new statistical geographies:</b> Included census tables, shape files and information papers	Yes
Main Statistics – phase 3	21 March 2023	<b>Census 2021 results for key topics at LGD level:</b> Marital and Civil Partnership Status, Household Composition, Sexual Orientation, Qualifications, Labour Market, Travel to Work or Study, Communal Establishments, and Migration	Yes
Main Statistics – supplemental	31 May 2023	<b>Census 2021 results for key topics at NI Level:</b> Additional detail on Demography, Ethnicity, National Identity, Language and Religion	No
Flexible Table Builder - Multivariate data	22 June 2023	<b>Launch of the online Census 2021 Flexible Table Builder:</b> All Census 2021 data available down to Data Zone level, accompanied by guidance videos	Yes
Main Statistics – Approximated Social Grade	30 November 2023	<b>Census 2021 results for Approximated Social Grade:</b> New Main Statistics table and inclusion of variable in the Flexible Table Builder	No
Main Statistics – additional geographies	30 November 2023	<b>Census 2021 results for key topics at Settlement and Ward level:</b> Main statistics data tables updated to include settlement and ward data	No
Census 2021 Grid Square product	14 Dec 2023	<b>Census 2021 results at Grid Square Level:</b> Release of database, supported by guidance document, shapefiles and codebook.	Yes
Specialist product – Origin-destination	9 July 2024	<b>Census 2021 public origin-destination products:</b> showing detailed migration and commuting patterns	Yes
Specialist product – Alternative populations	8 August 2024	<b>Census 2021 results for Daytime and Workplace populations:</b> Census topics available for a range of different geographical breakdowns, including Local Government District (LGD) and Super Data Zone (SDZ)	Yes

### 7.6.1. Population and household estimates – First release

The first release from Census 2021 was the [Census 2021 population and household estimates for Northern Ireland](#). These were published on 24 May 2022 and included headline estimates of the population of Northern Ireland by age and sex, the number of households with usual residents, and the Communal Establishment population. This release was accompanied by a media briefing, press notice and statistical bulletin discussing key trends and changes in population and housing observed over time.

Further population and household estimate tables were published as additional geographies were released from Census 2021.

### 7.6.2. Main statistics tables

The [main statistics tables](#) were the key release of univariate statistics from Census 2021. These included summary statistics for each of the main census topics for a number of geographies including Northern Ireland, and Local Government Districts.

These were released in a number of phases. Each release contained a set of excel tables on the particular topics, associated briefings, press notices and statistical bulletins (where relevant) on each topic covered, and a set of associated infographics. The phases of the main statistics release covered the following topics:

- Ethnicity; Country of Birth; Passports Held; Religion; Religion or Religion Brought Up In; National Identity; and Language. Included finalised, unrounded estimates for the population and household statistics (22 September 2022);
- Health, Disability and Unpaid Care, and Housing and Accommodation (15 December 2022);
- Marital and Civil Partnership Status, Household Composition and Living Arrangements, Sexual Orientation, Qualifications, Labour Market, Travel to Work or Study, Communal Establishments, and Migration (21 March 2023);
- Further detail on Demography, Ethnicity, National Identity, Language and Religion (31 May 2023); and

- Approximated Social Grade and main statistics tables for the Settlement and Ward geographies (30 November 2023).

### 7.6.3. Digital Products

Two new free-to-use online products were developed to disseminate Census 2021 outputs, namely the Census 2021 Flexible Table Builder and the Census Area Explorer, both of which are versatile tools that offer a dynamic approach to the presentation and analysis of census data. They allow users to examine census data according to their specific needs in ways not previously possible.

#### Flexible Table Builder

A significant part of the improvement in the timing and flexibility of the outputs was due to the release of the [Flexible Table Builder](#) (FTB) tool, which was launched in June 2023.

For the first time in Northern Ireland, the FTB allows users to build and tailor their census data online to produce their own tables for their specific needs. Users can quickly build, pivot, preview and manipulate multiple variables within a table, streamlining the process of synthesizing information. This saves valuable time and enhances productivity by providing a simple user-friendly interface for data manipulation and access. Multivariate datasets can be downloaded in several formats or shared with colleagues via weblinks for improved project collaboration.

The FTB has 87 variables in the Household dataset and 197 in the People dataset, each of these variables has accompanying metadata describing it. The FTB allows users to use the variables to create their own queries or to download one of the 100+ pre-built tables that align with the main statistics releases.

Disclosure controls are applied automatically in the FTB system, allowing users to access all the data they need, so long as it is within established disclosure rules, which are in place to protect census data (see [section 6.4.2](#)). Users can also enhance their custom query within the FTB by filtering and pivoting the data as required. The system is also designed to allow for easy collaboration, using the 'Copy Link' feature to easily share queries with colleagues.

## Census Area Explorer

The [Census Area Explorer](#) enables users to examine Census 2021 and Census 2011 data using enhanced visualisation options. Census Area Explorer users can easily view charts and visual elements directly on screen, offering a comprehensive view of the data for a selected area. This visual aesthetic allows users to browse the available geographies on an interactive map and return census information for those areas, helping to convey complex information more effectively, fostering better understanding and decision-making, particularly when comparing smaller geographic areas with Northern Ireland.

### 7.6.4. Geographic products

#### Census 2021 statistical geography release

The Census 2021 statistical output geographies were released on 21 February 2023. This release included shape files and guidance documentation. With this publication of the new geographies, person and household estimates from Census 2021 were also published for this geographical level. Census data covering all topics were made available for these new geographies via the launch of the FTB in June 2023, with topics added to the Area Explorer for the new geographies in July 2023.

#### Census 2021 Grid Squares

NISRA has published Grid Square statistics for the last five censuses in Northern Ireland (since 1971), in order to permit the examination of trends over time for consistent spatial units.

The [Census 2021 Grid Square product](#) was released in December 2023 and provides basic census statistics for a combination of 1 kilometre and 100 metre grid squares in Northern Ireland.

### 7.6.5. Additional specialist products

There are additional specialist products which have also been released from Census 2021 as part of the planned outputs phase, these include:

## Census 2021 origin-destination data

[Origin-destination data](#) from the census provides aggregate statistics on the movement of people from one location to another. Three types of flow data were released in this publication:

- Migration: showing the movement of individuals from their address of usual residence one year before Census Day, to their address of usual residence on Census Day;
- Workplace: showing commuting patterns of employed individuals from address of usual residence on Census Day to their normal workplace; and
- Student migration: showing movement of individuals who were living at student addresses one year before Census Day, 21 March 2021 to address of usual residence on Census Day.

The release in July 2024 was the first phase of releases under this topic – further releases are scheduled for 2025.

## Census 2021 alternative population base statistics

[Alternative populations data](#) provide census statistics on the various locations where individuals can be counted in Census 2021. The main populations are Daytime and Workplace.

**Daytime population:** The population and characteristics of people in the area during the daytime. It includes all usual residents who are either in employment or in full-time education in the area, or who are neither in employment nor in full-time education and live in the area. People with a work or study address outside Northern Ireland are excluded.

**Workplace population:** The population and characteristics of people working in the area. It includes all usual residents aged 16 and over (excluding full-time students) in Northern Ireland at their place of employment. People with a workplace address outside Northern Ireland are excluded.

Alternative population tables were released on 8 August 2024.

#### 7.6.6. Research datasets

A number of census microdata products have been made available to the research community alongside the release of standard tabular and digital products. These are:

##### Northern Ireland Longitudinal Study

The Northern Ireland Longitudinal Study (NILS) is a longitudinal dataset that provides a rich resource for research into Northern Ireland society, made available by incorporating data from the 1981, 1991, 2001, and 2011. The dataset covers roughly 28% of the Northern Ireland population and incorporates other data available across government such as health data, vital events, and geo-spatial information.

The NILS dataset was updated over the course of 2023 to include new Census 2021 information, extending the research data coverage to 40 years. The NILS 2021 was subsequently launched in April 2024 at an event in Queens University Belfast.

Further information on NILS is available on the [NISRA website](#).

##### Northern Ireland Mortality Study

The Northern Ireland Mortality Study ([NIMS](#)) is a dataset designed to enable more detailed investigation into NI mortality patterns. NIMS datasets have existed for previous censuses, and most recently the NIMS 2021 was created using Census 2021 data linked with death information from Census Day onwards. The 2021 NIMS dataset was officially launched in April 2024 alongside the NILS launch.

##### Census 2021 Comprehensive Microdata

The [Census 2021 Comprehensive Microdata Dataset \(C21CM\)](#) is a research ready dataset that provides a large sample of census data for research purposes. It contains around 1.87m person records and 760k household records from Census 2021, accompanied by around 320 census variables. This was the first time that census information has been made available for research in this way. Developed over the course of 2024, it was launched in October 2024.



### 7.6.7. Future final planned Census 2021 releases

A number of products are still planned from Census 2021 but are not yet completed at the time of publishing this report, details of these are outlined in the following sections.

#### Samples of anonymised records

These are small anonymised samples of census records that are provided for research purposes. There are three files planned, each with increasing levels of access restrictions:

- Teaching microdata file: publicly available, containing anonymised records on a limited set of variables for a random sample of 1% of individuals from Census 2021 for Northern Ireland.
- Safeguarded microdata file: this will consist of a random sample of 5% of individuals from Census 2021 for Northern Ireland. This file will not be made publicly available and will only be made available under licence and control from Census Office.
- Secure microdata file: this will consist of two random samples of 10%, one a sample of the individuals and one a sample of households from Census 2021 for Northern Ireland. This file will not be made publicly available and will only be made available under licence and control from Census Office.

#### United Kingdom 2021/22 Census data

The three UK Census Offices work closely throughout the delivery of censuses in the UK. England, Wales and Northern Ireland undertook censuses in 2021 (as planned) and Scotland undertook their census in 2022 (one year later than planned due to COVID-19).

Despite the delay with Scotland's census, UK census outputs will be made available for this cycle. Plans are still in development at the time of publishing. Further details of these plans will be added to the [Outputs prospectus](#) when available.

## Ireland and Northern Ireland 2021/22 Census data

After the last round of censuses, NISRA and Central Statistics Office (CSO), Ireland, presented a joint [Census 2011 Ireland and Northern Ireland report](#). This presented analysis and comparisons of census attributes across various topics such as demography, ethnicity, place of birth, religion, health and care, housing and travel to work or study. It is planned that a report covering the recent 2021/22 censuses will be published in 2025. Further details of this release will be included in the [Outputs prospectus](#).

## UK Armed Forces Veterans Data

Census Office will create a number of tables focused on the UK Armed Forces veterans living in Northern Ireland on Census Day. These statistics will be subject to enhanced disclosure control, but where possible, will include statistics on demography, employment status, qualifications and health, disability and unpaid care. Further details of these plans will be added to the [Outputs prospectus](#).

## 7.7. Supporting information relating to outputs, methods and data access

### 7.7.1. Reference materials

A broad range of supporting information and reference material was provided alongside the releases for Census 2021. These include topic analysis, quality information, methodology overviews, outputs definitions, table lookups, variable indexes, FAQs. All are available on the NISRA website:

- [Topic summary Census 2021 statistical bulletins](#) were published alongside the release of data for population and household estimates, and each phase of main statistics.
- [Information on quality and quality assurance](#) was published at various points in the outputs project.
- Methodology overviews, information papers, outputs definitions, FAQs etc are all available on the [reference materials page](#).

- Details of quality notes, issues, and corrections to published Census 2021 data are available on the [Quality notes, issues and corrections page](#).
- Information to assist users with the Flexible Table Builder (including information videos) were published on the [FTB help page](#).
- [Relevant information on geography](#) was published on the geography page of the NISRA website – including [reference material](#) relating to the new statistical geography.

### 7.7.2. Commissioned Table Service

The commissioned table service offers a means for users to access data that is not available in the published outputs or through the FTB. Commissioned tables are generated upon request from customers.

More information on how to request a commissioned table can be found on the [census commissioned output](#) webpage, with information on the charging policy, and the confidentiality considerations to be considered when making a request.

### 7.8. Promoting census releases

A key objective with census outputs is to maximise their reach and to promote their availability as widely as possible. This approach changed depending on the release and its contents. All releases were announced in advance on GOV.UK in line with National Statistics protocols. After this a variety of channels were used to promote outputs with the main ones being media, social media, websites and direct engagement via email and webinars.

The NISRA website was kept up to date with publication dates through the Outputs prospectus. This outlined what would be included in each release along with release dates and proposed timescales for future releases. Each release was accompanied by a news story on the homepage of the NISRA website.

### 7.8.1. Media and social media

After the announcement of each release, on the GOV.UK website, updates were posted on social media channels such as Facebook and X (formerly Twitter). The Census 2021 Northern Ireland accounts were the primary vehicle, and then shared via NISRA and Department of Finance (DoF) accounts. For the main statistics releases there was a social media plan which increased the frequency of posts in the run up to release day. These posts gave a bit more information on the release and what people could expect. On release day itself infographics were also shared on social media throughout the day and for the FTB release there was also animated content to show functionality.

For the first release and Main Statistics (phase 1), media briefings took place. For the first release the media briefing was online with electronic press packs being provided at the time of the briefing. For the release of main statistics (phase 1), the media briefing was a hybrid event with the face-to-face element taking place at the Public Records Office of Northern Ireland (PRONI). Both media events were well attended, however the second one was much more popular due to the volume and range of data included in that release.

All main statistics releases were accompanied by statistical press notices which were distributed to media outlets by DoF Press Office.

### 7.8.2. Engagement

Throughout the outputs phase of Census 2021 there was continual engagement with users of census data and key census stakeholders. Prior to each release, users were notified of the release contents and dates, and this was done with emails and via social media.

The stakeholder emails went to:

- Census Office mailing list – customers who had requested to be kept informed of general census news;
- other NISRA mailing lists – other areas of NISRA disseminated information on behalf of census to maximise the reach of the outputs;

- Council Chief Executives; and
- MPs, MLAs, political party leaders.

Further promotion of census outputs was through a series of online webinars and presentations to a number of stakeholders such as departmental boards, university classes, researchers etc. These seminars and presentations focused on updated/new census geographies as well as the digital products and how to access and use them, as well as the publication schedule for remaining outputs at that time.

### **7.9. Comparison with 2011 results**

NISRA has published a [2021-2011 Census in Northern Ireland questionnaire comparability report](#) which details the changes/differences between the Northern Ireland Census 2021 and Census 2011. It helps users identify where differences in census outputs may be as a result of a change in definition or response categories, rather than a change in underlying population characteristics.

In general, comparability between Census 2021 and Census 2011 is high where the questions are broadly similar. However, it is noted that the restrictions in place due to COVID-19 at the time of the census in March 2021 may have affected some of the responses and therefore reduced comparability. Any limitations to the comparability are documented within relevant statistical bulletins.

### **7.10. Statistical Disclosure Control – Outputs**

Statistical Disclosure Control (SDC) refers to a range of methods that aim to protect individuals, households, businesses, and their attributes from being identified in published data and microdata. Methods may be applied to the microdata (pre-tabular) or the output tables (post-tabular) prior to release.

The methods described below relate to the post-tabular methods adopted to ensure SDC. Pre-tabular methods were discussed in [section 6.4](#).

### 7.10.1. Cell Key Perturbation

Cell Key Perturbation (CKP) is a post-tabular method of disclosure control that involves adding ‘noise’ to some cells in a table. This adds uncertainty to the table with the goal of protecting against disclosure. The method uses an algorithm to apply a pre-defined level of perturbation to cells in each table, with the same perturbation being applied to every instance of that cell. Small counts are more likely to be perturbed, so tables with large counts have less noise added than those with a lot of small counts. The noise can be positive or negative and should approximately balance out across a table.

The cell key method provides protection against using differences between similar tables to create disclosures for small areas or specific sub-populations, known as ‘disclosure by differencing’. The method also allows more detail than previous censuses and allows bespoke combinations of variables. However, it does reduce efficiency as its application is an extra step in the production of tabular outputs.

CKP was applied to all published Census 2021 tabular outputs. In addition, cell key perturbation was embedded within the newly developed Flexible Table Builder so that a table created in the builder will give identical results to the same pre-published table.

### 7.10.2. Disclosure rules within the Flexible Table Builder system

To prevent large and sparse tables being accessed from the build-a-custom-table facility in the Flexible Table Builder, disclosure rules were set within the system. These disclosure rules ensure sensitive or sparse outputs are protected from the risk of disclosure and identification while providing users with the flexibility and rapid access to tabular outputs they require.

When a table is created in the Flexible Table Builder, the system checks against the pre-defined disclosure rules to determine whether the outputs are too disclosive to release. The rules are checked for each specific combination of variables and geographic areas the user attempts to build for, withholding data for those areas that do not meet the requirements. This ‘patchwork’ approach allows greater accessibility

than the 'blanket' approach used in previous censuses, where data for all areas would have been blocked if any areas were deemed too risky.

These disclosure control measures have been designed to protect confidentiality without distorting the statistics unduly. In consideration of the statistical disclosure control methodology, NISRA aimed to strike a reasonable balance in providing utility, accessibility and flexibility to users while also fulfilling legal obligations to protect against disclosure risk. More detail is available in [Statistical Disclosure Control Methodology Guidance note](#).

## 8. Quality Assurance

### 8.1. Introduction

The census is the most complete source of information about the Northern Ireland population available, with significant effort made to include everyone. It is essential to ensure the quality of census data given the key role it plays. In January 2021, the NISRA published the [Census 2021 quality assurance strategy](#) which outlined the quality assurance work that would be undertaken in order to ensure that the outputs released from Census 2021 were robust, reliable and met user needs.

As outlined in the strategy, the quality assurance of Census 2021 aimed to:

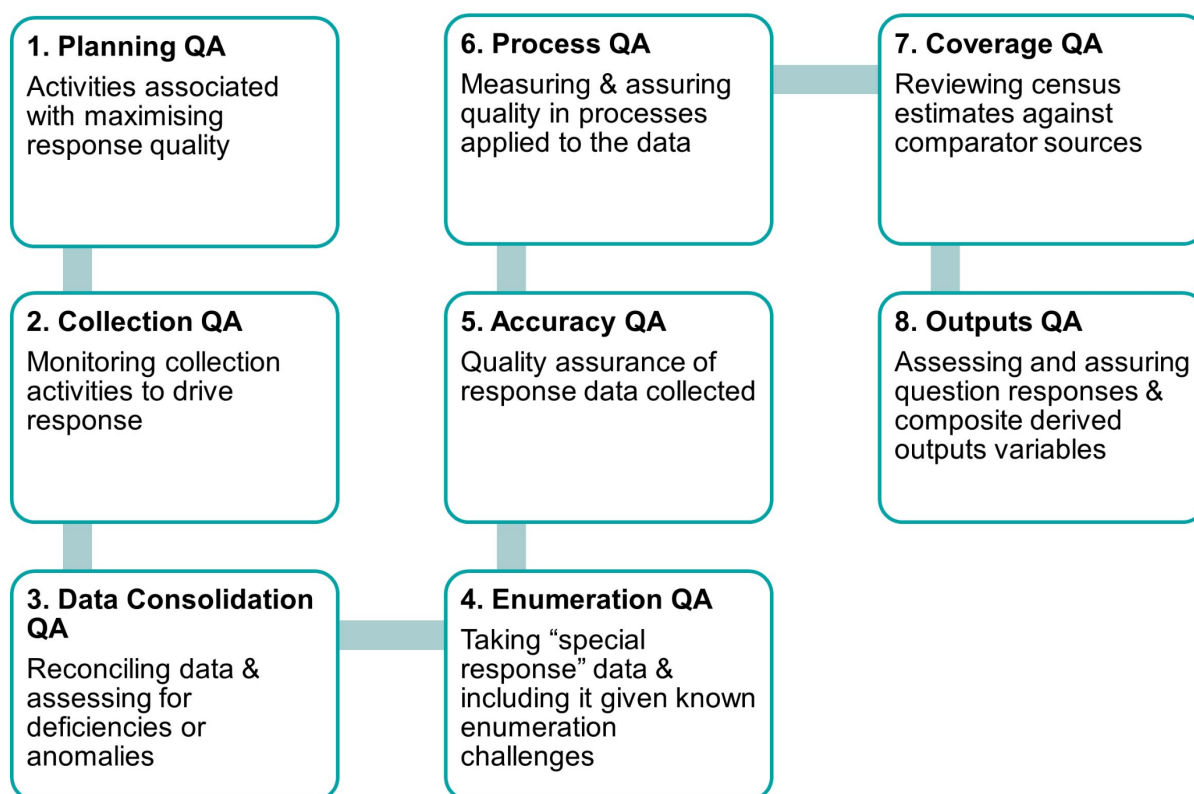
- ensure that the census results provided a reliable basis for decision-making;
- give data-users confidence that the census results are fit-for-purpose;
- deliver census results as soon as possible;
- minimise the risk of errors in the census estimates;
- enhance the overall credibility of the statistics; and
- leave a legacy of methods, tools and skills for the quality assurance of future population statistics.

### 8.2. Stages of Quality Assurance

From planning through to outputs, quality has been at the forefront of all decisions taken throughout Census 2021. Figure 10 summarises the eight stages of quality assurance.



**Figure 10: Eight stages of quality assurance during Census 2021**



Some details of the approaches taken at each stage are given in the following sections. Additional detail is available in the [Census 2021 population and household estimates for Northern Ireland quality assurance report](#) published in May 2022.

### 8.2.1. Planning quality assurance

Years of planning go into a census to design the content and agree questions to be asked. As part of this planning a number of activities took place:

- a review of the successes and lessons learnt from the 2011 Census and [2011 Census quality survey](#);
- the [Census 2021 topic consultation](#) carried out between September and December 2015;
- a programme of testing and research to better understand the public's perception of the census, question wording, questionnaire design and response channels;

- the [Census Test in 2017](#), which was a large-scale, voluntary census test conducted in autumn 2017;
- topic expert meetings which took place between 2016 and 2019; and
- a full end-to-end [Census Rehearsal](#), which took place in autumn 2019.

This work helped to get the questionnaire design right and test the processes ahead of Census 2021.

### 8.2.2. Collection quality assurance

A major focus in the run up to Census 2021 was developing the systems and services required to collect data securely and efficiently, and the monitoring of collection activities to drive response. This ranged from development of the Wave of Contact (WoC) and materials to ensure households knew the census was happening, to the Response Management (RM) system that allowed live tracking of the status of each census return.

All the collection approaches resulted in an overall household and person response rate of 97% and a Communal Establishment response rate of over 99%. This is the highest census response rate since 1991, the corresponding figures were 94% household and 92% person in 2011.

### 8.2.3. Data consolidation quality assurance

Working with the Office for National Statistics (ONS) and NISRA, the contractor prepared and dispatched paper questionnaire packs, and then securely managed, captured, digitised and coded the responses for the 2021 Censuses in England, Wales and Northern Ireland. Once processed, the data relating to scanned paper questionnaires were transferred to the ONS.

Following receipt of this data, the ONS carried out a large reconciliation exercise to ensure that data for all paper questionnaires were received. ONS merged this data with data from the online system prior to it being delivered to NISRA.

There were established processes for checking the data, both prior to transfer and following receipt of data by NISRA. This ensured that the data satisfied the specified requirements and included checks such as:

- reconciling expected numbers of records against data files delivered (by response type and response mode);
- variable range checks;
- variable format checks;
- analysis of variable distributions to identify unusual patterns; and
- geographical distribution of responses.

Once the data was received by NISRA and verified, a number of further processes took place, in order to refine the data prior to onwards processing by NISRA. These included:

- removing test and spurious returns;
- removing those born after Census Day;
- removing those deceased prior to Census Day;
- linking unlinked paper responses with an address; and
- examining blank questionnaires.

#### 8.2.4. Enumeration quality assurance

A number of measures were introduced for Census 2021 to help drive up the response rate of special population groups, including the establishment of a dedicated team to oversee the process for capturing the characteristics of those living in approximately 1,500 Communal Establishments such as hotels, hospitals, boarding schools or prisons. This team worked with the managers of the Communal Establishments to ensure a response was made for each one.

Additional procedures were also adopted for some special populations. This included people with no settled place of residence and persons sleeping rough. Specifically, engagement took place with the responsible public bodies (NIHE, Department for

Communities and Department of Health) to ascertain the number of persons sleeping rough around Census Day.

Engagement with local universities enabled emails with instructions on how to complete the census to be sent to all students. Students were asked to fill in their census questionnaires at their term-time address, and their parents/guardians were also asked to complete details on them at their family home. This facilitated a more accurate count of students.

#### 8.2.5. Accuracy quality assurance

A number of approaches were used to ensure the captured and coded data from Census 2021 questionnaires was of the highest quality. Coding accuracy was improved through the successful introduction of Artificial Intelligence (AI) coding techniques into the overall coding process for the first time.

Quality assurance was carried out by ONS, the supplier and independently by NISRA to ensure that the captured and coded data met the agreed specification and service level agreements targets. While data linkage/matching allowed comparison of census responses to administrative data, allowing for the manual review of all records aged 90 or over – ensuring that the estimate of the very elderly was as accurate as possible.

#### 8.2.6. Process quality assurance

Invariably the census is affected by a small amount of over-coverage (for example, duplication) and a small amount of under-coverage (for example, missed people and households). To correct this, robust methodologies were implemented to assess and remove over-count and estimate and adjust for under-count. Given the complexity of these processing steps, it was necessary to have controls in place to assure the processes were doing what they were designed to do, and to measure and manage quality throughout.

As described in [section 6](#), data processing involves a number of steps – for example, data consolidation, data transformation, coverage assessment and adjustment. These processes were supported by detailed quality assurance steps at each stage,

to ensure that the methodologies adopted had the desired affect and did not adversely impact on the quality and utility of the data collected. Examples include:

- clerical checking of records flagged as multiple responses during data cleaning;
- checks during edit and imputation to ensure that particular donor records have not been overused;
- socio-demographic analysis of the data after coverage estimation and adjustment to identify any anomalies against broad expectations; and
- spatial and time series analysis of the data to ensure trends look plausible and where they are not, an explanation can be given (for example, effects of COVID pandemic on workplace location).

Some notable enhancements to data processing that had a positive impact on quality are listed below:

- For 2021 (as in 2011), students were required to be enumerated at their term-time address to satisfy the usual resident population base. However, due to the known issues associated with maximising the student enumeration, and the prevalence of COVID restrictions, it was decided to allow students to also be enumerated at their home address and ask what their term-time address was on the questionnaire. This information was used within the Reconciling Multiple Responses (RMR) process to move students to their term-time address in the database.
- The Reconciling Multiple Responses (RMR) process, which identifies and removes duplicate census responses was enhanced for Census 2021 to include extra modules that matched the entire Northern Ireland dataset to itself, allowing duplicates to be removed across the whole database (in previous censuses duplicate records were only removed within the same household or Communal Establishment). This was a significant improvement in overall quality for Census 2021 and was particularly important for students as they were more likely to be recorded on multiple responses and at different locations due to the capture methodology adopted.

- Coverage adjustment in 2021 used administrative data to assess and make an adjustment for very young children, in acknowledgement that people can “forget” to include very young children on their completed census questionnaires.

Further information is available in the [Census 2021 Data processing overview](#).

#### 8.2.7. Coverage quality assurance

The resulting Census 2021 Northern Ireland population estimates were compared against a variety of statistical and administrative datasets to benchmark across all age groups to ensure close alignment, or to understand where deviations occurred.

The main aim of the quality assurance checks was to ensure that the census estimates were plausible at the NI level and also at lower levels of geography such as Local Government District and local areas.

This work was primarily led by NISRA but was supported by an External Quality Assurance Panel to assist the quality assessment (see [section 8.3](#)).

#### 8.2.8. Outputs quality assurance

When possible, output variables were developed early to check for anomalies and identify any issues quickly. For those questions asked in Census 2021 and Census 2011, analysis of aggregate level outputs for Northern Ireland and lower level geographies took place. Changes between censuses were examined and compared, where possible, to trends in administrative and survey data. Output variables were also inspected for known issues from Census 2011.

Any issues were addressed or details added as a quality note or issue on the [quality notes, issues, and corrections](#) page of the NISRA website. For example, DI002: Accommodation - notes a data issue related to the classification selected by respondents, NISRA noted differences in classification declared by a small number of respondents for accommodation type when compared to the accommodation type recorded by Land and Property Services (LPS) for the address. This can be

explained by census respondents favouring selecting 'semi-detached' instead of 'terraced (including end terrace)' for end-terrace properties.

A set of robust processes were also developed to ensure application of the necessary statistical disclosure control techniques. This also ensured that the confidentiality of the information provided by the general public was protected in all Census 2021 outputs.

### **8.3. External quality assurance panel**

Provisional census outputs were independently reviewed by a panel of four external contributors, seen as experts in the field of demography and census. Reporting to the Registrar General, this team reviewed a number of materials, including provisional census estimates and methodological summaries. Their role was to sense check the estimates, alongside considering the data processing and quality assurance approaches taken, with a view to feeding back important issues and considerations – ultimately giving the Registrar General confidence that the results of Census 2021 were of high quality and accurate.

The external panel carried out their review in two stages. The first was a review of population and household estimates prior to the publication of the first release in May 2022, and included a review of:

- key elements of the census design (questionnaires, CCS etc.);
- key elements of census data processing;
- integration of admin data into data processing;
- internal quality assurance processes; and
- comparator datasets.

The second was a review of census topic distributions prior to the publication of the second release in September 2022, including a review of:

- processing of the data for equality characteristics;
- use of admin data in data processing;

- data transformation approach taken; and
- comparator datasets for equality characteristics.

This independent feedback was invaluable in assisting NISRA to make decisions on the quality and the state of readiness of the processed data for publication of census results.

#### **8.4. Census Quality Survey**

A Census Quality Survey (CQS) was carried out, between October and December 2021 where NISRA invited 5,000 households to take part in an online survey to re-answer some questions that were included in the 2021 Census. The purpose of this was to essentially get respondents to repeat their answers to some census questions to allow comparisons to be made – and thus create a measure of quality relating to question understanding.

An online response approach was chosen for the CQS to mitigate against the risk of low response rates given the ongoing COVID-19 pandemic at the time.

Respondents were asked the same questions as in the census, using exactly the same wording and following the same routing. However, they were not asked to remember what answers they had provided in the census, rather they were asked to reflect their circumstances as on Census Day.

The results from the CQS were generally encouraging and confirmed that the 2021 Census data are of a high quality and fit for purpose. The [Census Quality Survey \(CQS\) information paper](#) describes the methodology and findings of the CQS in 2021. It outlines the extent to which the responses provided in the CQS, to both the household and individual questions, agreed with those captured in the census, helping users to understand any strengths or limitations in Census 2021 data, based on the CQS responses.



## 9. Use of administrative data in Census 2021

Census 2021 made greater use than ever before of administrative data collected by public and some private organisations; recognising the importance of utilising the best available sources to deliver a high-quality census for all.

A range of administrative data sources were used to support census data collection, processing and quality assurance. The following summarises the main uses:

- constructing and quality assuring the Census 2021 Address Register (CAR) (see [section 4.2](#));
- supporting the census field operation and ensuring the right approaches and resources were in place to maximise response (see [section 4.9.7](#));
- data processing to cleanse the data, remove duplicates and fill any gaps in an efficient and accurate way (see [section 6.3](#));
- estimating under-coverage and adjusting the census dataset to recover from non-response (see [section 6.3](#)); and
- quality assuring the census results – including comparing census data against a variety of statistical and administrative datasets to benchmark against independent sources, both at the national level and local level geographies (see [section 8](#)).

Further details on how administrative data was used for Census 2021 are available in the [information and methodology papers](#) on the NISRA website.

### 9.1. Statistical purposes in the public interest

As with all census data, administrative data have only been used for statistical purposes in the public interest. The data are subject to robust controls to ensure that individuals cannot be identified. Furthermore, NISRA complies with all data protection legislation, including the General Data Protection Regulation (GDPR), the Data Protection Act 2018, the Statistics and Registration Act 2007 and the Digital Economy Act. See [NISRA privacy notice](#) for further information.

## 9.2. Census Outputs from Administrative Data

When developing the Census 2021 questionnaire, NISRA sought input from users and stakeholders to shape the question set, but also looked at what administrative data might be available across government to negate the need to ask questions in the census. As part of this work NISRA determined that Census 2021 did not need to ask a 'Number of rooms' question, since similar – high-coverage – information was already available.

Instead, the number of habitable rooms available in a household's accommodation was modelled using information from the Land & Property Services Domestic Property List and other sources.

It should be noted that due to this methodology, the Census 2021 published count included rooms such as living rooms, studies, bedrooms, and separate dining rooms. It did not include bathrooms, toilets, halls or landings, conservatories, utility rooms and kitchens used solely for kitchen purposes (i.e. those without dining/sitting areas). So, while a useful output from Census 2021, it is not considered comparable with Census 2011.

## 10. Confidentiality, Security and Privacy

### 10.1. Introduction

One of NISRA's key objectives of Census 2021 was to protect, and be seen to protect, confidential personal census information.

### 10.2. Confidentiality principles

The [2021 Census Proposals document](#), laid out all plans for the conduct of Census 2021 and was published in April 2019. These proposals outlined the confidentiality principles that would be adhered to, in order to ensure the safety of the data. The following lists those principles and how they governed the treatment of all information provided in the census responses:

- only persons working under the control of the Registrar General for Northern Ireland had access to relevant personal census information. Staff were only granted access to personal census data on a 'need-to-see' basis;
- all persons working on the census were security checked and required to sign census confidentiality undertakings (CCU) bound in law, to ensure they were aware of their statutory confidentiality obligations. They were also given strict instructions and liable to prosecution if they breached any of the laws;
- the online data collection, storage and processing systems were tested in accordance with the strictest of government standards;
- in the majority of cases one questionnaire covered all members of the household but individuals could provide a private personal response on a separate individual questionnaire;
- the systems handling census data had strict technical and process safeguards to stop unauthorised access;
- the security of personal census information was strictly managed. All sites processing census data had appropriate security arrangements in place, including perimeter and access controls;

- the preparation and dissemination of census statistical outputs were subject to statistical modification to preserve confidentiality; and
- all services and systems complied with the government Security Policy Framework, including relevant technical and data transfer standards.

### 10.3. Security measures

The census data falls under the OFFICIAL – SENSITIVE classification in the government's information classification system. This categorisation comes with a comprehensive set of standards and protections designed to ensure the security of the data. These measures encompass regulating physical entry to any location or space where the data is stored and tightly controlling access to IT hardware and systems.

In compliance with the previously mentioned official standards, the census data was and is securely held, and safeguards are in place to ensure its protection. The data is kept on fully accredited systems designed to prioritise privacy.

Other measures that were put in place included:

- NISRA collaborating with key stakeholders such as the Information Commissioner's Office, the ONS, and Government Communications Headquarters (GCHQ) to address census security concerns.
- All electronic communication links for personal census information being encrypted to recommended levels.
- An independent review of systems and procedures, including those of contractors.
- Secure systems having strict controls and procedures in place for data storage, with no storage of financial details, and removal of names and addresses from data sources used for statistical tables.
- Information from questionnaires being used solely for census-related publications, further analysis, and secondary research under the control of NISRA, with no attribution of statistics to specific individuals.

All data handling and storage complied with the Data Protection Act 2018 and GDPR. Contractual and operational arrangements for the security of Northern Ireland census data included:

- ownership by the Department of Finance;
- data was processed within the UK and never left;
- access to the full census data set was restricted to a subset of NISRA (Census Office) staff; and
- stringent physical security procedures were in place to prevent unauthorised data copying.

#### **10.4. Online security**

As the ONS designed and built the online services for Census 2021 so they took on the responsibility for ensuring all the digital services were secure. They built security into the systems from the design stages and followeded all the government and industry standards. These standards included Government Digital Service (GDS) design, National Cyber Security Centre (NCSC) guidance, and industry standard security requirements. The ONS consulted with and worked closely with these organisations as well as the Centre for the Protection of National Infrastructure (CPNI, now the National Protective Security Authority) and cyber security consultancies to ensure they implemented all the requirements and standards properly and were following best practice. All necessary audits and penetration testing of systems was carried out and acted upon where necessary.

Census 2021 online collection and support sites were secured against two main kinds of attacks. The first was data-exfiltration attacks, including attempted hacking of the website infrastructure or data pipelines in the ONS, or spoofing of the census brand to redirect responses. The second was service disruption attacks and events, such as distributed denial of service (DDOS) attacks or targeted resource attacks, or greater than expected legitimate usage damaging the site performance. The ONS 2021 publication [Delivering the Census 2021 digital service](#) describes how they secured the census against these attack types.

## 10.5. Statistical Disclosure Control

Statistical Disclosure Control (SDC) refers to a range of methods that aim to protect individuals, households, businesses, and their attributes from being identified in published data and microdata. Methods may be applied to the microdata (pre-tabular) or the output tables (post-tabular) prior to release.

For Census 2021, NISRA applied three strategies to ensure individuals were protected from identification while minimising the impact on the quality of results:

- Targeted Record Swapping (see [section 6.4.2](#));
- Cell Key Perturbation (see [section 7.10.1](#)); and
- Disclosure rules within the Flexible Table Builder system (see [section 7.10.2](#)).

Information on these methods is included in the relevant sections given above and further information can be found in the [Census 2021 Statistical Disclosure Control Methodology paper](#).

## 10.6. Data Protection Impact Assessment

One of the components of the census planning process was to complete a Data Protection Impact Assessment (DPIA) to ensure that all risks to personal data were identified and mitigated against, as well as ensuring that the project had data protection built in by design. For Census 2021 the DPIA was completed and published in October 2020.

The DPIA demonstrated NISRA's dedication to ensuring the confidentiality of information, safeguarding privacy, and upholding government security and data handling protocols. The assessment made sure that full consideration was given to protecting all personal data that would be gathered and managed as part of Census 2021. It considered each stage of the census operation that involved the collection of personal data and how it would be processed and stored. It identified and assessed each of the risks and outlined solutions for each.

Full details of the [relevant statutory impact assessments](#), including a DPIA, can be found on the NISRA website.

## 10.7. Independent reviews of security and confidentiality

NISRA wanted to ensure that the public were confident that they were protecting the security and confidentiality of their personal data that was collected during Census 2021.

To support this, an independent review of the security arrangements was commissioned jointly with the ONS between 2019 and 2021. The review was done in two phases with the first being completed in July 2019 ahead of the Census Rehearsal in October that year and the second was concluded and published in February 2021. Reports from both phases were published on the NISRA website. The review included an assessment of the systems, services and staff in the ONS and NISRA that were supporting census as well as census suppliers and the physical and digital security.

The [first phase](#) of the review stated:

“While some deficiencies have been identified throughout the review, the responsiveness and ownership of remediation has been impressive to the extent the review team are satisfied that all such deficiencies have been resolved or that a viable and timely course of resolution has been established.”

The [second and final review](#) concluded that:

“Overall, this assessment has concluded that both the ONS and NISRA have comprehensive security programmes in place designed to reduce the risk of compromise to the delivery of the census and citizen data. The assessment found that strong controls were also in place to detect and respond to threats that may impact the census when it is in live operation. This 2020 assessment has found that security controls in place have built upon and enhanced those in place during the 2019 rehearsal.”

## **11. Evaluation and lessons learned**

### **11.1. Introduction**

This report contains a wealth of information about the planning and conduct of the 2021 Census in Northern Ireland. It has noted that many aspects of the census were new and worked well, and many were impacted by the COVID-19 pandemic. However, it also reports some challenges and issues, for which, in resolving, NISRA identified lessons to be learned that could be applied to future census processes. Consequently, this chapter looks at the key conclusions to emerge from Census 2021 and summarises the lessons learned.

### **11.2. Strategic evaluation overview**

There are many highlights from Census 2021, not least the incredibly successful response rate of 97% of households – the highest response rate of the last three censuses in Northern Ireland. However, the true value of any census is determined by the quality and utility of its outputs. One of the key aims of the census was not only to maximise overall response rates but also to minimise differences in response rates across geographic areas and among particular population groups. In effect, the whole census design and operation was geared to ensuring that this could be achieved through:

- delivery of a high-quality online census data collection operation, supported by appropriate design of the field operation, and user and community engagement to advise and support the operation;
- protecting, and being seen to protect confidential personal census information, to ensure public trust and, therefore, public response both for this census and future data collections;
- capture and processing of census questionnaires and responses, and the effective and efficient cleansing and validating of the associated data.
- securing public and user confidence in the final results and delivering them in a timely manner; and



- encouraging wider use of census data to facilitate greater benefits from the data collection exercise.

### 11.3. Highlights of Census 2021

The key successes of Census 2021 were:

- a digital-first strategy – Census 2021 was the first census that actively encouraged the public to complete their census online (although the option to complete a paper questionnaire remained);
- a high-quality online census data collection operation that the public found easy to access and straightforward to use;
- user and community engagement to advise and support the collection operation, thereby engendering higher levels of support for and confidence in the census;
- development of a purpose-built address register which provided the basis for contacting the public to invite them to participate in the census, while also facilitating address selection in the online data capture system;
- provision of a hand-held device with a fully integrated workflow system to all field staff, greatly reducing the need for paper and allowing field staff to better manage their workloads when following up with non-responding households;
- a more strategic approach to the data collection operation by utilising targeted enumeration (Wave of Contact) to maximise response rates;
- introduction of a number of measures to help drive up the response rate of special populations, for example, Communal Establishment residents, students and homeless;
- the enumeration of Communal Establishments – creating a specialised team within NISRA was extremely effective at managing this process, achieving a very high response rate of 99%;
- NISRA successfully completing downstream processing of census data for the first time locally;

- making increased use of administrative data to support data collection, data processing and quality assurance; and
- a more flexible means of dissemination and analysis of an increased range of census data via the free digital products that were developed to disseminate Census 2021 outputs, the Census 2021 Flexible Table Builder (FTB) and the Census Area Explorer – supported by statistical bulletins, guidance documents, and a range of reference materials hosted on the NISRA website.

The following sections provide more detail on some of the key successes.

### 11.3.1. Programme Management

UK harmonisation was achieved through close liaison and co-operation between the three UK statistics organisations, and through the agreement between the National Statistician and the Registrars General to work together to achieve consistent and comparable census outputs. The management structure adopted for Census 2021, with representation from the three UK Census Offices at each level, allowed for the necessary coordination and alignment required between the offices.

NISRA worked very closely with the ONS and partnered on many of the key contracts to deliver Census 2021. Due to changes in procurement practices, no large contract was awarded. Instead, a wider range of suppliers was used across the work streams with the ONS and/or NISRA developing some key elements in-house as well.

Census 2021 was delivered to an overall budget of £34.7 million over the 10-year period from 2015/2016 to 2024/2025. NISRA benefited from being part of a joint census operation with the ONS, both in terms of leveraging resource and skill, as well as financially (although the extent of the financial benefit is not easily quantifiable).

### 11.3.2. Digital-first

In line with the NICS Digital Transformation programme and the digitisation of public services, Census 2021 was the first census that actively encouraged the public to

complete their census online (although the option to complete a paper questionnaire remained).

The digital-first approach was applied across all elements of the census operation with the online system offering the public the option to request new access codes, get help in up to 17 languages, complete their census return in 3 languages via the online questionnaire to name just a few examples. The digital-first approach was well received and the vast majority of people engaged this way with just over 80% of households opting for online completion. In total, 49% of the online returns were completed on a mobile phone, 42% on a personal computer/laptop and 9% on a tablet computer. These figures are a reflection of a system that the public found easy to access and straightforward to use.

The digital-first approach also ensured better quality of returns with higher data quality due to automated routing and lower levels of 'missing items' as discussed in [section 6.2.1](#). It also contributed to almost real-time management information for online returns as there was no longer a lead in time to questionnaires being posted back then receipted and scanned at a processing site.

Overall the digital-first was a key success to Census 2021 and provided greater insights to the census operation with the volume of management information now available and key learnings from the implementation processes.

### 11.3.3. Online Questionnaire

The online questionnaire included a link for providing feedback, with over 22,000 comments being received (positive/negative comments and question-specific feedback). The overwhelming number of general comments contained positive words (86%) as opposed to negative words (14%), indicating that the vast majority of the public thought the questionnaire was easy to understand and quick to complete.

The majority of comments about the accessibility, reliability and usability of the online questionnaire were very positive and encouraging, these provided an invaluable learning opportunity for NISRA on the development, reliability and usability of online questionnaires.

#### 11.3.4. Address Register

For Census 2021 the development of the Census Address Register (CAR) was supplemented with additional address level information available through government or within administrative/utilities data, improving the selection of appropriate addresses for census enumeration. The Land and Property Services (LPS) POINTER database was the main source of household addresses, whereas the CE addresses were developed using a bespoke method independently from household addresses. The CAR built on lessons learnt from Census 2011, census tests and the 2019 Census Rehearsal. Mitigations were put in place to reduce the risk of under coverage as much as possible, including a top up delivery of addresses after the initial supply of the CAR.

Increased access to administrative datasets, coupled with the availability of robust Geographic Information System (GIS) data and software, meant that NISRA could perform much more verification and validation of address records. This was done using a desk-based approach rather than having to rely on an expensive on-the-ground operation.

The CAR was maintained to a high standard throughout the operational phase, with a Response Management (RM) system operating to track fulfilment requests and an address Resolution Service to verify any address additions, deletions or changes necessary. After the operational phase of the census closed and data processing began, a number of consolidation activities and refinements took place which further refined the CAR.

This resulted in the development of a fit-for-purpose CAR, which provided a comprehensive and accurate list of addresses as the basis for contacting the public to invite and encourage them to participate in the census, as the source for the RM system and daily management information.

#### 11.3.5. Stakeholder engagement

A census has an exceptionally large number of stakeholders having varying degrees of influence and interest in the various aspects of the census operation. Managing interactions with these stakeholders is important to a successful operation, achieving

good coverage and realising the benefits of the census through the use of the census results.

In Census 2021 it was recognised that the numerous stakeholder groups would require different methods and degrees of approach, and thus, different modes of engagement were developed to reflect this. The local knowledge and intelligence provided by certain stakeholders helped NISRA to target its communications more effectively. For example, NISRA engaged with community representatives and voluntary organisations to ensure everyone was included, and to encourage and support completion of the census returns for hard-to-reach population groups such as Irish travellers and refugees.

Overall, the engagement process can be considered a success and was a key contributory factor in assisting NISRA in reaching its objectives and the utilisation of its outputs.

#### 11.3.6. Census Coverage Survey

NISRA carried out a Census Coverage Survey (CCS) soon after the main census fieldwork was completed.

As response to the CCS was voluntary, maximising response rate was a strategic aim during planning and development of the 2021 CCS process. In an effort to maximise response NISRA used experienced interviewers from NISRA's Central Survey Unit, this also ensured independence from the census enumeration, an important part of the methodology. The previous experience interviewing also meant training could focus on the purpose of the CCS, the schedule and equipment, the high response rate needed, and the key questions that needed accurate answers.

The CCS was successful in that it was conducted on schedule, within budget and provided sufficiently robust information to enable the statistical adjustments for coverage.

The response rate for the 2021 CCS was 88%, which was higher than the 82% achieved in 2011, and provided a sound basis on which to create statistical estimates.

### 11.3.7. Data processing

The first Census 2021 results were released on 24 May 2022, one year after the close of the online data capture platform – and 14 months after Census Day. The speed of the release of results from the census depends on how quickly the information can be processed, validated, quality assured, tabulated, and made ready for publication. The Census 2021 first release date was an improvement on the equivalent date for Census 2011, while also being the first time NISRA completed the downstream processing in-house. The higher proportion of responses received from the online system compared to Census 2011 was one of the reasons that this was a success, but there were others, such as:

- the increased use of administrative data to support processing systems and quality assurance (for example, to cleanse erroneous data, to assist with the identification and removal of duplicates, to move students to their term-time address, and to provide high quality records for coverage adjustment); and
- the parallel approach taken to running the processing steps – a new methodology that was adopted for Census 2021 to recover from delays associated with late delivery of captured data.

### 11.3.8. Flexible outputs

The main census outputs for Northern Ireland were published in a series of phases from May 2022 to late 2023. The outputs were supported by statistical bulletins, guidance documents, infographics and a range of reference materials hosted on the NISRA website. This represented a considerable improvement in the timeliness of the releases compared with the 2011 Census.

A significant part of the improvement in the timing and flexibility was the development of the free online products developed to disseminate Census 2021 outputs, with the Census 2021 Flexible Table Builder and the Census Area Explorer, both being very well received by users.

This approach has also reduced the overheads for NISRA (Census Office) in responding to queries for census information, as users have either self-served, or

Census Office has been able to quickly build and share links to data within the FTB. In addition, less time was taken up in the design and creation of many pre-defined tables, which for past censuses had become the norm for output production. Lessons learned from 2001 and 2011 suggested that there were many tables released in this way that had not been used.

#### **11.4. Lessons learned from Census 2021**

Census 2021 was a complex exercise, heavily dependent on a wide range of technological systems and processes, and with input from numerous staff, as well as external suppliers and stakeholders. Despite the overall success of Census 2021 there were a few elements that on reflection, could be improved, resulting in several lessons learned.

For Census 2021 the high-level lessons learned were:

- all elements of the operations should be fully tested and included in an end-to-end rehearsal – particularly to include data transfers and data processing;
- issues were experienced with the volume and consistency of the management information being provided across the various systems. Clearer defined parameters would be needed for future systems to mitigate against conflicting information;
- there was too much variation in the workload of enumerators, stemming from variation in the level of response across Enumeration Districts (EDs) and the requirement to finalise the address register months in advance of live operations (for example, housing developments being finalised in the interim). This led to unbalanced workloads, and should be borne in mind when planning for future census operations;
- address selection was a key element of the online questionnaire – while it had positive benefits to respondents when answering address related questions, there were issues associated with the completeness of the lists and respondents' understanding of how their address should look;

- there are more pragmatic ways to run data processing, for example, adopting parallel processing activities rather than adopting a more time intensive, linear approach;
- administrative data was used extensively to support and enhance Census 2021 – from assisting with the development of the address register, to contributing to the enumeration strategy, to enhancing the robustness of data processing, to facilitating detailed quality assurance activities. It is important to realise the advantages that administrative data brings to data collection, and to reflect that in any future planning;
- dependent on the method adopted, applying a post-tabular statistical disclosure control methodology has the potential to lengthen the time required to create outputs – and, potentially, change significantly the number of data extracts that are required to produce tables (for example, to create independently disclosure-controlled marginal totals). Consideration should be given to future post-tabular SDC processes in this context.

The following sections provide more detail on some of the key lessons learned.

#### 11.4.1. Testing and operational readiness

A key lesson from Census 2021 is the need for rigorous testing and in particular of the end-to-end process including all aspects of the operation. In 2019 a rehearsal took place which did cover the majority of the end-to-end census process but some elements were not fully incorporated in the rehearsal, for example, CEs and data processing.

Both these areas were either new for 2021 or the process had changed significantly from previous censuses and therefore testing was arguably more important. Going forward consideration needs to be given to incorporating all aspects of the census processes in the rehearsal and any other operational readiness testing, especially where significant change has occurred since previous operations.



### 11.4.2. Management Information

A key improvement in Census 2021 was the access to almost real-time management information (MI). This allowed for better decision-making and earlier sight of any issues and therefore quicker resolution or reaction. However, due to the increased volume of MI from various different systems and services it was sometimes difficult to determine which system was right. MI reports were run at different times of the day and on different systems and it was unclear which figure to base decisions on.

Going forward it is critical to ensure that MI requirements are made clear from the outset and that sources of such MI are consistent. It is important to not get weighed down by excess MI. Key sources should be identified and consistently used throughout the operation.

### 11.4.3. Enumerator workloads

In Census 2021, as with previous censuses, enumerators worked in a fixed area an Enumeration District (ED). These areas were designed based on a number of parameters but primarily the type of area (urban/rural) and then the number of households. The objective was to keep sizes of the same type of ED consistent to create even workloads for enumerators.

However, a number of factors impacted on this in 2021 and resulted in uneven workloads across Northern Ireland. Firstly, as previously discussed there was a high response rate and this meant that some enumerators had much fewer households to follow-up for non-response.

Secondly, due to operational constraints the address register had to be finalised months in advance of the live operation and this resulted in EDs being finalised much earlier in the process than was ideal. Subsequently construction of some large new developments were completed and significantly increased the sizes of a number of EDs (by as much as 50%) therefore further affecting the workloads for some enumerators. This created difficulties with the pay and reward of field staff in certain areas.

Consideration needs to be given not only to the timing of finalising the address register but also to a more flexible approach to how the field operation works. Is it still appropriate to have a fixed input geography with 1 enumerator 1 area or is it more beneficial to manage the field from a higher-level like the Census Team Co-ordinator (CTC) area and have more flexibility to target follow-up.

#### 11.4.4. Online address selection

Generally, online address selection worked well, with the majority of respondents able to locate and select the appropriate address where necessary.

When completing the online questionnaire, if a respondent started to type in an address, suggestions from the corresponding lookup were shown. Respondents could then select an address shown or continue to manually enter one. If an address was selected from a lookup, it meant the record contained full address details formatted in a consistent manner. If an address was manually typed or written in, it had to be matched to the address lists to obtain full details and transform it into the correct format.

The address lookups worked well when respondents could find their address in the list. However, some addresses within the system (particularly workplace addresses) did not have a formatted address string that was recognised by respondents. This contributed to the inability of the public to find an appropriate address to complete their questionnaire – leading them to either edit an existing address, or manually enter a new one. While a resolution function was operated by NISRA HQ to resolve these, on some occasions this resulted in the creation of duplicate addresses (for example, where a new address was created that was slightly different to an existing address). This added to the data processing overhead since clerical checking was required.

Moving forward additional work should be done (including user testing) to create more accurate and recognisable formatted address lists, which are less susceptible to changes by respondents, therefore reducing the need for de-duplication and/or clerical checking steps during data processing.

#### 11.4.5. Data Processing

The various systems and processes that were designed to clean, validate, adjust and protect the data largely worked as they were designed to within the overall timetable that had been set for outputs. However, there are some over-arching strategic design and methodological lessons that should be considered.

##### Systems and system development

One of the main difficulties experienced in processing was that all systems did not undergo complete testing prior to live processing. Testing was carried out in advance but using synthetic data which had higher levels of quality than was experienced in the live environment. As a result, during 'live operations', changes were implemented to ensure that the processing continued to work in a robust and timely manner. The pressure created forced a rethink of the linear approach to processing – opting for prioritisation of critical processes and running parallel activities to make more time for quality checking. This worked very well, so future processing activities should consider building this approach in from the beginning.

##### Data capture and coding

Accuracy of the data capture and coding processes were assessed against set targets. NISRA staff were able to take part in random checks. However, the setting of targets, the training of coders, and the quality checks around this work should be reviewed against the main requirements for census information from decade to decade. Consideration should also be given to it being localised, where specific actions can be taken.

##### Validation of edits

Item imputation methods adopted for Census 2021 are robust in maintaining attribute distributions when imputing missing information. However, in recognition of the greater demand for census microdata samples for research purposes, future applications of the item imputation methodology should seek to further prioritise record level consistency.

## Adjustment

Statistical developments and operations utilised within a coverage system must have flexibility in their development and implementation, allowing planned time for the methods and systems to be updated when real data become available, as development and testing using old (or synthetic) data may not tease out all issues and not all results can be predicted.

It is important to consider the possibility that future data collections might have coverage issues that are new, and therefore not planned for. Any future coverage system should be designed in such a way that it is able to react to such eventualities – and therefore should not be overly rigid in its design.

## Coding of workplace address

For Census 2021 the coding of workplace address data included a clerical checking process. The coding of workplace address has always been problematic since respondents often do not know either their workplace address or the address for others in the household. The ability to select addresses in the online questionnaire helped the respondent journey but caused some issues in processing (for example, when the wrong address was selected, or an address was entered manually).

Any future census operation should take account of this and prioritise methods that would reduce the manual work required to code workplace addresses.

### 11.4.6. The use of administrative data

[Section 9](#) outlines the ways in which administrative data were used to support Census 2021. A key lesson learned from this process is that future exercises should look to where this approach can help to support data collection and processing activities further. The main aim of this should be to reduce respondent burden, while also supporting collection activities in a way that reduces costs and wastage. Added to that is the clear benefits that administrative data brings to data processing, both in terms of increasing accuracy and quality – but also towards reducing the time taken to finish the work in advance of outputs production.

#### 11.4.7. Statistical Disclosure Control

Cell key perturbation was used to introduce noise to Census 2021 tables, adding to the uncertainty of tables, reducing the risk from differencing of tables, thus allowing greater numbers of tables to be produced via the FTB system. However, the initial operationalisation of the method proved to be a more involved process than first envisioned. Better planning and streamlining of the processes involved would potentially reduce the complexity of this area and therefore reduce the lead-in time to release of first outputs.

#### 11.5. Adaptation for COVID-19

Census 2021 was conducted during the COVID-19 global pandemic and as a result some things had to change from the planned approach. However, not every impact of these changes due to the pandemic was negative. An example of this positive impact was the desk-based address checking carried out in place of a physical on the ground address check. The desk-based check involved the development of an online system that was used to view addresses and record outcomes and information about these addresses. The system has a range of benefits in terms of saving time and money making the address checking much more efficient as well as having benefits for re-use for NISRA.

Another positive example was the move online of all the field staff training. Due to restrictions in place at the time, training sessions couldn't be carried out face-to-face and therefore alternative methods had to be worked out. All training sessions were moved online through the Google Meet platform. This turned out to be very successful and ensured consistent and timely training could be delivered to all field staff at the same time and logistically was much easier to arrange. This also reduced delivery costs of this part of the project as no physical venues were necessary.

A change which was not so positive had to be implemented in the field operation at the start of non-response follow-up. After consultation with the Chief Medical Officer (CMO) the face-to-face element of non-response follow-up had to be delayed and adaptations to the approach used in early follow-up were necessary. For the early follow-up rather than do nothing the 'I called but you were out' postcards were

amended to explain why enumerators weren't calling at the door but still highlighting that the householder hadn't made a response yet. This early follow-up was new for Census 2021 and targeted potentially 'hard to count' addresses so it is now difficult to know how successful this would have been, if it had been carried out as planned.

## **11.6. Looking to the future**

NISRA is continuing to deliver products from the last census to ensure the best possible value from the successful Census 2021 programme. Consistent with previous census timetables, and similar to other statistical institutes, NISRA has been considering how changes in the data and financial landscape could bear on a future census data collection. It is clear that administrative data has a role in supporting or enhancing the collection of such data – the extent to which that is utilised for the future has yet to be determined.

However, the first step in planning for any future data collection is to understand user need. Therefore, NISRA will firstly prioritise a programme of work to determine the user need for census-type information and will engage with appropriate users and stakeholders at the relevant time to progress that work.