Scotland's Census
Shaping our future
A' dealbhadh ar n-àm ri teachd

Scotland's Census 2022

General Report

December 2024

Laid before the Scottish Parliament, SG/2024/296

National Records of Scotland
General Register House
2 Princes Street Edinburgh
EH1 3YY

Published by National Records of Scotland, December 2024

Contents

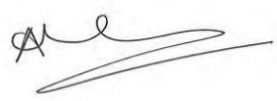
Foreword

It is a privilege to present this report to Parliament, in my role as Registrar General for Scotland.

I am grateful to all the people of Scotland who contributed to Scotland's Census 2022. From that information, the National Records of Scotland has been able to gather, analyse and present over a billion statistics.

Census 2022 tells the story of the diversity of Scotland and how it has changed over time. The Census uniquely provides information about how we identify ourselves and the characteristics of our local neighbourhoods. In a myriad of different ways that information is now being used to identify service needs across the country, in the Scottish Government, local authorities, health boards, academic institutions, public bodies and the third sector.

This was a large-scale, multi-year and multi-faceted programme. The digital first approach was very popular and secure, but the programme faced challenges, having to adapt to the impact of Covid-19 and a lower than anticipated response rate. This report sets out how the programme was delivered and what we have learned from it for the future.



Alison Byrne, OBE
Chief Executive | Registrar General | Keeper of the Records
National Records of Scotland

Executive summary

For over 200 years Scotland has relied on a decennial census to underpin national and local decision making. The Census Act 1920 mandated that it be a function of the Registrar General for Scotland. The result has been the production of an unparalleled source of consistent and comparable information about the population, household characteristics, housing and individuals.

Strategic objective outcomes

At the beginning of the 2022 Census cycle, National Records of Scotland (NRS) set seven strategic objectives to determine the success of the programme. Statistical outputs were central to the objectives listed below and it is these statistics which are already being used across Scotland to make vital decisions about our economy and society. Our strategic objectives were to:

1. Produce high quality census results
2. Generate outputs that meet the needs of users
3. Maximise online response
4. Produce timely outputs to maximise benefits
5. Protect, and be seen to protect, confidential information
6. Do so in cost effect way
7. Make recommendations for the approach to future census in Scotland

Despite the unprecedented challenges of the global pandemic, NRS met all these objectives.

The accuracy and quality of the data received and produced was of a high standard, with no security breaches occurring. 89% of responses were made online, exceeding the target of 70%, with user consultation reports showing that the 2022 Census topics met the needs of users.

Scotland's Census 2022 had a final person response rate of 89.8%. This was lower than the original target of 94% and lower than the 97% response rate for the 2021 Census in England and Wales. The reasons for this are complex and are explored further in Chapter 4.

Lower response rates are part of a broader trend across government social surveys in recent years. At the time of the 2011 Census, the Labour Force Survey (LFS), the largest annual social survey in the UK, had a response rate of around 60%. In the years following the pandemic, response rates to the LFS and other social surveys continued a downward trajectory, dropping to less than 25% in recent collections.

Of those responses in Scotland, the vast majority were online, demonstrating the preference and ease of completing the 2022 Census through an online platform.

The field force in 2022 was greatly reduced compared to 2011, taking advantage of new digital management systems to undertake targeted follow-up to achieve cost effectiveness.

NRS responded to the lower-than-expected response rate by using administrative data in a groundbreaking way that gave confidence in the ability to innovate with new types of data. These changes were made under the guidance of an International Steering Group which was established to give NRS and users confidence in the changes we were making.

While the unique circumstances around the 2022 Census are unlikely to be repeated, the successes and challenges incurred in delivery have provided NRS with a crucial understanding of Scotland's communities and how to evolve the service in future.

The high digital uptake and effective security measures demonstrate that NRS has proven it can progress in the way it gathers population statistics.

NRS are building on our experiences from the 2022 Census as we plan the future of population statistics in Scotland. This includes closely collaborating and aligning with the rest of the UK as set out in the UK Concordat on Statistics. NRS remain committed to the Concordat as we reimagine the role of administrative data in a future system.

Lessons learned

Scotland's Census 2022 was a large scale and complex programme. NRS have captured a wide range of lessons which reflect the programme's successes and areas for improvement.

We have identified several high-level strategic lessons within this report which provide an important legacy for any future census in Scotland. These are summarised below and in more detail in Chapter 12, with the context for these lessons provided across the chapters of this report.

1. Delivering a census on a national scale within a fixed timeframe requires strong governance and independent assurance to maintain control and direction, with oversight across all components, evolving over time to reflect the specific needs of each programme phase.

2. It is vital that as a digital programme with national delivery logistics, Scotland's Census is designed end to end at the outset to plan the required components and sourcing strategy to achieve the optimum strategic integration that reduces rework and enhances value for money.

3. Scotland's Census requires sufficient early investment to enable time to initiate and resource the programme, develop the end-to-end design, design requirements for components, procure contract services, develop, test and rehearse components to ensure delivery optimises value for money.

4. Scotland's Census is multi-faceted and requires realistic cost estimation from the outset based on the end-to-end design to ensure all required components are planned and costed and there is contingency for unforeseen factors in the 10-year delivery cycle.

5. Design in use of administrative data from the outset.

6. Future approaches to collect population statistics should maximise digital uptake while ensuring that the census is accessible for everyone.

7. Fully rehearse end-to-end processes, and test digital and operational end-to-end processes at least two years out from a census in line with international experience. Earlier small-scale testing, like ONS carried out in 2017, should also be undertaken.

8. Work closely with ONS and NISRA throughout, sharing expertise and contracts.

9. Develop the end-to-end design with local and community groups to maximise reach.

10. Population statistics must be supported by access to international expertise.

Timeline

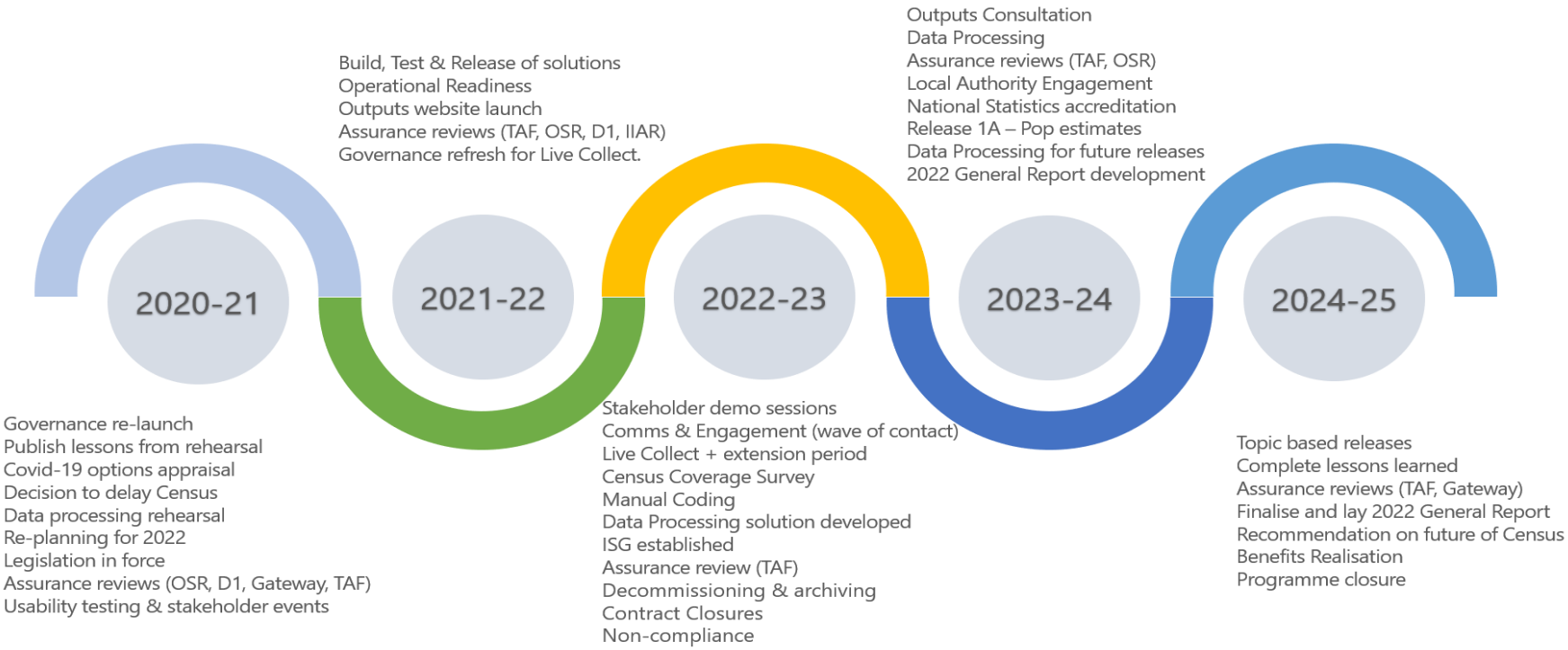
There were two broad phases to the 2022 Census programme, the first covered the period up to the live rehearsal event in 2019 and the lessons captured from this. The second phase focused on applying those lessons and preparations for the live collect operations, and into processing the data and producing the 2022 Census results. The diagrams below provide a high-level overview of these two phases.

Engagement with citizens and users of statistics, data security, privacy and assurance around delivery were constant themes throughout the programme.

NRS re-baselined the programme to take account of Covid-19, moving census day from 2021 to 2022. We also adapted the programme to respond to the lower-than-expected response rate by supplementing the data we had collected with data from administrative sources. This enabled us to produce high quality statistics representing the whole of Scotland's population. More detail on these changes is provided later in the report.

Census Roadmap – Phase 1

Census Roadmap – Phase 2



Chapter 1 – Introduction

History of Scotland's Census

For over 200 years, the country has relied on the census to underpin national and local decision making. Early censuses were little more than a population count but later censuses offer a richer picture of the Scottish population.

A lot has changed since the first census, not least the level of detail the questions go into. The modern census questionnaire collects much more information than the 1801 version, giving a more detailed picture of the population.

The way we collect and publish census information has also changed. What was once a paper-based process is now mainly online. What has not changed is that the census remains the only survey of its kind to offer such an accurate and detailed snapshot of Scotland's population over such a long period of time.

All statistics produced from the census are aggregated and do not include personally identifiable information. After 100 years, all census returns become available for the public to access. Not only can we study how Scotland's past has changed, but we can also discover more about the individuals who lived here.

Reasons for conducting a census

The census is the only survey of its kind to ask everyone in Scotland the same questions at the same time. No other survey provides the richness and range of information that the census does. It is widely acknowledged as playing a fundamental and unique role in the provision of comprehensive and robust population statistics.

Government, local authorities, the health service, academia, businesses, professional organisations and the public all need reliable information on the number and characteristics of people and households to conduct their activities effectively.

Government in particular needs this information to inform policy, plan services for specific groups and to distribute resources effectively to local authorities and NHS boards, in a way which matches needs. The information must be authoritative, accurate and comparable for all parts of Scotland down to very small levels of geography. Currently, only a census can provide this detailed information on a consistent basis.

Information on the size, age, sex, and location of Scotland's population is fundamental to the work of government, including in areas such as:

- service provision
- pension and fiscal planning
- migration within Scotland and from the rest of the UK
- economic growth and government revenues
- labour supply
- housing

Census population data helps determine the financial allocations that the Scottish Government receives via the Barnett formula. The data also supports funding allocations at regional and local government levels.

Other information collected by the census enables the Scottish Government to:

- understand pressures on transport and to plan our road and public transport systems
- identify areas of deprivation so that interventions can be developed to improve communities
- gather evidence on diverse groups of people to tackle discrimination
- plan for skills and training
- make good investment decisions

Date of the census

The census does not have to take place on a specific day of the week, but Sunday has traditionally been chosen as the most likely time that people will be at home. The original date for the Census was Sunday 21 March 2021 which would have been the earliest date in the census year since 1801. We chose the date to maximise the number of people who were present at their usual residence. For example, we wanted to avoid public and university holidays. In 2021, Easter Sunday fell on 4 April and the Scottish Parliamentary elections on 6 May. 21 March avoided these dates.

During April and May 2020, we carried out an options assessment to consider the impact of Covid-19 on Scotland's Census. Several issues affected the delivery of the Census because of Covid-19. As a result of our recommendation, Scottish Ministers agreed to change the date of the Census to Sunday 20 March 2022. Many other countries also chose to delay their census operations due to the pandemic. More information on the impact of Covid-19 is provided at Chapter 3.

Scotland's Census is underpinned by law

The Registrar General for Scotland takes a census in Scotland under the Census Act 1920. The Act allows for a census to be taken not less than five years after the

previous census. Every census needs further legislation detailing how it is to be run: the Census Order and Census Regulations.

The Census (Amendment) (Scotland) Act 2019 allowed the census to ask voluntary questions about sexual orientation and trans status and history for the first time. The Act became law on 18 September 2019.

The Census (Scotland) Order 2020 became law on 12 March 2020 and directed:

- the date of the census
- who must make a census return
- the topics which were to be asked

The Census (Scotland) Regulations 2020 set out the arrangements for how Scotland's Census would be conducted, including the detail of the questions. The Regulations became law on 16 June 2020.

Scotland's Census was subsequently moved from 2021 to 2022 due to the impact of Covid-19. The Census (Scotland) Amendment Order 2020 changed the date of the next census to 20 March 2022. The Census Amendment Order became law on 17 December 2020.

The Census (Scotland) Amendment Regulations 2020 reflect the change made by the Census (Scotland) Amendment Order 2020 to the date of the census. The updated regulations were laid in the Scottish Parliament on 21 December 2020 and came into force on 1 March 2021.

Impact assessments

National Records of Scotland (NRS) published the following impact assessments to support the census legislation and programme.

- Human rights
- Equality
- Data protection
- Children's rights and wellbeing
- Business regulatory
- Fairer Scotland duty
- Island communities
- Strategic environmental assessment

UK harmonisation

In England and Wales, responsibility for the census lay with the UK Statistics Authority and was conducted by the Office for National Statistics (ONS). In Northern Ireland, responsibility lay with the Registrar General for Northern Ireland and the census was conducted by the Northern Ireland Statistics and Research Agency (NISRA).

The three UK census offices cooperated closely in planning for their censuses. This helped harmonise outputs across the UK, meeting the needs of many users. It also provided for efficiencies while remaining sensitive to the different circumstances and user needs of each country. This close co-operation was formalised in a statement of agreement between the National Statistician and the Registrars General for Scotland and Northern Ireland. More detail on harmonisation across the three census offices can be found at Appendix B.

Developing a modern statistical system – an independent review of Scotland's Census 2022

In 2022, the Office for Statistics Regulation (OSR) (responsible for providing independent regulation of all official statistics produced in the UK) agreed with the Chief Statistician for Scotland that an independent review of the 2022 Census would be of use. The review would examine whether NRS statisticians had, at the time of the census collection phase, sufficient resource and seniority to effectively respond to the challenges faced during the delivery of the programme.

The review was undertaken by the office of the Chief Statistician for Scotland in response to the request from OSR. The review also considered what the Chief Statistician could learn for the future delivery of strategically important statistical exercises across the Scottish Statistical System. The report titled 'Developing a modern statistical system - a review of Scotland's Census 2022' is due to be published shortly.

Chapter 2 – Designing and building

Design for Scotland's Census 2022

Scotland's Census 2022 built on lessons from previous censuses. Following the 2011 Census, National Records of Scotland (NRS) consulted data users and undertook research to understand how the census programme could improve. We also incorporated learning from censuses in the rest of the UK and other parts of the world.

NRS planned the 2022 Census around a set of design assumptions, factors and principles. These helped to design a high-quality census and made sure its constituent parts were designed in the same way.

Design assumptions

The design assumptions for the 2022 Census were:

- the census would be carried out primarily online.
- Internet Access Codes (IACs) would be posted out to all private households.
- an address list of suitable quality would support post out.
- for those living in private households, the census would target enumeration at household level, with individuals responding within those households.
- there would be targeted follow up of non-responding households using administrative and other data.
- all non-responding households would receive at least one follow-up visit to ensure the status of vacant/derelict dwellings could be assessed.

Shaping the high-level design

The following factors shaped the high-level design of the 2022 Census:

- the successes and lessons from the 2011 Census.
- lessons from censuses in other countries.
- users' needs in terms of the type, quality, frequency and detail of census outputs.
- changes in technology - in particular digital government and public expectations for online services.
- improvements in other data sources (such as the NHS Central Register) and opportunities to link them with census data.
- learning from our impact assessments.

Design principles

Our design principles guided how we designed, developed and implemented the 2022 Census. They were:

- employing operational and statistical methods to deliver the highest quality population estimates by age and sex at local authority level.
- using the elements of the 2011 Census that worked well and were relevant.
- embracing new technologies and methods.
- designing for online first and making it as easy as possible for the public to respond using a variety of devices.
- seeking to minimise the respondent burden on the public.
- testing the census design iteratively to assure us and stakeholders of the underlying system, processes, and security of the overall design.
- attempting to get a response from every person and household in Scotland.
- maximising appropriate use of administrative data in all areas of the operation and processing.
- estimating and adjusting the results to account for over and under enumeration as in the previous two censuses.
- producing a complete, consistent and protected dataset which has been adjusted for over and under enumeration to allow production of outputs.
- making the first results available more quickly than results from the 2011 census and more rapid completion of the full suite of outputs.

Who the census collected information about

As in the past, the 2022 Census counted people at their place of usual residence, whether they were present or not on census night. If usual residents happened to be away on census night, whether elsewhere in the UK or abroad, the questionnaire required that their household still included them. Limited information was also collected about visitors (including overseas visitors) at each address to help householders count the correct people on the census form.

Each household was required to complete a questionnaire containing questions about the household as a whole and about each person usually resident in the household. The definition of a household used for the 2022 Census in Scotland and the rest of the UK was:

> 'A household is one person living alone, or a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area'.

This was consistent with the definition used in censuses across the UK in 2011 and aligned with UN guidance.

As in previous censuses, students and boarding school children were counted at their term time address, irrespective of where they were on census day. This made the census consistent with annual population estimates. People who lived in 'communal establishments' such as hotels, hospitals and care homes completed individual questionnaires. Special arrangements were made for the enumeration of other types of communal establishments, such as prisons and armed forces bases. See Chapter 6 for more details on communal establishments.

Topic and question development

Overview

NRS undertook a lot of research and testing to make sure the 2022 Census asked the right questions. We talked to people and organisations across Scotland to help us decide what subjects to cover and what questions to ask. The complete set of questions is available on Scotland's Census website. When developing questions, we considered:

- how acceptable questions were to the public
- how to ask questions in a way that produced reliable answers
- whether other ways of collecting the information already existed

We measured the effectiveness of our questions using two sets of criteria:

- Criteria for existing, changed and new questions
- Criteria for tick box response options

The Scottish Parliament made the final decision on census questions as part of the legislative process. NRS worked closely with the ONS and NISRA to make sure the census results were consistent across the UK.

Topic consultation

NRS ran a topic consultation between October 2015 and January 2016. We asked census users what topics they thought should be included. Our consultation report details what we learned. We found a strong need to retain most of the information asked on the previous census given the need to compare over time. We did, however, identify user need for new questions on veterans, sexual orientation, trans status and history. You can find out more about our topic consultation in the:

- consultation document
- moderation policy
- background note

Testing census questions

In 2017 we commissioned the Scottish Centre for Social Research to carry out cognitive and qualitative testing of questions for the 2022 Census. Their findings can be found in the cognitive and qualitative testing report. NRS also held topic events, meetings and focus groups throughout Scotland to understand users' needs and measure the quality and acceptability of new questions. Our topic reports detailed the results of our research and covered the background and evidence that went into designing the census questions.

Enumeration strategy

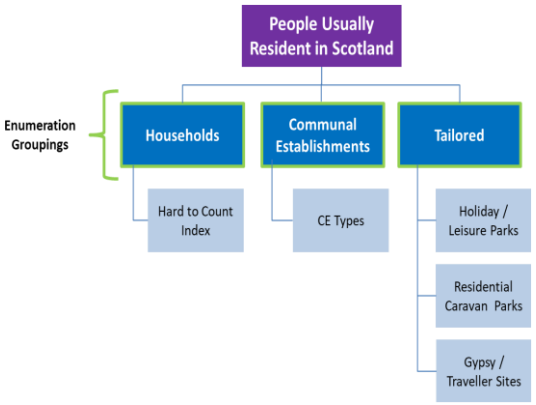
Enumeration was the process of collecting data from the people of Scotland during the 2022 Census. This included the operational aspects of data collection, such as

- Direct contact
- Encouragement of self-response
- Follow-up

Enumeration groupings

Scotland's population was split into three main groups of respondents:

- Standard households
- Communal establishments
- Population groups which required a tailored approach

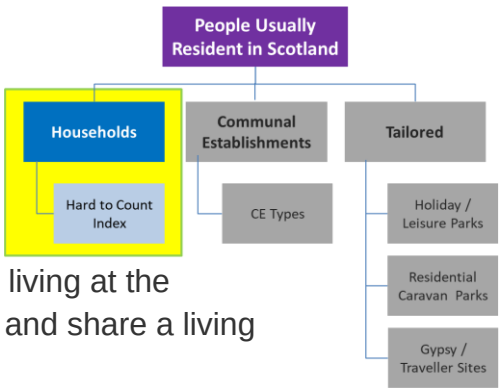


Household Enumeration

Standard Households

A household was defined as:

- A person living alone, or
- A group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area.



Hard to Count Index

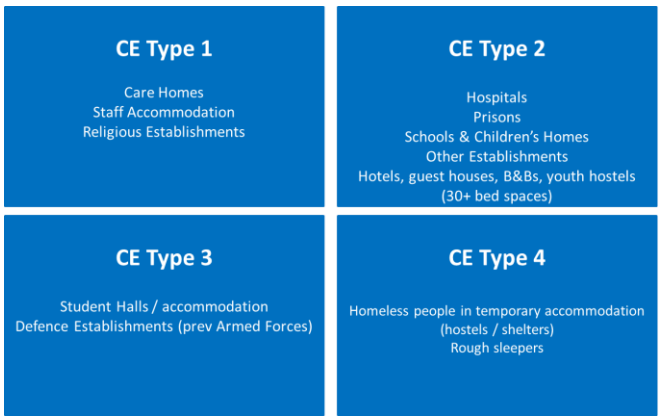
NRS developed a hard to count index (HCI) to help us target non-responding households. We applied the HCI to every household in Scotland. The index ranged from one to five, with five being the households least likely to respond.

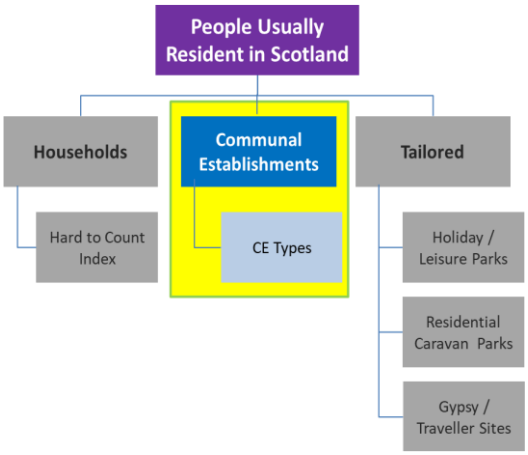
We produced the HCI using area-level characteristics associated with census non-responses. For example, we used age profile, housing tenure, dwelling type and level of deprivation. We applied this to planning areas, which were areas used by the field operation for non-response follow-up with households. Planning areas usually consisted of 200 - 400 households. We approached non-responders through reminder letters and doorstep visits.

Communal Establishments

We defined a communal establishment (CE) as a typically managed residential accommodation where there was full or part time supervision of the accommodation.

By using four types of CEs, we identified the best tactics and strategies to maximise response rates.

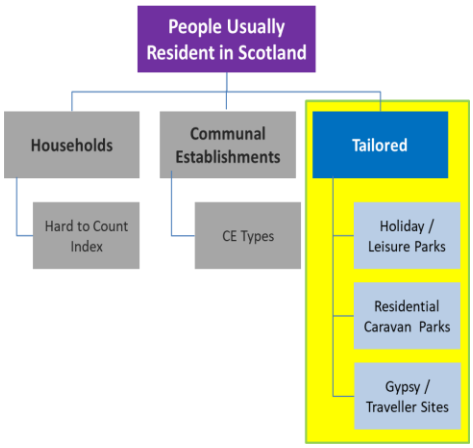




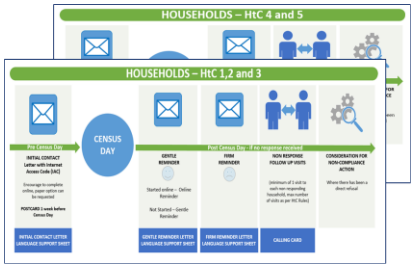
Tailored Enumeration

Tailored enumeration was defined as:

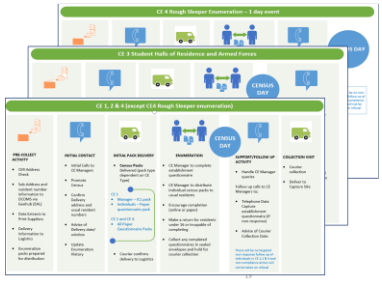
A bespoke approach to maximise census returns from identified population groups, with specific characteristics or corresponding lifestyles which do not allow enumeration to take place using standard design models (household or communal establishment).



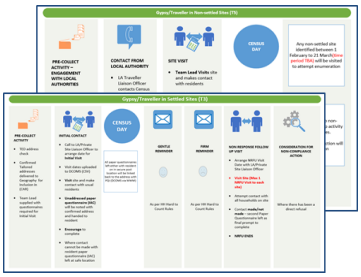
We defined enumeration approaches for each of the groupings and segments.



Households



Communal Establishments



Tailored

Address database

With a move to our online first approach, NRS needed an accurate database of addresses to send the Internet Access Codes (IAC) to. This in turn would allow households to complete their returns online. The database helped us to identify CEs and other addresses requiring tailored enumeration. It also assisted with reconciling responses, following up non-responders and processing.

Since 2011 the NRS geography team had been developing the Scottish Address Directory (SAD), a list of residential and workplace addresses. NRS created SAD using Ordnance Survey's AddressBase Premium. SAD combined information from Royal Mail's postal file and the 32 Scottish local authority address gazetteers to give a full picture of addresses in Scotland.

As an established product with comprehensive quality assurance, we used SAD to inform the address database for the 2022 Census. This led to the creation of the Census Address Register (CAR) which took an extract of the SAD and the Scottish Postcode Directory at a point in time and added census specific information such as enumeration type. The CAR served a multitude of purposes as a golden source of geographical information by:

- assisting with planning by grouping addresses into planning areas
- allowing addresses to be enumerated using the correct procedures (household, communal establishments and tailored enumeration)
- providing historical address information to aid with coding of the 'Address 1 year ago' question
- providing business addresses to aid with responses and coding of the workplace address question
- providing details of other names that addresses may be known by which could help resolve queries
- assisting with follow-up exercises by allocating each address to a fieldwork area making it more manageable to assign workloads
- acting as a single point for address and postcode information making it easier to access and manage.

The CAR incorporated the unique identifiers from SAD, the unique property reference number from the One Scotland Gazetteer and the unique delivery point reference number from Royal Mail's Postcode Address File. This enabled data linkage to other datasets for quality assurance and processing purposes. This included a comparison to the electoral register to ensure residential properties were identified correctly. Additional checks undertaken on the CAR were to:

- investigate addresses which had an organisation name but were flagged as residential
- investigate addresses where one data source suggested the property was not yet built
- remove additional historical or unwanted records using classification

We produced a version of the CAR in January 2022 to allow for the printing of post-out materials. We then updated the CAR in February 2022 so addresses could be added to the enumeration address list for receiving an IAC.

<u>Communal establishment and tailored enumeration address check</u>

In 2021 an extract of the CE data held on the CAR was passed to our data collection team to allow them to check addresses by contacting the CEs. The purpose was to:

- confirm whether the CE still existed
- confirm that the establishment type was correct
- identify the number of usual residents
- contact the manager

This helped ensure the address register was up-to-date and accurate and that addresses had been given their correct enumeration process. Findings from the address check were fed back to the geography team to allow changes to be made to the CAR.

For tailored enumeration addresses (e.g. caravan parks) the address check helped us refine our list by changing:

- holiday and leisure park addresses to communal establishments
- residential caravan park addresses to households.

For addresses that remained tailored, the address check also confirmed:

- the number of caravan pitches
- number of caravans sited and
- the number of usual residents

In some cases, the address type or enumeration type was changed for logistical reasons even if the address fell under the census definition of a communal establishment.

Rehearsing the 2022 Census

Delivering a successful census is not straightforward. That is why NRS carried out a public rehearsal in late 2019 to test some of the systems and services to be used in the live collection phase. Initially, we intended to carry out a full end-to-end test of the census, but this was reduced in scope to reflect changes to the timetable for the full operational design and on-boarding of some suppliers (paper capture, coding, logistics, field force and contact centre were not in place for the rehearsal test window). Issues contributing to this decision were outlined in the gateway review report of December 2018 and the subsequent recovery action taken within the programme during 2019. The lack of an end-to-end rehearsal did not contribute to the decision to delay to 2022.

The rehearsal took place from 7 October to 7 November 2019 using a reference day of 13 October. The rehearsal took place in three areas: parts of Glasgow, Dumfries & Galloway and Na h-Eileanan Siar. These areas were selected to allow NRS to test approaches in rural, urban and diverse communities. The scope of the rehearsal was split into learning areas, which included testing:

- the usability of online and paper census questionnaires
- the public-facing telephone helpline (NRS internal solution, not outsourced)
- some elements of census communications and public assistance
- census ICT systems and operational processes

Participation in the rehearsal was on a voluntary basis. Over 72,000 households were contacted and nearly 18,500 responded. The rehearsal was an important milestone. It gave us insights into the systems and processes used to gather census information. The rehearsal helped us understand what worked and where we needed to improve. An evaluation report of the rehearsal was published on 31 March 2020.

We also ran a statistical methodology rehearsal from April to June 2020 to test data processing steps and use of administrative data. We published this evaluation report in July 2020.

Lessons learned from the 2019 rehearsal

The rehearsal highlighted that most of our approaches to contacting citizens and collecting data worked as expected. It also showed that there were a few aspects of our approach that required improvement. The majority of these were already known to us and were already in our post-rehearsal work schedule.

The rehearsal reassured us that our approaches in many respects worked well. For example, initial contact materials and reminder letters increased returns, elements of our local engagement and marketing strategy tested strongly, and the overall design and functionality of the online and paper questionnaires allowed the public to complete returns and deliver usable data. The rehearsal also identified areas for improvement. These included the need to:

- improve how we collected address information
- improve online question routing
- review the timing and tailoring of reminder letters and
- improve the provision of management information

The descoping of communal establishments, tailored enumeration, field force and outsourced contact centre from the rehearsal in 2019, combined with limited testing post-rehearsal meant not all systems, processes and enumeration types were fully tested. A lesson was to rehearse these elements before any future census and to pilot any census coverage survey.

NRS used a multivendor strategy following the recommendations of an independent report commissioned by the Scottish Government's Digital Assurance Office. This resulted in greater complexity and responsibility on NRS to act as a strategic integrator of a complex mix of suppliers. NRS should have compared the strategic integration approach and the prime contract approach to understand which would have realised better value and efficiency for the programme.

The programme was late in placing user centred service design at the heart of the supporting operations. While these issues were resolved before the live collect phase, a user centred service design approach should have been implemented at the outset of the programme. This would have ensured better alignment of content development across all channels and end-to-end.

Chapter 3 – Impact of Covid-19

The priority and responsibility of National Records of Scotland (NRS) was to put in place a census that enabled everyone in Scotland to participate, so that the information collected could be used to produce high quality outputs and deliver benefits for the people of Scotland. Before the pandemic, an independent gateway review found that NRS was on track to deliver the Census in 2021; albeit with a significant amount of work to do throughout 2020.

NRS began to assess the impact and risks of Covid-19 on the 2021 Census programme in March 2020. At that time staff had started working remotely and many of our partners, such as the NHS and local authorities, were under acute delivery and response pressures. In response to the pandemic, many NRS staff were re-focussed on developing and delivering essential services in response to Covid-19. This included Scotland's registration system and services (responsible for registering births, deaths and marriages) and the production vital Covid-19 statistics, including weekly mortality data. This was set against a backdrop of uncertainty about the length, duration and significance of Covid-19 related disruption to the 2021 Census programme.

The census collection phase is a significant logistical operation. It involves recruiting and deploying thousands of staff, including a large field force team who engaged with the public on the doorstep. The 12 months leading up to this are vital in planning and testing the effectiveness, safety and security of census systems and collection processes to ensure they are fit for deployment. The uncertainty of the pandemic in early 2020, and the potential for further restrictions throughout the year, posed a significant risk which was deemed likely to prevent key census activities from progressing.

The potential impacts included slowing recruitment, being unable to undertake comprehensive testing, limiting on the ground contact with care homes and hospitals to establish their requirements for questionnaires, and limiting engagement with third sector and community groups to encourage participation.

Options assessment

In response to this uncertainty, NRS carried out a detailed options assessment in April and May 2020 to consider the impact that Covid-19 restrictions could have on the programme. We assessed several options to preserve a 2021 Census but concluded that delivering the Census in 2021 would risk achieving the high quality of data required. NRS provided the full options assessment to the Scottish Parliament's Public Audit Committee in March 2022. This included the impact of restrictions that might be in place during the census collection phase, the risk of a significantly

reduced response rate, and pandemic-related issues preventing normal planning discussions with organisations such as local government, the NHS and other public bodies.

These considerations were supported by a further gateway review in May 2020. That review noted that NRS had taken reasonable steps to assess and analyse the impact of Covid-19 on the programme plans and had undertaken a robust options assessment. Following the options assessment, and on the advice of NRS, Scottish Ministers announced on 17 July 2020 that Scotland's Census would move to 2022.

Comparisons with other census taking bodies

Scotland was not alone in delaying its census. UN survey data showed that several censuses across the world were delayed in 2020 and 2021 due to the pandemic, while others proceeded but with extensions to their field collection periods. Out of 83 nations planning to conduct censuses over that period 59 (71%) delayed their census field collections, including Scotland, Germany, Italy and Ireland.

Censuses in the rest of the UK went ahead as planned in March 2021. This reflected the significant difference in the resources and remits of the other UK census offices, and their different assessments of the financial and data impacts of delaying the census.

The Office for National Statistics (ONS), responsible for the census in England and Wales, had analysis of administrative and commercial datasets to support the 2021 Census field operation and quality assurance of the Census outputs. Similar sources were being used as part of its longer-term transformation programme. ONS is also a larger organisation than NRS, with access to a wider pool of resources.

Wider functions of NRS

NRS's role was and remains quite different to that of ONS. We deliver a range of statutory services, many of which were critical to the pandemic response. In addition, NRS had no operational requirement at the time for the broader access to administrative data held by ONS. While our census design included the use of some administrative data to assure quality, NRS did not have access to the wide range of data available to ONS to mitigate for a low or biased response to the Census. As the pandemic hit, NRS did not have the time nor capacity to identify the legal gateways and permissions to bring in, and effectively use, alternative administrative data for a census in March 2021.

Following the decision to delay, NRS replanned our census programme. Scotland's Census 2022 followed the same design and question set as planned for March 2021. NRS worked closely with stakeholders and partners to ensure that appropriate data

was available to support work that was expecting to make use of revised population outputs from a 2021 Census, in 2022. We also worked closely with our colleagues in ONS and NISRA to ensure the needs of data users in Scotland and across the rest of the UK would be met. Scotland's Census 2022 took place on Sunday 20 March.

Chapter 4 – Collecting the data

The comprehensive nature of the 2022 Census involved identifying all households across Scotland plus other types of residence such as communal establishments. Most of the data was to be collected online, with all the advantages of data validation, easy to access guidance and translation facilities. However, we had to give care and attention to those who might be excluded from this digital first approach. To support people who could not respond online, we provided paper questionnaires, a telephone contact centre, field force support, and an extended collection period. We used our follow-up Census Coverage Survey in the modelling phase to ensure the outputs represented the whole of Scotland's population.

Response rates

Scotland's Census 2022 had a final person response rate of 89.8%. This was lower than the original target of 94% and lower than the 97% response rates for the 2021 censuses in England & Wales and Northern Ireland. Detailed information on our final response rate was published in our statistical quality assurance report alongside the first release of census data in September 2023.

National Records of Scotland (NRS) responded to the lower-than-expected response rate by integrating administrative data into our census design in a groundbreaking way that gave confidence in the ability to innovate with new types of data. These changes were made under the guidance of an International Steering Group which NRS brought together to provide confidence in the changes being made.

Lower response rates are part of a broader trend across government social surveys in recent years. At the time of the 2011 Census, the Labour Force Survey (LFS), the largest annual social survey in the UK, had a response rate of around 60%. This had decreased to less than 35% during the pandemic. In the years following the pandemic, response rates to the LFS and other social surveys continued a downward trajectory, dropping to less than 25% in recent collections. More recently, following the implementation of a strategic recovery plan by the Office for National Statistics, response rates have begun to recover.

The unique set of lockdown restrictions in 2021 when the England and Wales Census took place may have contributed to a higher response rate than their similar 94% target. These unprecedented restrictions also had implications for the population which was measured at that time. For example, many university students were living at their parents' home rather than closer to their university as they would have been in any other year. Students had returned to living in their university accommodation by the time Scotland carried out its 2022 Census.

As intended, NRS provided multiple reminders to non-responding households. These were in the form of both letters and household visits. Despite this and a significant awareness campaign, the lower-than-expected response rate in Scotland indicated a reluctance among households to respond.

Differences in timing between the 2022 Census in Scotland and the 2021 Censuses for the rest of the UK may have resulted in a more complex message for the public and affected the response rate. UK-wide media for the 2021 Censuses was not repeated in 2022 and NRS did not benefit from this additional publicity. The ScotStat Board for Official Statistics recognised this and emphasised that simultaneous media exposure with the rest of the UK would have boosted engagement. They recommended that future censuses should be delivered at the same time as the rest of the UK. Furthermore, there were other competing media stories at the time of the 2022 Census in Scotland. A Scottish Government evaluation of the first phase of the Census campaign published in July 2022 found:

> "This campaign has run during a challenging period for the public, with the Ukraine war raging, cost of living pressures, Covid-19 still in circulation and general fatigue as the country recovers from the pandemic."

NRS recognised that it was not optimum to delay by a year given the loss of the UK media benefit, but unique circumstances led to the decision to delay. We set out our reasons during evidence to the Public Audit Committee in January 2022 and concluded that:

> "… delivering the census one year later, when we have in place processes and methodological solutions, and engagement with our colleagues, is not as bad an option as producing a census that is not fit for purpose, is biased and does not have enough coverage".

There was inevitably significant uncertainty about the course of the pandemic across the world when Scotland decided to delay its census in 2020. We considered several other factors in Chapter 3 of this report. There was some evidence that there had been a decrease in the level of trust in government across the UK as the pandemic continued.

NRS are building on experience from the 2022 Census as part of our plans for the future of population statistics in Scotland. This includes closely collaborating and aligning with the rest of the UK as set out in the UK Concordat on Statistics which NRS remain committed to as we look at reimagining the role of administrative data as part of a future system.

Wave of contact

The 2022 Census programme raised awareness amongst households in Scotland through a variety of methods. The digital first approach to the 2022 Census meant that we changed the way we contacted households from previous censuses. Most of our contact with households encouraged online completion, with information about other ways to complete also provided for households unable or unwilling to engage online. For the first time, we used Royal Mail to deliver letters and questionnaire packs. This was cheaper and more efficient than delivering by hand.

Initial contact

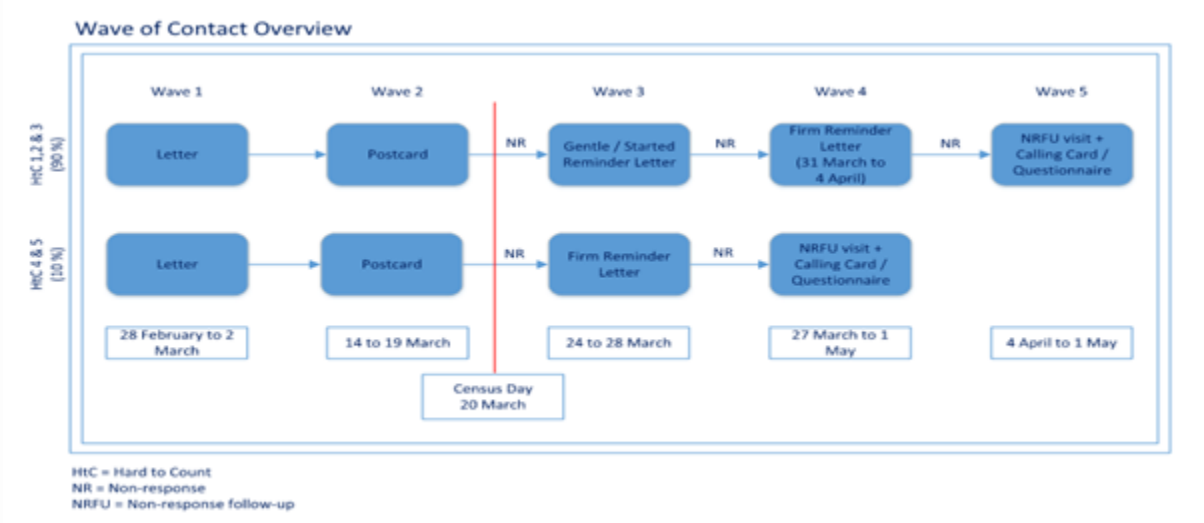
Before Census Day, we sent letters to around 2.7 million households. These letters asked households to complete the questionnaire online using a unique Internet Access Code. The letter also had information about where and how to get help, including how to request a paper questionnaire, if required. We followed this up before Census Day with a postcard reminder to all households.

Follow-up reminder letters

After Census Day, we sent a series of reminder letters to households that had not completed the census. The letters encouraged householders to complete as soon as possible. The letters advised households of the legal requirement to complete the census. We also sent paper questionnaire packs to some non-responding households in harder to count areas and areas likely to have higher levels of digital exclusion.

Follow up visits

After Census Day, our field force began to visit households. These visits reminded households of their legal requirement to complete the census and offered help and support to aid completion. We targeted visits to the 10% of households in areas we had identified as hard to count, where we expected lower engagement.



The overview above represents the preplanned sequence and timeline of our household enumeration approach. We amended this during live operations to further support completion:

Initial Contact Letter, delivered to all households	28/02/22 - 04/03/22
Reminder Letter 1, delivered to all non-responding households	24/03/22 - 01/04/22
Reminder Letter 2, delivered to all non-responding households	05/04/22 - 12/04/22
Reminder Letter 3, delivered to 250,000 non-responding households	14/04/22 - 20/04/22
Paper Questionnaire Packs, delivered to 115,000 non-responding households	27/04/22 - 04/05/22
Reminder Letter 4, delivered to all households which had started but not yet completed an online return	30/04/22 - 04/05/22
Reminder Letter 5, delivered to 450,000 non-responding households	12/05/22 - 19/05/22
Non-Response Follow Up (NRFU) visits	HTC 1-3: 01/04/22 - 31/05/22;
	HTC 4-5: 27/03/22 - 31/05/22

Non-compliance early intervention, Paper Questionnaire Packs, delivered to households recorded as non-compliant or which had received five or more NRFU Visits	24/05/22 - 27/05/22

Contacting communal establishments

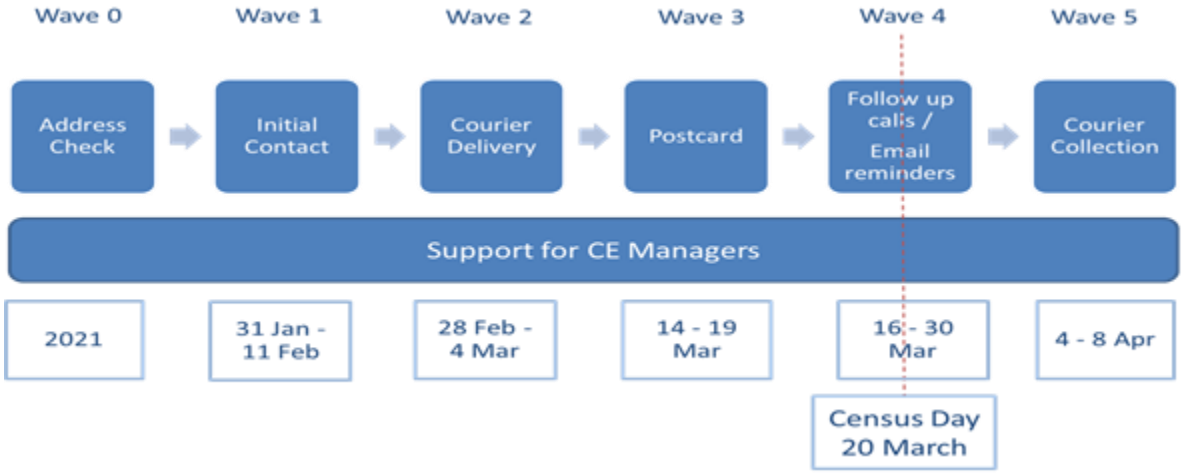
We grouped communal establishments (CEs) into four types and took a different approach to collecting census data for each type:

- **type 1**: care homes, staff accommodation and religious establishments
- **type 2**: hospitals, prisons, schools and children's homes, hotels, guest houses and hostels
- **type 3**: student halls and accommodation, defence establishments
- **type 4**: homeless people in temporary accommodation, rough sleepers

We sent paper questionnaires and an Internet Access Code to all CEs, except for those in type 3. Residents in type 3 received an Internet Access Code but could choose to complete on paper if they preferred. Prisons were the only type of establishment where residents could only complete on paper.

CE managers were responsible for:

- completing and returning the CE managers questionnaire
- supporting residents to complete their own individual questionnaire



Enumeration of some types of CEs was more successful than others. In general, the person response rate for CEs was lower than that of the population living in households. Counting populations in CEs is recognised as being difficult to do in the

rest of the UK and across the world. For future collections dedicated resource should be made available to focus on these communities separate to household enumeration. The role of administrative data should be fully explored for these groups from the outset. More information on the quality of the data can be found in our assurance report published in September 2023.

Online completion of questionnaires

Strategic objective 3: To maximise online response

Scotland's Census 2022 was designed to be digital first. This was consistent with the Scottish Government's digital strategy. NRS ensured that the online questionnaire was usable and accessible, and met the expectations and standards of a modern government service.

NRS targeted an online completion rate of at least 70%. Householders received a letter from the end of February 2022 with instructions on how to complete the census questionnaire online, including details for the census website and a unique Internet Access Code.

Almost 90% of respondents completed the 2022 Census online with no outages or major defects reported. The approach was flexible, with respondents able to complete the census questionnaire online or on paper, with assistance available from our telephone contact centre and our field force team. The high digital uptake of 89% exceeded NRS's target of 70% and indicated a strong preference for most citizens to use digital rather than paper. This should be taken into account for any future census exercise or similar significant public engagement.

The option of submitting a census questionnaire online was first introduced in the 2011 Census for those living in households, only. Those living in communal establishments were only able to complete on paper. Online returns in the 2011 Census were by design capped at 20% of households due to system capacity limitations.

Key objectives

The objectives of the online solution were to:

1. Support the production of high-quality census outputs that met user needs by designing, specifying and building a platform with reasonable respondent burden.
2. Maximise the overall response rate by designing the platform websites to maximise digital uptake and support the user journey and experience to be as seamless, efficient and as quick as possible.

3. Maximise self-response, self-completion and submission of census returns by developing the platform as an accessible, inclusive and user-focused system with availability of web chat and email and telephone enquiries options.
4. Protect, and be seen to protect, confidential information by designing, specifying and building the platform to meet requirements of UK General Data Protection Regulations and the Data Protection Act 2018.

Popularity of online responses versus paper responses

The option to complete the census online was very popular. Two million households completed their questionnaires online. This equated to 89% of all responses, significantly more than our 70% target. The Office for National Statistics also saw 89% of households submitting their census returns online in 2021.

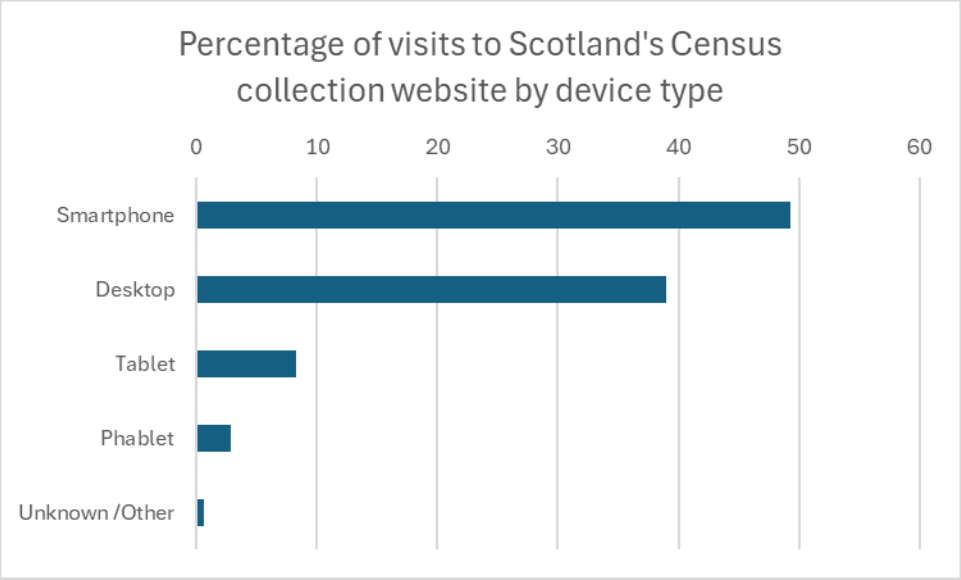
Census Day was Sunday 20 March 2022, but householders could complete their questionnaire online as soon as they received their letter. They were asked to answer questions with information that would be correct as of 20 March to ensure that we had a snapshot of the nation on that day.

Help and support

Scotland's Census 2022 was designed to meet the needs of a wide range of users and to meet the Scottish Government's Digital First standards (now the Digital Scotland Service Standard). NRS helped respondents to complete their census questionnaire online by embedding functionality into the solution to minimise respondent burden and errors.

The questionnaire could be accessed through a range of devices, such as laptops, mobile phones and tablets. It was compatible with commonly used browsers and assistive technologies (e.g. screen readers). Analysis of responses revealed that:

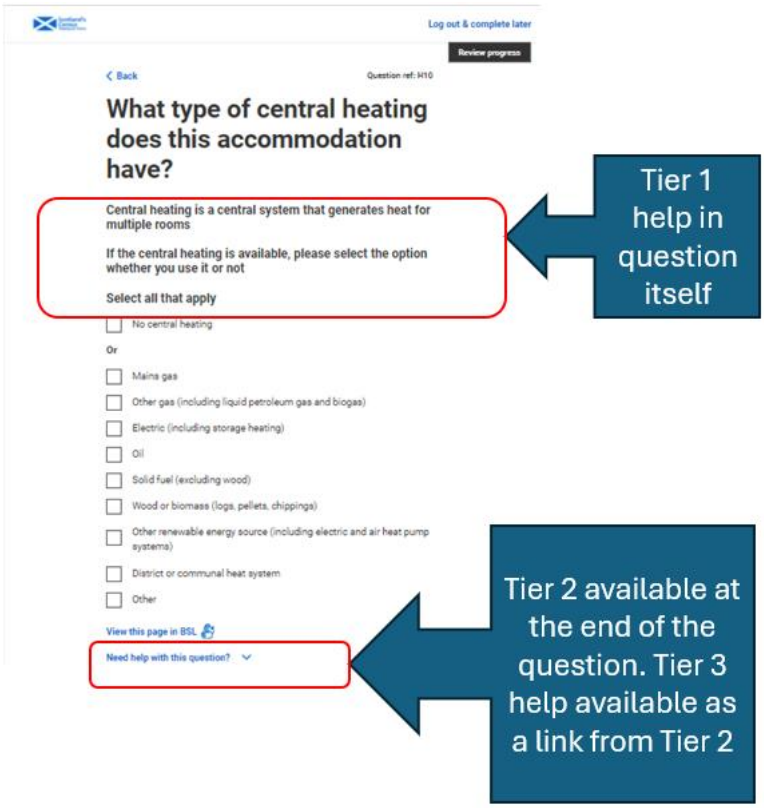
- there were more visits from smartphones than desktops, with relatively few visits from other devices e.g. tablets.
- individuals in households were more likely to use smartphones and individuals in communal establishments (CE) and the CE managers were more likely to use desktops.
- the most frequently used device brand was Apple and the most frequently used browser Mobile Safari.
- most frequent operating system Windows 10, followed by iOS 15.3 and Mac 10.15.



Question guidance

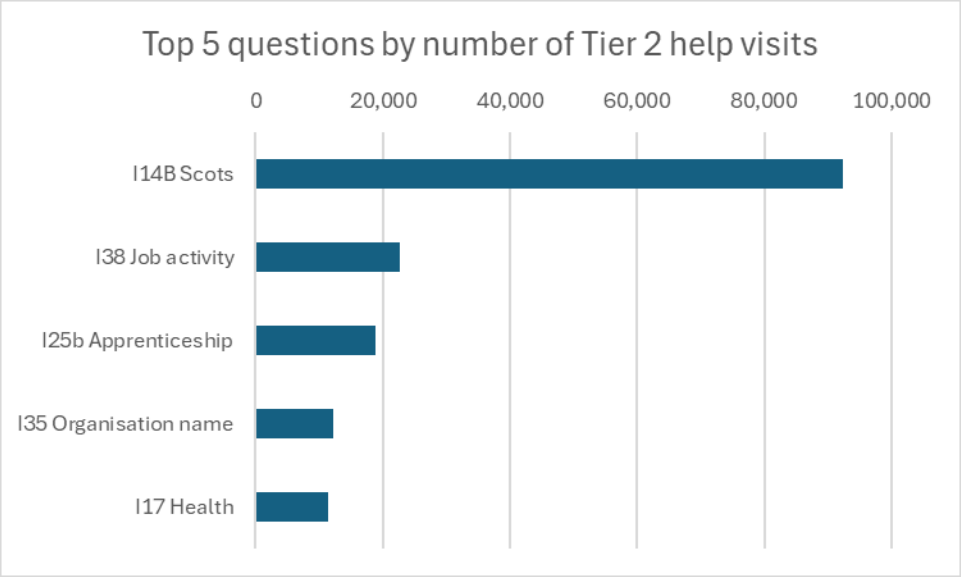
As with all questionnaires, clear guidance for users was imperative to assist completion and to help ensure the production of high-quality census outputs. Guidance was provided for each question, and in some cases alongside the question itself (Tier 1), in the form of prompts or suggestions. If required, respondents could access further guidance and information online to help them understand why the question was being asked and how best to respond (Tier 2 and Tier 3).

Most people did not access the question guidance, which is a recognised behaviour among those completing surveys. An example of how question help worked is as follows:



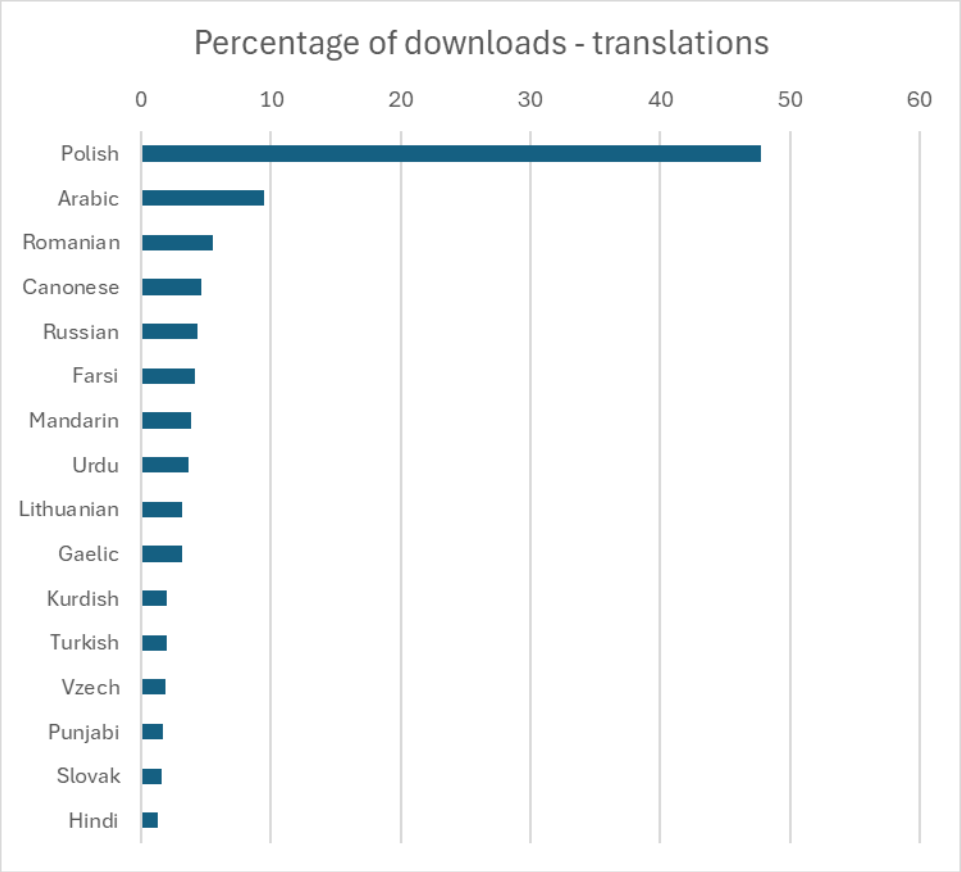
Tier 2 question help was provided on the question webpage. The most accessed Tier 2 help was for the question, “Can you understand, speak, read and write Scottish Gaelic or Scots” (Scots language), which was used around four times as much as the next most accessed questions.

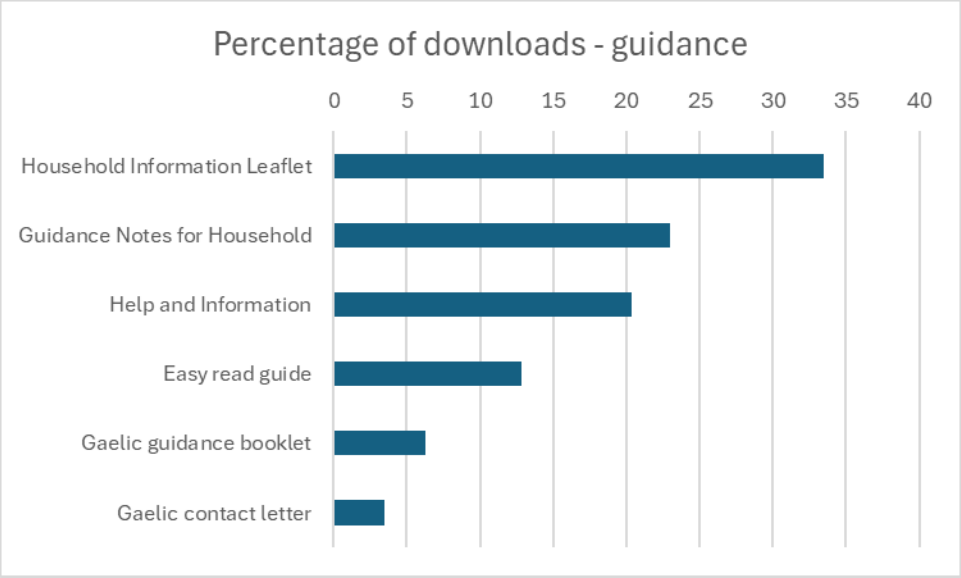
Respondents were also more likely to access question help for questions on job activity, apprenticeship, organisation name and health. The question help accessed varied by Internet Access Code type. For example, CE individuals were more likely to access help for the question “address you travel to (student)”.



Tier 3 question help was provided on the census website and accessed either by links from the questions, or directly on the 2022 Census collect website. A version of the Tier 3 help can be viewed on NRS web archive. The proportion accessing Tier 3 help varied by question. Again, the most accessed Tier 3 help varied by Internet Access Code type.

A wide range of guidance materials and question translations were provided. The census questionnaire could be completed online in English or Gaelic. British Sign Language translations were also provided for the questions and guidance. The Polish translation was by far the most downloaded item, followed by Arabic translation. The 'Household Information Leaflet' was the most downloaded guidance. Downloads were slightly more frequent on desktop than on mobile devices, with mobile devices more commonly used to view the website overall.





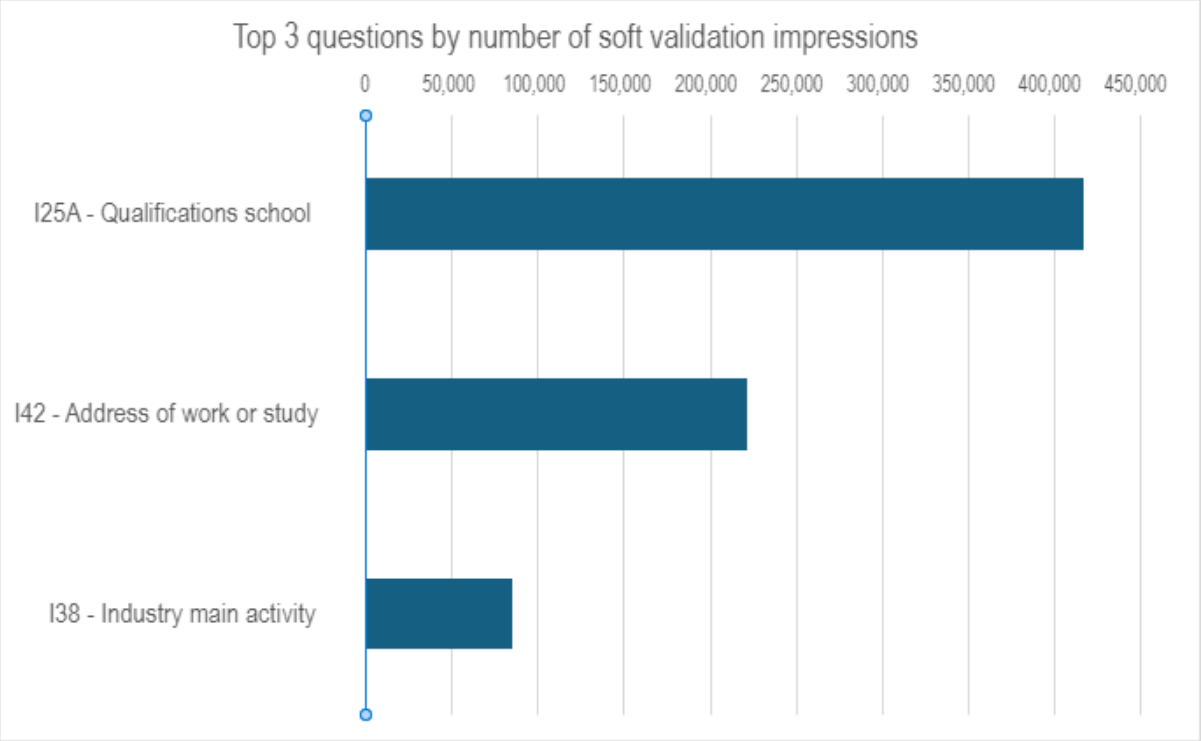
Hard and soft validations

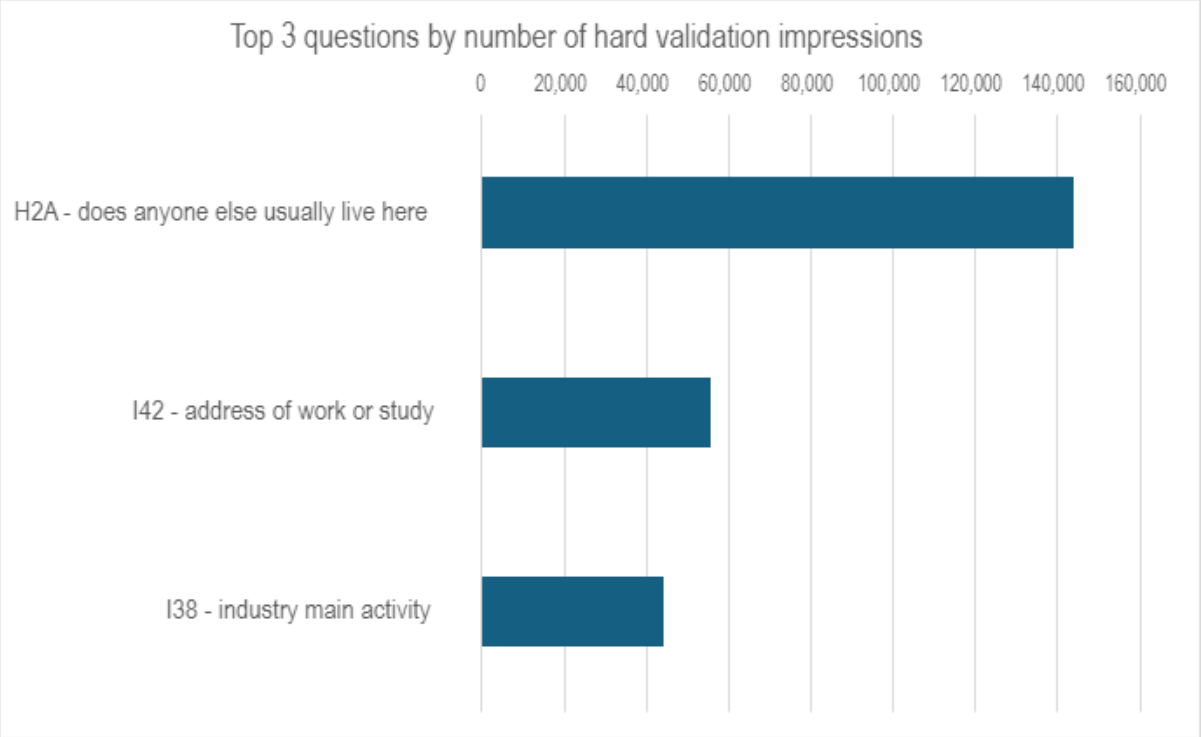
'Validations' were messages displayed on screen when the system detected an issue with the response provided. These prompts improved the quality of the data compared to a paper census.

'Hard validations' meant that the user had to amend their response to something valid before moving on. Most hard validations were for:

- how many people usually live here
- what address do you travel to
- main activity of job
- condition list

'Soft validations' meant that the user did not have to amend their response before moving on but were prompted to consider the accuracy of their response. Most soft validations were triggered for "school qualifications", followed by "what address you travel to".





'Automatic routing' meant that respondents were only asked relevant questions. Routing was based on the respondents' previous answers, for example their age or whether they had ever worked. The online questionnaire also included predictive text functionality which allowed the respondent to select a response from a predefined list.

These functions improved the quality of responses and reduced the burden on the user. Importantly, they could not be replicated with paper questionnaire responses. This meant there were modal differences in data quality between digital and paper responses. For paper returns, the physical process of capturing and coding responses was very time consuming. The online solution captured and coded some questions in the returns automatically, reducing manual processing and costs.

System availability

A notable success was the high level of stability of the online solution, which ran successfully between 28 February and 12 June, with no outages or major defects. This was in the context of significant volumes of traffic where there were:

- over 2 million online census returns
- over 3 million visitors
- over 800 million user requests (for example: page loads, link clicks or contact form submissions)

Paper questionnaires

Most people completed the census questionnaire online, but we knew that not everyone would be able to complete it this way. Our initial contact letters sent to all households included guidance on ordering a paper questionnaire online or from the contact centre.

Demand for paper questionnaires in the first week was very high, which stretched the contact centre and print suppliers who struggled to meet this initial demand. Despite this pressure the suppliers adapted to cope quickly.

We received requests for over 350,000 paper questionnaires. In addition, we proactively sent out a further 115,000 questionnaires in targeted areas identified by our research. Field force staff also issued more than 92,000 questionnaires during their household visits. However, only 270,000 paper questionnaires, less than half, were returned. It is not clear why this was the case, especially for those questionnaires requested by householders.

At the end of the collection phase, 11% of census returns were paper and 89% online. This was the same ratio as in England and Wales. In Northern Ireland the ratio was 19% paper and 81% online.

NRS should consider the value for money and environmental impact of using paper questionnaires and alternatives to paper completion. If NRS chooses to use paper in a future census, we should consider proactively posting questionnaires to some households in advance. This would align with the approach taken by ONS and NISRA in 2021.

Field Force

Field force activity fitted within a wider picture of citizen engagement. It alone did not create large response rates but was an important part of driving responses from those less likely to participate in a census. We used a smaller field force than in 2011 mainly because we anticipated that more people would complete their questionnaires online. We were also able to quickly direct the field force to addresses that had not responded, which was a significant improvement from 2011.

Field force was modelled to start its activity from 27 March 2022 (wave 4). We expected field to achieve between 25% and 33% of the remaining returns, and around 10% of the total census returns.

For our field operations we divided Scotland into approximately:

- five regions

- 35 areas (aligned to local authorities)
- 170 field work areas and within them
- 8,900 planning areas

We used these areas to plan and operate field work and had intended to assign a team of field workers to each field work area. The field worker role was to visit addresses that had not completed a questionnaire to offer support.

To secure public trust in the field force, it was decided that they should be Government employees rather third-party agency employees. As such the field force were employed under a Civil Service compliant recruitment process and terms and conditions. This approach made sense in the context of pre-pandemic labour market conditions and expected societal acceptance of doorstep interactions. However, challenges arose due to the pandemic and its impact on the labour market such as online recruitment and training. Our ability to quickly increase field force numbers was limited due to the employment and onboarding timescales as Government employees and working with one partner agency to undertake the recruitment. Recruiting staff as Civil Servants made the process more complex, lengthier and reduced the pool of suitable people. A more diversified approach could have offered greater flexibility and access to a broader market. Using local authority staff with existing knowledge of local circumstances may have helped engage with hard-to-reach communities.

In addition, the Scottish Government HR system was not designed to support large scale and specialist recruitment against a fixed timescale delivery programme. Consequently, NRS had to contract an external supplier to recruit. We aimed to recruit almost 3,400 staff comprising 35 area managers, 277 team leaders, and 3,081 field workers (enumerators).

Brexit and the pandemic made the employment market much more competitive, with skills and capacity gaps across a range of sectors. This made short-term contract work of this nature less attractive. Recruitment for area managers was successful with a full quota achieved and only one replacement required over the collection period. The target of recruiting 277 team leaders was not reached, with only recruited 240 in total.

Field worker recruitment was the most problematic with numbers at the appointment stage being around 30-35% of the original target. A further 10% left during the first two weeks of employment which was focussed on induction and training. This meant that the number of active field workers was around 25% of the original target. In total just over 1,100 field staff were appointed against the original target of 3,400 for the collection phase. We mitigated this shortfall by:

- extending the recruitment timeframe to maximise the resource we could get from the supplier
- introducing additional training cohorts
- offering staff additional hours and over time – overall over 35,000 further hours worked
- dynamically targeting field staff to areas of low response
- moving around 20% of our field staff to mobile operations during the collection phase
- using field force managers to undertake visits
- offering to help households complete the census on the doorstep
- offering contract extensions to field staff, with a total uptake of 790
- using Census Coverage Survey field staff to carry out census field work, during the collection phase, with a total uptake of 410.

Field force staff made over 1.6 million visits to support people to complete their census return. We estimated that field visits contributed to nearly 12% of the national response, exceeding our expectations. Although we had recruited fewer field staff than expected, the four-week continuation period meant that our target of 10% was exceeded.

Households could be visited on numerous occasions by field staff. The table below demonstrates that significant effort was made and that some households were visited on multiple occasions.

Number of non-response follow up visits per household	Number of households
1	256,965
2	135,117
3	78,223
4	172,310
5	22,181
6	9,800
7	3,926
8	1,512
9	831
10	890
11	54

12	1

Doorstep data capture

In response to ministerial guidance, on 9 May field staff began doorstep data captures which resulted in 1,848 questionnaires being completed up to 31 May. Field staff contacted approximately 26% of households for this exercise. The overall contact rate in Scotland across the collection and continuation stages was 22%.

The final decisions around the role of the field force, and the subsequent training, took place during a national period of anxiety given the emerging Covid-19 Omicron variant in late 2021. As such, NRS paid due regard to guidance about reducing risk of exposure to Covid-19 and took reasonably practicable measures to reduce incidence and spread. This decision was supported by the Chief Medical Officer (CMO) and these measures were applied from the start of non-response follow up on 27 March. Once practical to do so, NRS retrained and supported field force staff to begin doorstep data capture from 9 May, again the CMO supported this change.

In the latter stages of collection, and through the extension period, our field force activity was focused on areas with low return rates. This reflected our statistical design for adjusting for under-coverage. Several field events encouraged census completion where possible. These events focused on young people, students and ethnic minority communities. Locations included faith centres, supermarkets and universities, with field staff available to assist with census completion at each site. Events were covered in local and national media. Some were supported by local authority and voluntary sector workers to help connect with the community.

At the end of May 2022, as part of the field force work, households were invited to comment on the reasons for not completing the census. Of the 1,231 responses, the most common reasons were 'too busy' (35% of responses), 'not aware of the census' (16%) and 'didn't realise they had to complete it' (14%). For more detail see our report on reasons for not yet completing the Census.

Data Collection Operational Management System

A new element for the 2022 Census was the Data Collection Operational Management System (DCOMS). It enabled NRS to manage the collection phase and, together with other integration services systems, to have its 'finger on the pulse'. This was a shift from the field-driven paper-based reconciliation of every address that was used for the 2011 Census.

DCOMS supported the development and management of the Enumeration Address Register to ensure every household and communal establishment address received

an Internet Access Code or paper census questionnaire, with access to support from the field operation to ensure a census return for the address. It helped manage interactions with each Enumeration Address and Sub-Address and tracked the census returns up to receipt at capture.

Public assistance and the contact centre

Scotland's Census 2022 Contact Centre was an outsourced multichannel contact centre designed to handle a wide range of queries from Scotland's population during live operations. The contact centre opened on 28 February and was free to call from any landline or mobile phone. It assisted with a range of queries, such as:

- requesting a paper questionnaire
- replacing an Internet Access Code
- providing access to language support with an interpreter using a dedicated language line
- requesting other accessible questionnaires and guidance (such as large print, braille, British Sign Language videos on USB and DVD etc.)
- supporting census queries, complaints or issues

The contact centre was open from:

- Monday to Friday, 8am to 8pm
- Saturday and Sunday, 9am to 4pm
- Saturday 19 March and Sunday 20 March, 8am to 8pm

A range of other contact options such as webchat, structured email, British Sign Language and text relay were also available. The contact centre handled over 748,000 calls, 34,000 emails and 33,000 web chats. The contact centre experienced significant issues in the early stages of live operations, which led to high call volumes, lengthy waiting times, high abandonment rate and customer frustration. Overall, however the joint NRS Arvato team successfully stood up a national multi-channel contact centre that provided a high level of service to a high volume of people over a relatively short period of time.

Digital exclusion

Everyone usually resident in Scotland was in scope for the census. In developing an inclusive census, NRS consulted stakeholders around development and testing to ensure the census was easy for everyone to complete. Our design acknowledged that response rates would vary by location. We understood that not everyone would be able to complete their census online. Subsequently, additional provision was made for groups who had been identified as less likely to complete, or less likely to complete online. Our user research identified the following groups:

- young adults not living with their parents
- socio-economic groups with high deprivation or low incomes
- parents of children up to the age of five
- people aged 75 and over.
- minority ethnic communities.
- people with physical, emotional or learning disabilities or difficulties
- Gaelic speakers
- People living in rural locations.

This research informed our Hard to Count and Digital Exclusion analyses, our field force priorities and our communications and media strategy.

We provided a free interpretation service, which was promoted via household information leaflets. The most commonly interpretated languages were Polish (35%), Arabic (30%), Urdu (17%), Romanian (9%) and Mandarin (9%). Guidance was also available in 16 languages and could be accessed online or via the contact centre. People could submit their online returns in Gaelic. Our telephone data capture service allowed respondents to complete the census over the phone with a trained interviewer. We received over 13,000 responses this way. Help and support available in accessible different formats including British Sign Language videos available online and on DVD and USB), easy read, braille, audio and large print. A text relay service was available. British Sign Language users could use Contact Scotland BSL.

In areas identified by our research, 115,000 paper questionnaires were proactively sent out to support people to complete their census, with field force issuing an additional 92,000 questionnaires. An overview of paper interventions is provided at Appendix D.

Over 200 organisations, include older people's organisations, partnered with Scotland's Census to promote and share census information.

Non-Compliance

Completing the census was a legal responsibility. This message was included on the census form and on our communications to remind the public of their legal responsibility and civic duty to complete the Census.

Our approach to non-compliance differentiated between households which did not respond and those which directly refused (i.e. households that told us that they were deliberately refusing to respond). This proportionate approach was consistent with that taken by ONS and NISRA in 2021, and NRS in 2011. It also provided value for money.

In accordance with section 8 of the Census Act 1920, householders could be prosecuted following a report to the Crown Office and Procurator Fiscal Service (COPFS) if they refused to complete the questionnaire, neglected to answer a question, provided a false answer or signed a false document.
In line with previous censuses, anyone who directly refused to fill in the census (for example, if someone told a field force worker that they were refusing during a non-response follow up visit) was written to and given an opportunity to complete their census before NRS referred them for potential prosecution to the COPFS.

A non-compliance letter was issued to the 5,500 households that directly refused to complete the census. We also issued letters to the approximately 23,000 households who had received between five and 10 visits by census field staff. The letter included the Internet Access Code (IAC) which enabled people to complete online, and the contact centre number should they need assistance.

On Monday 6 June 2022, NRS wrote to approximately 6,500 households in Scotland that had refused to complete the census and advised them that they may be referred to the COPFS for prosecution and could receive a criminal record or fine. NRS included a paper questionnaire for households to complete and return by 19 June. Our online collection platform remained open until 12 June to support late returns. Non-compliance teams visited households to offer help and support.

NRS did not have powers to enforce compliance or issue fines directly. As a specialist reporting agency, NRS referred cases to the COPFS for consideration of prosecution. Following review, seven people were fined for failing to complete the 2022 Census compared to five in 2011.

As part of any future census, NRS will work closely with COPFS to review and improve our approach to non-compliance. We may also review whether the legislation enabling non-compliance action remains the most appropriate and value-based approach.

Collect phase continuation

We made extensive efforts to collect information from everyone in Scotland but changes in society meant that it was difficult to contact some people and households, especially in cities. These changes included:

- an increasingly ageing population
- a more mobile population with more complex living arrangements
- changing work patterns
- greater numbers of single person households

These factors made it challenging to identify and gather information about the population. Ensuring that every household and communal establishment had the means to respond to the census, and was motivated to complete it, was central to the design and planning of our operations.

During the collection period, we considered that the return rate at the start of May 2022 (79.2%) was too low to move to the next stage of the programme. We therefore recommended to ministers that the collection period be extended by a month, until the end of May 2022.

On 28 April 2022, the Cabinet Secretary for Constitution, External Affairs and Culture announced in Parliament a four-week extension to the collection period. This extension led to significantly more returns which allowed us to move to the next phase of the Census.

The additional costs of the extension were initially estimated at £9.76 million and noted in the Cabinet Secretary's statement. This investment allowed suppliers to support the Census response channels (digital and paper), the public assistance and communication channels, and additional interventions to increase response rates. Because of savings we were able to make, the extension cost £6 million in the end. More information on programme costs is provided in Chapter 10.

We extended our awareness campaign to remind people of the importance of completing the census and their legal responsibility. The contact centre handled more than 30,700 calls during the extension period, with more than 214 language interpretations and 5,314 telephone data captures. We worked with local authorities and voluntary sectors to connect with harder to reach groups through their existing relationships and networks.

By the end of May 2022, the overall return rate was 87.4%, with 32 local authorities at over 81%. Through data assurance and quality checking and excluding empty households, the return rate was subsequently increased to 89%.

Speaking on behalf of the International Steering Group, the chair Professor James Brown said:

> "In line with international best practice a high quality 21st century census of population and housing brings together several phases of data collection and reconciliation, to deliver robust and detailed estimates of the numbers of individuals and households. The Scottish Census is no exception and the main collection phase has now generated the data that is the basis of these estimates. While the overall return rates are lower than originally planned, NRS's extension has improved consistency and returns across the country.

With this solid foundation it is now time to move to the next phase and conduct a high quality coverage survey."

The extension to the collection period was a legitimate, and often used, process to increase engagement with the census. Countries including Poland, Japan and the USA all took similar steps in recent years to maximise participation. England and Wales also extended their collection for some communal establishments by three to four weeks after the 2021 census closed and Northern Ireland continued to accept returns after the closing date.

Most of Scotland's Census 2022 collection operations were closed on 1 June, with the online portal remaining open for 12 days to support late responses. Appendices D and E provide summaries of the interventions applied during the collection extension period.

Printing, Logistics and Paper Capture

The Census involved a huge logistical exercise comprising:

Print

- Printing of all requestable enumeration materials (e.g. questionnaires, information leaflets, support products), packaging, labelling and dispatch for onward delivery.
- Print and delivery of all Communal Establishment packs.

Logistics and Field Supplies

- Materials and tools for the field force to carry out their activities.
- The supply and distribution of field force ancillary and paper products
- Warehousing and distribution of field force kits, supply of replacement kits and individual components, management of stock, picking and packing, utilising internal stock ordering and the APS management system.

Paper Capture

- The capture of paper returns and conversion into an electronic format ready for processing.

Overall, more than 8 million letters were delivered to households, reflecting the wave of contact approach, and over 400,000 paper questionnaires were posted out. 270,000 questionnaires were returned by households and successfully scanned, captured, and submitted to NRS. As noted previously, an additional 92,000 paper questionnaires were delivered directly by census field staff.

A field force kit was provided to all field workers, and replacement products, were delivered as needed. Paper interventions were used to address low response rates. These were agreed and delivered quickly and effectively by both suppliers. The supporting processes worked well, allowing all services to be monitored during live operation and issues identified and resolved effectively.

Census Coverage Survey

As in previous censuses we knew that not everyone would complete the census. Therefore, as in 2001 and 2011 and in the rest of the UK, a key part of the census design was to run a survey to estimate non-responses. The Census Coverage Survey (CCS) helped the programme to meet the objective of producing "high quality census outputs that meet user needs". It was essential to measure the extent of the census coverage across various demographics and areas. This would allow the calculation of high-quality population estimates and the creation of confidence intervals around those estimates.

The CCS was voluntary and ran after the census collection period had closed. It targeted a sample of households and contained a small number of census questions that were required for the methods to estimate 100% coverage of Scotland's population. We had intended to start the CCS five to six weeks after census day, but we delayed it by four weeks due to the extension of the census collection operation. This meant that the CCS started around 10 weeks after census day.

The initial CCS response rate target was 80% but due to various factors including hard refusals on the doorstep, an overall response rate of 57.8% was achieved. This was slightly above other large household surveys and very similar to the rate achieved by ONS for their CCS in 2021. Due to the lower than anticipated response rates, the CCS was extended by four weeks: two weeks nationally, plus an additional one week in all areas except in the Highlands and Islands and a further fourth week in certain areas in Glasgow and to the west of Glasgow. The extension improved the CCS response rate to 57.8% and ensured that it had enough geographical coverage, along with administrative data, to estimate the population.

Several challenges influenced the lower-than-expected response rate to the CCS.

While we had tested some of our CCS operations before going live, we had not publicly rehearsed our systems and processes like we did for the census. This was because preparations for the CCS started later than those from the census. We had intended to outsource the CCS but market engagement told us that would not be good public value. A lesson for any future CCS is to design, build and test the survey on the same timelines as the census operation.

The later start to the CCS due to the census extension meant interviews took place further from census day than planned.

Recruitment was challenging. It was difficult to attract people with the right skills and experience to interview on the doorstep as the CCS was a face-to-face survey unlike the census. Turnover of staff and moving CCS staff to support the census extension and then back added complexity.

Property listing took longer than planned and we underestimated the time needed for this activity. There was limited evidence that this was necessary given the quality of the address frame used. Any future CCS design should consider removing the property listing stage. Longer than anticipated property listing had a knock-on effect to the completion of the interviewing phase.

Hard refusals were given from 20% of households, mainly on the first visit. Just over 10,900 households refused unequivocally to participate in the CCS. The 10,280 households that gave a reason for refusing fell into five categories:

- 41% were not interested in participating in the survey
- 19% indicated that they had already taken part in the census, or indicated a language barrier to completion
- 18% were too busy to participate
- 15% said that they were too old, infirm, disabled, or ill
- 7% gave little detail or information

The continuations to census and CCS meant that the operation ran for longer than planned which caused two issues. First, our field force suffered attrition and turnover. CCS staff moved to work on the census extension and then moved back to CCS operations. This meant that those who had other work lined up or holidays booked could not stay for the full CCS operation. Second, the school holidays in July and August impacted securing successful interviews with some households and communal establishments, particularly student accommodation.

Summary of key lessons

There were many positives to be taken from the census collection phase. There were no major service disruptions, the technology was stable and reliable, and no security or data protection issues were identified. NRS adapted and implemented interventions at pace during the short extension window to increase return rates.

The option to complete the questionnaire online was very popular. Just under 2.1 million households out of 2.6 million chose to complete online. This digital approach allowed many accessibility needs and requirements to be built into the service, which

would not otherwise be as available in a traditional paper approach. The solution ran successfully between 28 February and 12 June, with no outages or major defects.

The online solution delivered qualitative benefits such as automated question routing to mitigate user error and a simplified completion process. This improved users' experiences compared to those completing paper questionnaires. There were also quantitative benefits of the online solution. It enabled the automatic capture of responses, unlike paper which required a labour-intensive manual process.

Any future census using paper questionnaires should consider posting paper to households in advance, similar to ONS and NISRA, while also taking into account the environmental impact and value for money. There may be alternative approaches to paper completion.

There was strong and ongoing support from campaign partners to promote census, particularly through online and social media using the provided assets. This included more than 200 partners across the public and private sectors alongside close partnership working with local authorities and Third Sector Interfaces.

To secure public trust, field force staff were employed as civil servants. This approach made sense in the context as designed, but challenges emerged due to the unforeseen pandemic and the added longer-term impact on pensions, recruitment, training and SG pay awards. A more diversified approach could offer greater flexibility and access to a broader market, and which may also include exploring the use of local authority staff with existing knowledge of local circumstances such as hard to reach communities.

Future field force staff should be employed under a temporary 'contractor' status and be paid weekly. This would be more commensurate with the role and length of contract and enable NRS to manage performance more easily. Consideration should be given to options to further mitigate against field worker attrition rates.

Recruiting field force staff as Civil Servants rather than agency staff made the recruitment process more complex, lengthier and reduced the potential pool of suitable people. A more diversified approach could offer greater flexibility and access to a broader market. The approach should also explore the use of local authority staff with knowledge of local circumstances such as hard to reach communities.

For any future census where a field force is used, it may be appropriate to consider the use of more than one supplier, or multi supplier contingency, from the outset.

Targeted recruitment plans should be considered to reflect the variations in recruiting for urban and rural areas. Recruitment was problematic for some island communities and those who were recruited had to be deployed across a wider area which resulted

in travel and accommodation issues. We should continue to use of local press and media in our recruitment campaigns.

The initial contact letters and other contact materials such as reminder letters did not drive clarification questions or calls to the contact centre, indicating recipients understood them. Contact materials (including the initial contact letter and reminder letters) were reviewed internally and by a third party to ensure the language level was accessible to all.

Dedicated resource should be made available to focus on enumeration of communities within communal establishments, separate to household enumeration and the role of administrative data should be fully explored for these communities from the outset.

Chapter 5 – Data processing

The aim of the census was to produce high quality census outputs. Even with a successful data collection, we knew from previous censuses that we would not capture every household, communal establishment and resident. The person response rate for the 2022 Census was 89.8% at the end of our collect phase. This meant a small proportion of the Scottish population did not provide a census response. Another small proportion did respond, but did not fully complete their census questionnaire. We also needed to resolve multiple responses, obvious errors in answers and contradictory or conflicting answers.

The aim of data processing and estimation was to produce high quality census results by turning the responses into accurate estimates of Scotland's population. We met this aim and successfully published high quality census outputs that represented 100% of the population. We processed the data through five steps:

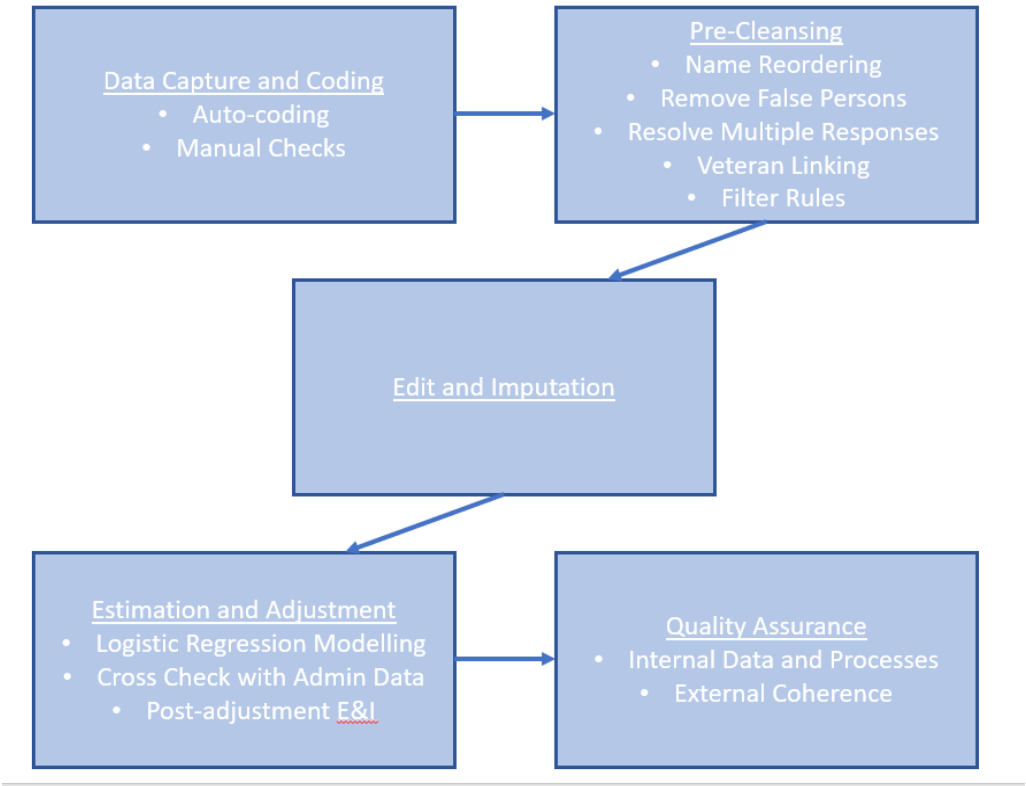
Step 1: Data Capture and Coding – We collected and recorded the responses in a consistent manner.

Step 2: Pre-processing – We cleaned the data, removed false and multiple responses and coded responses to achieve a single response for each individual, household and communal establishment.

Step 3: Edit and Imputation – We achieved complete and valid responses.

Step 4: Estimation and Adjustment – We took the data from the previous steps and turned it into estimates of the total population and then adjusted the data to make it representative of the population. We examine estimation and adjustment in Chapter 6: 'Administrative data and estimation'.

Step 5: Quality Assurance – We checked that our processes had been completed successfully and validated the quality of the population estimates and individual data topics. We examine quality assurance in Chapter 7: 'Statistical Quality Assurance'.



Step 1: Data Capture and Coding

Data capture and coding was the process of collecting and recording responses consistently. Capture was how we collected census information through the online and paper questionnaires. Both formats asked the same questions. Coding was the process of giving each answer a code. We used the codes to process the data and to report the outputs. We adopted several principles when developing our coding methods to ensure we achieved the required data quality standards. These principles included:

- Coding at the point of collection through autocoding techniques. Autocoding meant that the census coding logic was embedded into the Online Collection Instrument and into the software used to scan and code paper questionnaires.
- Ensuring responses were given codes from consistent, recognised classifications irrespective of whether they were submitted on paper or online.
- Reducing the dependence on manually correcting or inspecting responses. Autocoding reduced the volume of items that needed to be looked at by a human and reduced human error when manually correcting records.
- Harmonising with the Office for National Statistics (ONS) and Northern Ireland Statistics Agency (NISRA), where possible.

The quality of data we collected online was particularly high. In addition to complying with the coding specification, several features of the online questionnaire ensured consistency of coded responses, including:

- Only showing respondents the questions they needed to answer (routing). For example, those under the age of 16 were not asked the sexual orientation question or those who had never worked were not asked about their current or most recent occupation.
- Validating responses in real time by only allowing expected character types for certain questions. For example, when we asked about dates, respondents could only answer with numerical characters.
- Special features such as radio buttons which allowed respondents to only choose a single response from a predefined list.
- Providing a list of finite options to select an answer from. For example, users were asked to choose from a drop-down list of countries for the 'country of birth' question. When an option was picked from the list the corresponding code was stored. This feature prevented respondents from entering misspelt or erroneous answers.
- Real-time validation of responses also ensured that mandatory questions were answered. Pop-up reminders were triggered when respondents did not answer a mandatory question. Validations also ensured consistent logic between questions. For example, they ensured that a respondent's marital status was consistent with their relationship to others in the household.

Paper questionnaires were scanned and character recognition software digitally captured the responses. Simple tick-box questions were coded following the rules of the coding specification. Additional techniques were applied to code text-based questions to correct for things like spelling mistakes and word ordering.

The coding accuracy and completeness was lower for paper questionnaires than for online questionnaires. There were limits to interpreting handwriting and the paper questionnaires did not benefit from online validation and routing.

While new techniques increased the coding rate and accuracy of the 2022 Census, some answers needed to be manually inspected by a human to assign a code. We stood up a 'manual coding operation' to look at those responses that could not be automatically coded. The aim of the operation was to fill in the gaps and provide as complete a dataset as possible.

Step 2: Pre-processing

<u>Pre-cleansing cleansing</u>

Pre-cleansing cleansing (PCC) was the data processing step that ran before the main data cleansing steps.

The need for a pre-cleansing step was identified only once it was possible to see the data collected. Future censuses should address this issue earlier, potentially at the point of data capture, ensuring a relevant solution is in place to carry out initial data cleaning (e.g. removing spurious characters like "\" in fields). Cleaning routines should be developed for issues which were noted in each previous census.

Internal coding

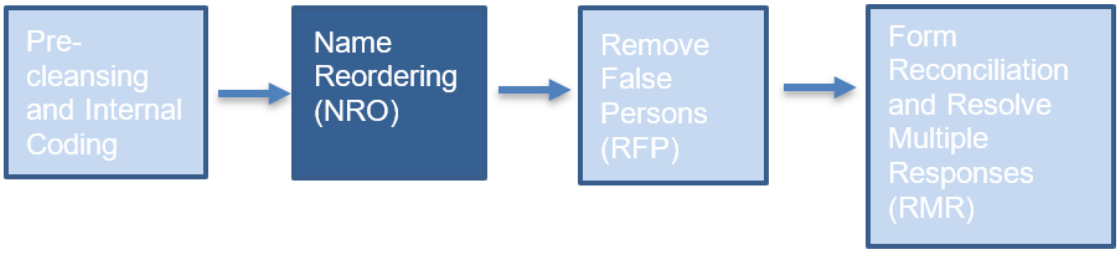
Internal coding (IC) was the data processing step that ran after PCC and before the main data cleansing steps. It corrected the value of codes in output variables due to:

- recoding because of changes identified after the completion of the build of the online questionnaire and Automated Paper Coding system.
- recoding due to other unforeseen issues identified during the live census collect operation, especially through the Coding Quality Assurance process.

The approach was deterministic in that it used a list of business rules applied to the data using if-then logic, thus changing the values of existing output variables. Recoding took place on existing variables and new variables were not created as part of this process.

Name reordering

Name reordering (NRO) was the first data cleansing step that ran after PCC and IC on the census dataset.



On paper forms there was a household section, followed by individual forms for each person within the household. The household section included a question on how the

people in the household were related to each other. Therefore, we needed to correctly match the individual forms to the people in the relationship question.

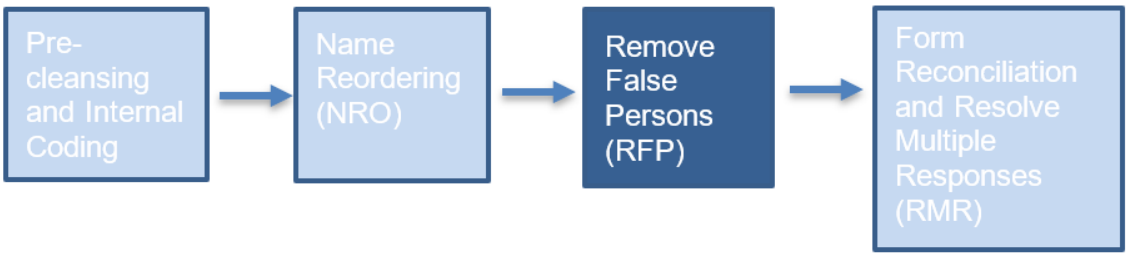
Usually, the people in the household form appeared in the same order as the people in the individual forms but sometimes they did not. Therefore, we compared the names on the household form to those on the individual forms, to make sure they matched correctly. Where they did not match, we reordered them.

The comparison was done by measuring the similarity of the names on the individual form to each of the names on the relationship matrix and to each of the names entered at the start of the household form. The similarity scores considered nicknames, phonetically similar names, names that agreed at the start, or the end, and a character-by-character comparison. This information was then used to find the ordering that minimised discrepancies. In some cases, it was obvious that the data could be reordered to the suggested ordering automatically, while in other cases a clerical review (where a staff member looked at the cases) was required to decide whether and how the data should be reordered.

Correcting the order of names at this stage of processing reduced problems for later data processing steps and improved the quality of the data.

Remove false persons

Remove false persons (RFP) was the data cleansing step that ran after NRO on the census dataset.



The raw census dataset sometimes contained blank, or mostly blank, records which may not have belonged to a genuine person. Such records were usually created at the data capture stage. Some were created when scanners recorded dust as a tick or text, or when respondents had crossed through individual forms on the paper questionnaires. In these cases, no person was related to these records but keeping them in the dataset created overcount and burdened statistical processes which were required to adjust for it. RFP identified these non-genuine person records so that they were not taken to later processing stages. RFP carried out the following checks:

1. **False name check** – RFP looked for names such as 'anonymous' or 'no-one'.
2. **Administrative data check** – RFP looked at cases where minimal information was given compared with administrative data, but there was potentially an indication of a genuine person (for example, a name but nothing else).
3. **2 of 7 rule** – RFP checked a record for at least two of seven variable groupings, where one must also have been a name or date of birth.

False Name Check Rule

The name check rule filtered for obviously false names, like 'anonymous' or 'no-one'. We changed these names to 'missing' and put the census record through the 2 of 7 process. There was a clerical review of records that had '#' in the name and date of birth field. This character appeared due to scanning errors. RFP would not flag these records as being false people, so a human had to check whether they were real or not.

The 2 of 7 rule

The 2 of 7 rule removed false records from the census. It considered a person to be false if they did not answer at least 2 of 7 questions:

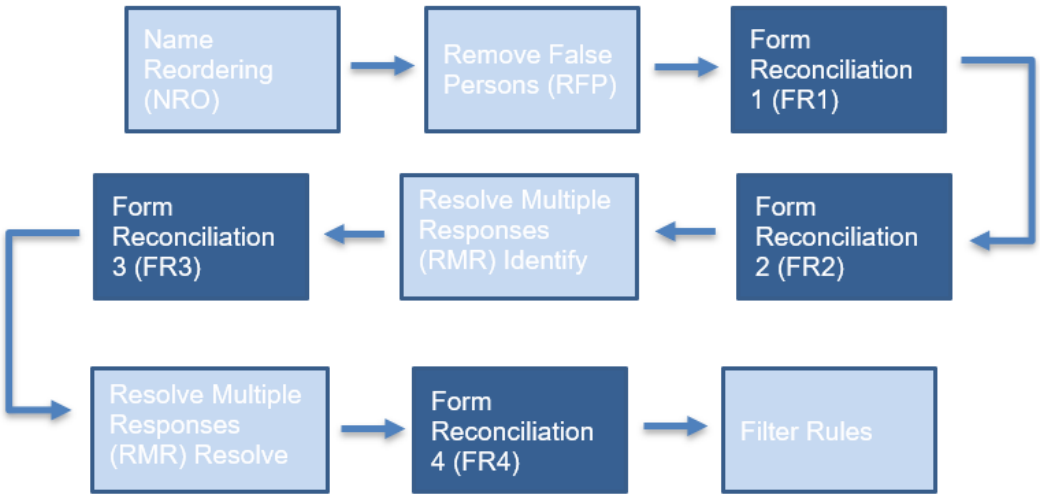
- Name in the individual form
- Name in the relationship matrix
- Name in the household form
- Date of birth
- Relationship to others in household
- Sex
- Marital status

One of the two questions must have been either the name or date of birth.

Form Reconciliation

Form reconciliation (FR) was a group of processes that work around, and in parallel to, the main processes. It could be thought of as data manipulation to prepare for other processes.

This allowed processing to move from forms, questionnaires and returns to households and communal establishments (CE). This needed to be done before Remove Multiple Responses (RMR) as RMR looked to resolve multiple responses within a household or CE. The four FR processes occurred at the following stages:



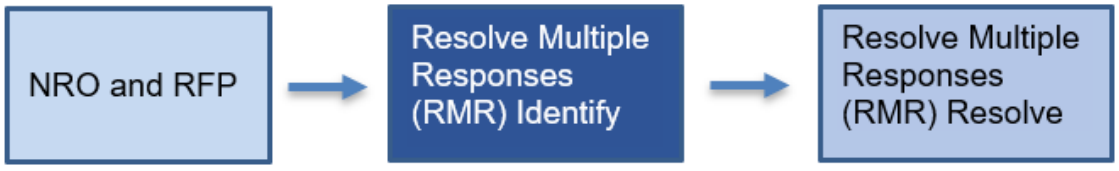
FR1: CE manager and CE resident forms - This step dealt with CE manager and CE resident forms and reconciled them together. This is where the term 'form reconciliation' comes from.

FR2: Continuation forms - This step was similar to FR1 but it dealt with continuation forms and reconciled them with their parent household. It involved updating the continuation person records so that they were associated with their parent household.

FR3: Individual forms - Like FR 1 and 2, we needed to make sure that all individual forms were allocated to a household. We needed to either assign them to a household or discard them.

FR4: Person numbering - The earlier cleansing processes may have affected person numbering within a household or CE, so this step dealt with fixing person numbering and the relationship matrix within a household or CE. This was done after RMR but before filter rules.

Resolve multiple responses (RMR)



Respondents sometimes submitted multiple responses. We needed to resolve these into a single record to avoid overestimating the population. The 'Resolve Multiple Responses' (RMR) step resolved cases where this occurred within the same household or postcode. Cases across different postcodes were dealt with later in the

process using the overcount correction methodology. First we had to identify the multiple responses. We did this through RMR Identify.

RMR Identify

During RMR Identify census records within each postcode were checked for duplicate names and dates of birth. For extra verification, we checked records against administrative data sources. Those found to be duplicates were resolved into one record. We grouped cases into three categories:

1. Automatically accepted for resolution
2. Automatically rejected for resolution
3. Sent for clerical review

The third category of cases involved complex sets of potential duplicate records. A human reviewed these cases to decide which ones to keep.

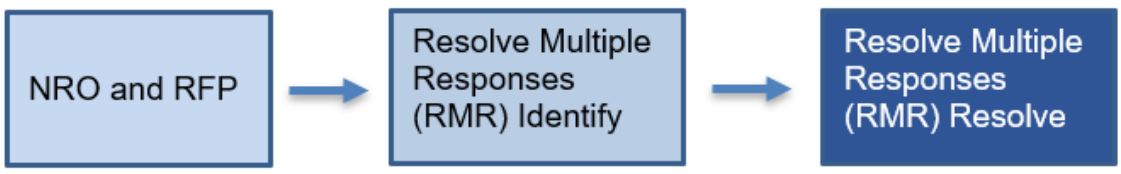
Date of birth check

Date of birth was a crucial piece of information on the census. It was used to derive age, one of the most important variables, and was used to produce high-level breakdowns and basic outputs, as well as being combined with most variables in output tables.

It was vital that all census records contained dates of birth, and that this was as accurate as possible. Respondents may have deliberately chosen not to give their date of birth or missed the question by mistake. Unsubmitted returns from the Online Collection Instrument may have been incomplete and not contained a date of birth. Date of birth may also have been incorrect in the census dataset due to scanning errors, or respondents making mistakes when inputting data, leading to inconsistent or implausible data.

The date of birth check linked the census dataset to an administrative data source using name, postcode and sex. It compared the census and administrative dates of birth. If the census date of birth was missing or inconsistent with the administrative date of birth, the administrative age was used in edit and imputation to find a similar record and age was then taken from that census record.

RMR resolve



The RMR resolve process took decisions from RMR Identify and implemented them in the dataset by combining duplicate responses in a way that retained as much accurate data as possible.

The process selected a priority record, using criteria listed below, and this became the base record to be carried on to later processing. The duplicate records were merged on to this priority record, and any missing or invalid values on the priority record were backfilled using the non-priority records (if that information was available). The criteria for selecting a priority record, where a group of household or communal establishment records were to be resolved, was:

- prioritise by mode of collection and return status (online submitted over paper. Paper over online unsubmitted); then by,
- number of valid fields filled; and finally,
- at random.

The criteria for selecting priority records when a group of person records were to be resolved were:

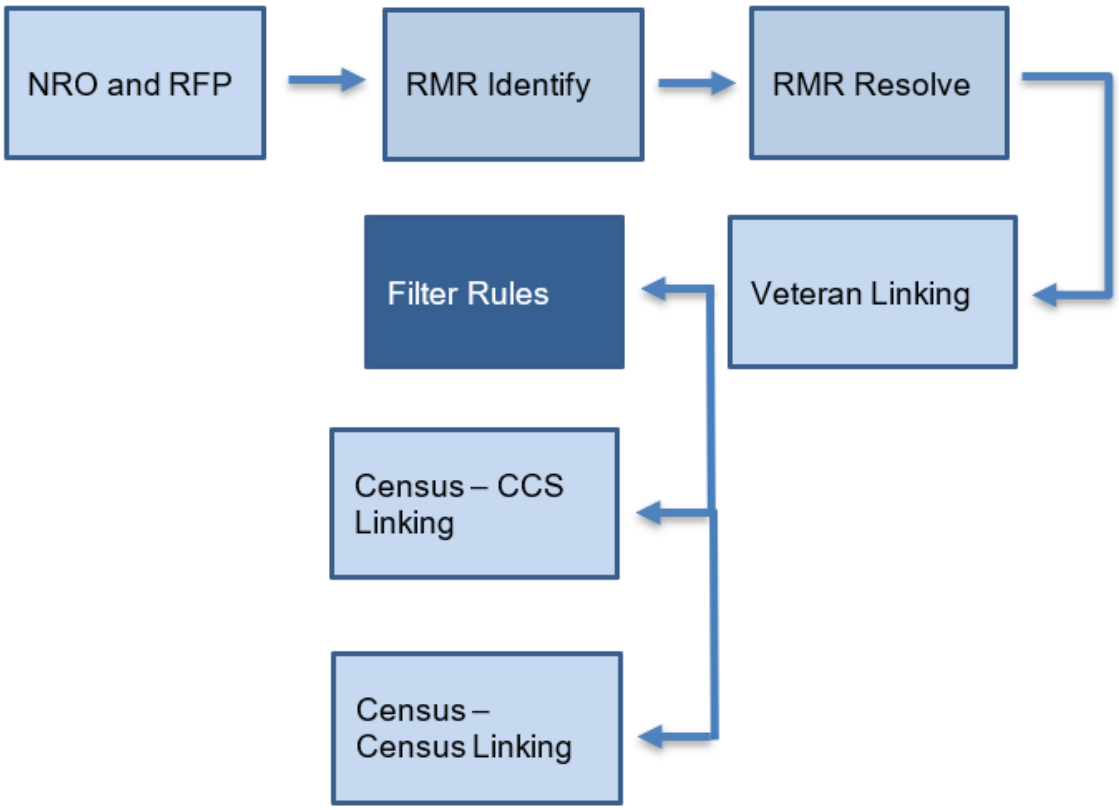
- Prioritise first by questionnaire type (where individual questionnaires take priority over any other type); then by,
- mode of collection and return status (online submitted over paper over online unsubmitted); then by,
- number of valid fields filled; and finally,
- at random.

Testing RMR Resolve in advance alongside Form Reconciliation on an early cut of data would have improved processes during the census collection phase. It would also have helped if an identified statistician had worked on the code development so that they had the methods and code knowledge. It was difficult for software contractors to find issues in the code as they did not have the methodological knowledge.

Veteran linking

The 2022 Census asked, 'Have you previously served in the UK Armed Forces?' Current members of the armed forces should have answered 'no', but our testing showed that some currently serving members answered 'yes'. To obtain accurate information on individuals who had previously served, the responses of those who were still serving on Census Day needed to be changed to 'no'. To do this the Ministry of Defence provided NRS with a dataset extract of currently serving personnel which we linked to the census. Anybody who indicated that they had previously served but who also appeared on the currently serving dataset had their response corrected from 'yes' to 'no'.

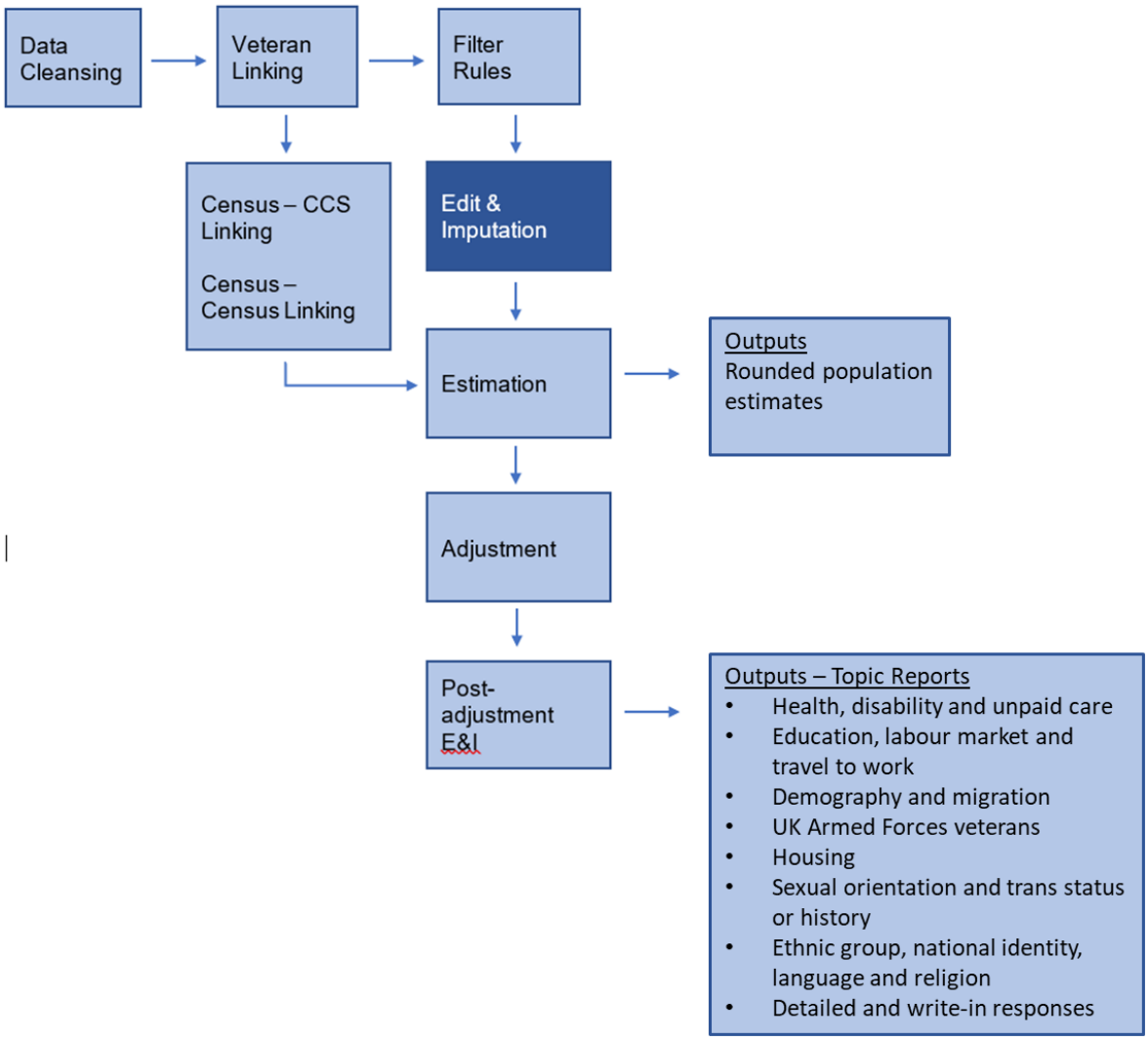
Filter rules



Some questions in the Census were relevant to only some respondents such that certain questions could be skipped. This was usually based on a previous answer or criteria such as age. In the online questionnaire this generally happened automatically with people routed past questions and only seeing those questions relevant to them. On paper this was not possible and prompts on the questionnaire were relied on. If not followed correctly, this created contradictory responses. For example, when the respondent missed the guidance to skip a question and answered questions they were not meant to. Since these questions did not apply to them, the answers tended to be misinterpreted and of poorer quality, creating conflicts within a respondent's census record.

Filter rules were run to resolve inconsistencies in responses and to reinforce questionnaire routing by recoding skipped responses from "missing" to "no code required". This process relieved some of the burden on the next process, 'Edit and Imputation', and maximised its donor pool. The Filter Rules reinforced or applied routing for paper questionnaires. The online questionnaire automatically applied routing during the response. To ensure we treated data consistently, online responses were also processed through the Filter Rules.

Step 3: Edit and Imputation



Despite every effort to help and encourage respondents to fill out the questionnaire as accurately and completely as possible, some returns had missing answers to some questions. Some respondents also made mistakes when answering questions, which lead to inconsistencies across a response. For example, if someone wrote the current year instead of their year of birth in the date of birth field, they appeared to be less than one-year old but may be married or have qualifications or a job.

The 'Edit and Imputation' (E and I) process was about identifying these missing and inconsistent responses, filling in the blanks and correcting the inconsistencies using robust statistical methods to produce plausible results. This process generally generates some error, but our methodology ensured that the imputed dataset accurately reflected the population distributions.

The main method that we used for E and I was donor imputation. For each record that needed to be fixed, we looked for similar records in the census dataset and then copied responses from the donor record to fill in the blanks or correct inconsistent responses. We used specialised software developed by Statistics Canada to support this process.

E and I was carried out in modules. A module could be thought of as a collection of variables which were imputed at the same time. By imputing variables at the same time, rather than one after the other, we could resolve inconsistencies based upon the characteristics of the entire record, rather than by which variable was imputed first.

The variables were grouped thematically so that they contained variables which were related to and predictive of each other. For example, a person's perception of their general health was related to whether they had any long-term health conditions, but it was not related to their skills in Gaelic or Scots. We also included variables in a module which were not imputed but were used purely as predictors. For example, after age was imputed in demographics, it was included as a predictor variable in the culture, health and labour market modules.

There were four modules for census household and communal establishment individuals, and one module for census households.

- Demographics
- Culture
- Health
- Labour Market
- Household

For live processing, E and I ran in two parts:

Part 1 – demographics, culture and household modules
Part 2 – health and labour market modules

This was because the part 1 modules were required for the next processing step, estimation. It was also because updates were required to the Standard Industry Classification (SIC) and Standard Occupation Classification (SOC) data for the labour market modules, which were not available before estimation started.

Summary of key lessons

Originally, we had intended to process census data as soon as we started collecting it. We wanted to process the data in small batches and to automate the process. However, we did not start processing until after the extended data collection period.

This was for two reasons. First, the automated system was deprioritised due to resource being needed to protect vital collections systems. Second, data transfers between systems and suppliers, while individually tested, were not tested end to end. This meant that when the end-to-end process did not work to transfer data from collection systems to our coding supplier, we had to develop a new process as well as a process for transferring data between processing steps.

A simpler processing pipeline was developed with no hard integrations. While this delayed the start of processing, the result was that the data was processed faster than would have been the case with a more complex system. It was also faster than the time taken to process the 2011 Census data. It is recommended in the future that this simpler approach is followed, and a full end-to-end test of all data transfers takes place in advance. It is also recommended that an early cut of data is pushed through systems first to mitigate for any issues.

We ran each of the processes on the whole dataset in sequence and tested some of the processes on an early extract of the data. The combination of running the process on the whole dataset and having early "tuning" data was very helpful. A key lesson is to have three points during the census collection phase, evenly spaced out, at which the data is output and can be used as tuning data for the cleansing processes. This would replicate the early cut of data but have the advantage that it was at three time points.

Due to the complexity of some of the statistical methods, the lead time to develop and become familiar with them could be long, in some cases years. This resulted in complex methods being known by only a small number of people. In any future census, the timeline of when to ramp up resourcing for live processing should be brought forward to rehearsal time to help mitigate for single points of failure. The structure of the Data Processing team changed considerably before, during and after live. We recommend a team of at least 12 for live running and sometime before the census collection phase from the rehearsal phase. The team would be comprised of at least four people for cleansing, four for filter rules and E and I and four for estimation and adjustment. Having smaller teams focusing on a particular part of Data Processing would have led to a lower risk of a single point of failure.

NRS was very grateful to ONS and NISRA for their support with processing steps and the sharing of skilled resource and code. A key lesson is to work closely with ONS and NISRA to harmonise and share best practice for census data processing.

Chapter 6 – Administrative data and estimation

Administrative data is information created when people interact with public services, such as schools or the NHS and is collated by government. Administrative data was a critical part of the census operation. It was used to prepare for collect and to quality assure census returns. Due to the lower-than-expected return rate, we changed our plans to use more administrative data in estimation and adjustment to ensure the final dataset reflected 100% of Scotland's population.

The acquisition and linking of administrative data is a lengthy process which can take many years before permissions and processes are in place. A key achievement for Census 2022 was that data was acquired and permissions put in place rapidly which allowed us to use more administrative data in our adapted methodology. The process was speeded up by senior support from the Scottish Government and Office for National Statistics. Privacy panels and data providers prioritised this work recognising the strategic importance of census data to Scotland.

Previous chapters have explained how administrative data was used in the collect phase for the address register and for data processing. The use for quality assurance is discussed in that chapter. This chapter discusses how administrative data was used in estimation and adjustment, i.e. the methods used to get to 100% coverage of the population. We will explain what estimation and adjustment is and how we acquired and combined administrative data. We explain our original intended method and summarise of our revised method and links to more detailed information.

Estimation and adjustment

Estimation and adjustment helped us to estimate how many households and people were missing. While the census aimed to cover the whole of Scotland, some people and households were inevitably missed. We used estimation and adjustment to find out how many households and people we collected information from in the census. Where the census missed people, we added records, so we had a census dataset that covered Scotland's entire population.

Before the census we developed methods, like those used in 2011, for estimation and adjustment. An external methods panel reviewed these methods. Due to the lower-than-expected response rate we made greater use of administrative data on the advice of our International Steering Group.

Administrative Data Sources

In partnership with the International Steering Group, we reviewed the available administrative data. The following datasets were highlighted as essential, and we secured access to all data by December 2022.

- NHS Central Register - everyone registered with a GP in Scotland, or whose birth was registered in Scotland
- Health Activity - people who have interacted with selected NHS services in the three years prior to census day
- Electoral Register - people registered to vote
- Higher Education Statistics Authority - students studying or domiciled in Scotland
- School Pupil Census - pupils enrolled in state funded schools
- Vital Events - information on births, deaths, marriages and civil partnerships

Linking Data

The administrative datasets were linked to create a "population spine", a list of individuals along with a measure of the likelihood they were in Scotland on census day. This spine was then linked to the Census Coverage Survey (CCS) and the census to identify which administrative records corresponded to respondents. We used established linkage methodologies for this work which had been peer reviewed.

Clerical Review

We performed clerical checking (this is where a human looks at records to make decisions) of several critical links, as these errors could impact estimation. Automatic linking handled most cases, but clerical review was used for:

- Multiple links
- Discrepancies in name or date of birth
- Different addresses in administrative records versus the census

The review involved examining 8,500 cases in batches of 100. Approximately 32% of these cases were successfully matched. Quality assurance confirmed that the final admin-census link rate was as expected.

Quality Assurance

The quality assurance process involved several steps:

Rereview: Ten percent of clerical review cases were re-evaluated by another reviewer to confirm consistency. Few discrepancies were found and when found were often due to multiple links.

Difference Scoring: Links were scored based on similarity between administrative records and the census. High-difference cases were rechecked, revealing some errors in recording results and missing information in census returns.

Weakest Links: Automatically accepted weak links were reviewed, confirming the automatic acceptance was accurate.

Duplicate Checks: The admin spine was checked for duplicates to ensure no individual was counted more than once. Duplicate records were resolved, leaving a single record per individual.

Demographic Consistency: the proportion of spine records linked to the census was assessed across demographics, showing consistency except for some minority ethnic groups with higher unlinked rates, potentially reflecting true differences in census response rates.

We then used the administrative data in estimation and adjustment.

Our original intended method

Estimation: Estimation produced overall population and household estimates. Estimation required clean and complete datasets for the census and the CCS. We linked the census and the CCS together. We then used dual system estimation to give us an estimate of how many households or people the census missed. We corrected our estimates to account for people who were counted more than once or counted in the wrong place.

Adjustment: Adjustment created new records for the people and households missed by the census. It used completed census records as donors to create these new records. Combined with the estimation process, adjustment gave us a census dataset for the whole population.

Creating new records: We created new records by adding people to existing households or communal establishments. We created new households in a 'space' we already knew about. This could have been a known address with an occupied property from which we received no response. We also created new households in a 'space' that was not in our address register. In this case we gave them a real postcode, so we knew where they were.

Adjustment was a complex process. For each census record it calculated how likely it was that a similar person or household would be missed from the census. We used this information to choose existing person records to use as donors. Characteristics from these records were used to create new person records. This was the unit imputation process. You can find more in our estimation and adjustment methodology strategy.

Our new method made more use of administrative data

Due to the lower-than-expected response rate, administrative data was used to supplement the CCS records to identify how many people and households were missed in the census. Characteristics from administrative data guided the imputation of missing people and households. We also adapted our methods to use logistic regression which was more efficient and flexible. You can find out more about how we used administrative data in our paper Securing high quality Census outputs and Population Estimates.

Information on which administrative datasets we used is available in our document explaining our use of administrative data. More information on our methods was published in our quality assurance report.

Summary of key lessons

Our use of administrative data was very successful and was key to producing the high-quality outputs that covered 100% of the population. In the next section, we set out the comprehensive process we went through to assure ourselves and users that the statistics were fit for purpose.

The use of administrative data should be built in from the start of census design and used at different stages of future census programmes. Administrative data should be used in:

- Improving the quality of our address register
- Planning operations and contact strategies
- Nonresponse follow up
- Coverage estimation and adjustment, including bias adjustment
- Enumeration and estimation of people in communal establishments
- Quality assurance for data processing and validation of results
- Enhanced outputs through linkage to other sources

The possibilities of linked administration data should also be further explored.

Chapter 7 – Statistical quality assurance

Strategic objective 1: To produce high quality census results

Our innovative approach making greater use of administrative data meant the census outputs covered 100% of the population and we achieved similar confidence levels in our population estimates as we did for the 2011 census. The Office for Statistics Regulation designated our census statistics as accredited official statistics meaning. This meant that they met the requirements of the Code of Practice for Official Statistics.

Statistical Quality Assurance Strategy

In May 2021 we published our statistical quality assurance strategy which provided an overview of how we would measure the quality of the census. The strategy outlined why statistical quality assurance was important for the Census given the wide use of the data and the decisions it informed. It set out the following targets which we reported against in our quality assurance report published in September 2023.

How will we achieve high quality results?	How will we measure success? (Key performance indicators and acceptance levels)	Result
We will maximise our overall person response rate	Person response rate of at least 94%.	Person response rate of 89.8%
We will ensure a minimum level of response within every local authority in Scotland	Person response rate in every council area of at least 85%.	31 of 32 council areas had a response rate of at least 85%. Only Glasgow City was lower at 82.1%. More information on response rates was included in the quality assurance report.
We will maximise the accuracy of our national population estimates	Variability: national estimates will achieve 95% confidence intervals (CI) +/- 0.4%; Bias: < 0.5%	National confidence interval for persons of +/- 0.51% and bias of 0.15%.

We will maximise the accuracy of our local authority population estimates	Variability: Council Area estimates will achieve 95% CI +/- 3%	31 of 32 local authorities achieved a 95% confidence interval within +/- 3%. Only East Lothian was slightly outside this at +/- 3.07%. More information on variability is included in the quality assurance report published alongside first outputs.
We will minimise the non-response to all mandatory questions	Achieve or exceed target non-response rates for all mandatory questions	Non-response rates for age and sex published in the quality assurance report published alongside first outputs. More information on non-response for mandatory questions was released alongside the release of data for each question.
We will assess all national and local authority level results for each main release by means of quality assurance panel	Undertake quality assurance panel and resolve any issues present	We went a step further than we intended by providing all councils with the opportunity to highlight where further validation was required before publication by providing controlled prerelease access.
We will publish details of methods and full details of all our data quality indicators	Publish on our website	Information on methods was published on our website.
We will publish the results of an independent methodology review	Publish on our website	Published in the Peer review and governance section of our website.
We will maintain our National Statistics Accreditation	Accreditation maintained throughout	Accreditation maintained. More information is included in the quality assurance report published alongside first outputs.

External assurance

National Statistics Accreditation

The Office for Statistics Regulation designated our census statistics as accredited official statistics meaning they met the requirements of the Code of Practice for Official Statistics. You can read more about the Office for Statistics Regulation assessment on our website.

External Methodology Assurance Panel

The census data has been through several statistical processes that formed the overall census data journey. Ahead of the census, our methodology for data processing was approved by our external methodology assurance panel. More information on this process and panel is available on our website.

International Steering Group

The International Steering Group (ISG) made supportive statements at the end of collection and method development and when we published our first census outputs. The ISG chair, Professor James Brown, noted: 'The International Steering Group commends NRS for its systematic and robust application of the census estimation methodology that has led to today's published estimates.'

Scottish Government coherence assessment

In May 2023, the then Registrar General wrote to the Chief Statistician for Scotland to commission a review of the coherence assessment prior to the publication of first outputs. This included reviewing the quality assurance and validation processes.

The Chief Statistician convened a group of experienced senior analysts from the Scottish Government who use census population estimates for funding decisions and statistical outputs. The group met several times with the census team and demography statisticians from National Records of Scotland. In August 2023, the Chief Statistician confirmed:

> "I am therefore satisfied… that the outputs will provide the robust population statistics to support the wider statistical system and that analysts and the general public can have confidence in the outputs, and that they can be published on 14 September 2023."

Validation of population estimates

We have undertaken an extensive process to compare the Census data with other sources to ensure the population and household estimates are plausible. This is known as validation of population estimates. We also published information about the quality of the comparator data sets used when assuring the census estimates.

Validation with local authorities

As part of the validation process, we involved local authorities in the quality assurance of our census estimates. We shared prepublication population and household estimates with local authorities and invited feedback where our estimates differed from local data sources. Thirty out of 32 local authorities were involved and 28 fed back on the census estimates. We offered to meet all local authorities and held meetings with 10 to discuss the census estimates for their areas.

Topic expert quality assurance panels

NRS invited analytical colleagues from the Scottish Government, the Office for National Statistics and NRS demographic and housing statistics to participate in a series of quality assurance panels on the topic data released from May to October 2024. Panel sessions assessed the coherence of the 2022 Census statistics with previously published census estimates for Scotland and England and Wales and other data on that topic.

Assurance of processes

We performed quality assurance at each stage within the census data journey. Standard checks were repeated at each stage of processing to check that no data had been removed unintentionally during processing and no unexpected changes had been made. In addition to this, bespoke checks were performed for each process. These checks were performed on census processes and their Census Coverage Survey equivalents where applicable. More information on how we quality assured our statistical data is available on our website.

Quality assurance in UK censuses

We worked closely with the other UK census offices (Office for National Statistics and the Northern Ireland Statistics and Research Agency) to harmonise our efforts around quality assurance. This included a UK Statistical Quality Working Group which met quarterly to discuss:

- methodology
- best practice
- lessons learned

- opportunities for joint working

Quality assurance in international censuses

We worked with census offices around the world to share experiences and lessons learned. Lessons from other censuses helped us improve our quality assurance. We worked with:

- Canada
- Republic of Ireland
- USA
- Australia
- New Zealand

Summary of key lessons

Our published strategy considered the quality of the census statistics in several ways as set out in this chapter. Response rates were an important part of the census process but we looked to statistical measures such as confidence intervals to consider the quality of the final outputs.

External assurance from the International Steering Group (ISG) and validation of the quality of our results from analytical topic experts from the Scottish Government was important for user confidence in the quality of census outputs. In addition, sharing early population results with local authorities as part of our validation process gave us insight across the country which proved valuable. This approach of external assurance and validation worked well and is a key lesson for any future census.

Our experience in 2022 showed that despite lower-than-expected response rates, we were still able to produce robust census statistics. We achieved this by fundamentally changing our census design by using administrative data to supplement the Census Coverage Survey. A future census should build on this approach of integrating administrative data. We have learned that robust statistics can still be produced with national response rates of less than 94%.

Chapter 8 – Outputs and dissemination

Strategic objective 2: To generate outputs that meet the needs of users

Strategic objective 4: To produce timely outputs to maximise benefits

We published a wide range of outputs from Scotland's Census 2022, to meet a wide range of user needs. Census data will help government, charities and other service providers to understand how Scotland is changing.

To develop our plans for Census we engaged with stakeholders to understand users' needs and seek feedback on our plans. This included an outputs consultation. The consultation detailed our plans for publishing census data and asked for users for feedback.

We built a census website with new tools to help us share census data and analysis with users. The consultation and a summary of the responses are available on the new website.

The first release of data from Scotland's Census 2022 was in September 2023. We published new headline population numbers for Scotland and council areas. We also established one of the key themes in the 2022 census data – Scotland's population is ageing.

We published a series of topic reports in the summer of 2024. These reports and the underlying data provided some initial findings from the detailed characteristic data available in the census. Data was made available on a question by question, topic by topic basis. We made data available down to local area level and we provided breakdowns by age and sex where appropriate. We also provided quality assurance reports and metadata to help users work with census data.

Our reports highlighted key findings from each topic and developed the key theme of Scotland's ageing population. We prioritised impact, clarity and accessibility in our reports. Plain English and simple charts were used to tell the key stories from each topic. This approach helped us to achieve a high volume of quality media coverage. Our main messages were reported clearly to a wide audience. This helped to inform public debate on a range of important issues and raised awareness of census data.

In November 2024 we opened the census dataset to users via our new Flexible Table Builder. This tool allowed users to build their own tables by combining census data across topics and to take advantage of the breadth and depth of census data. It put data into the hands of users quicker and removed the need for NRS to build, check and publish tables individually.

We will make more data available in 2025. When we make data for our smallest local areas available via the Flexible Table Builder, we will have published over one billion statistics from Scotland's Census.

We are committed to making census data accessible to a wide range of users. In December 2024 we published our Census maps tool. This provided a quick and easy way for people to see data for their local area and compare across the country.

Output geography

As in previous years, several output geographies were made available alongside the Census 2022 data. Output Areas (OAs) were the lowest level of geography at which statistics were released and were created by grouping postcodes together. They were given a minimum threshold of 60 persons and 25 households to ensure any related data is non-disclosive.

Where possible, continuity with 2011 output areas was maintained in 2022 allowing for comparisons between censuses but due to changes over time some OAs had to be amended. If an existing 2011 OA now fell below threshold it was, in the first instance, merged with a neighbouring OA. Similarly, where an OA now exceeded the upper threshold of 90 households it was split into two or more OAs. In some cases, however it was necessary to move individual postcodes between OAs. This was to ensure specification rules and threshold levels were maintained, including nesting within council boundaries and not crossing localities. This revised dataset resulted in the 2022 Census Output Areas.

Other digital boundary files and a 2022 Census index was made available on the NRS website in conjunction with the population estimates release in May 2024. These included:

- Postcode to OA file.
- OA to higher area database.
- OA part removed dataset.
- Census version of settlements and localities.
- Census island groups.
- Census frozen postcodes.
- Information on OA creation and other reference material.

Summary of key lessons

Engaging with users was a theme throughout the census programme, from identifying question topics to the content of the outputs. The output consultation was particularly valuable in making sure that the published data met users' needs. It also

built our community of users whom we communicated with through the census newsletter.

Publishing statistics by topic theme during 2024 worked well as a way of setting out the main trends in data. Working with Scottish Government topic experts was a useful way of identifying trends and narrative. Complimenting topic-based summaries with topic specific quality reports also worked well as a means of informing users on how best to work with census data.

Across all census publications we drew heavily on the award-winning NRS approach to publishing statistics. Commentary was delivered in a plain English and well-structured style. The 2022 Census website was essential to publishing in this way and was a step change from the main NRS website in use at the time. We applied learning from Scotland's Census website when we recently refreshed the NRS corporate website.

Publication of the flexible table builder was a key part of our 2022 Census output strategy. The emphasis was on users producing their own outputs rather than NRS explaining the main trends in each publication. Using the table builder together with a new approach to disclosure control, we were able to publish statistics far more quickly than for other recent censuses. This approach had enormous potential for releasing large datasets securely across other parts of the statistical system.

Census maps were a popular way of analysing census data. We repurposed technology used by the ONS and demonstrated the value of collaboration. Opportunities to provide new ways to interact with statistics should be continually explored as should reusing examples from statistics producers across the UK and internationally.

The ability to produce statistics at multiple levels of geography (national level down to neighbourhood level) was a key strength of our census data. Complimenting data with look-up tools was popular with users. Recasting census output areas was an important stage in ensuring that this smallest level of geography is consistent in size despite increases and decreases since the last census.

Chapter 9 – Confidentiality, security and privacy

Strategic objective 5: To protect, and be seen to protect, confidential information

Our considerable programme focus on cybersecurity and data protection were well placed and effective during Census collect. There were no reported cases of fraudulent web sites or census fraud. Numerous cyber incursions from across the globe were successfully defended against without any penetration of our firewalls. This was a notable success considering the significant increase in cyberattacks, particularly following the invasion of Ukraine. Secure arrangements were put in place for the storage and processing of census data.

Protected by law

All our systems, staff and suppliers had to protect the confidentiality of census information and personal data by law. The laws that governed the way we protected and secured this information included the UK General Data Protection Regulation (GDPR), the Census Act 1920 and the Freedom of Information (Scotland) Act.

The GDPR and the Data Protection Act 2018 control how organisations collect, use and manage personal data. Personal census information was personal data because it related to identifiable living people. GDPR and the Data Protection Act came into force after the 2011 Census and placed additional obligations on organisations that processed personal data.

We followed a 'data protection by design' approach when preparing the census and during enumeration and processing. We ensured the protection and security of personal data, to meet our accountability obligations and to comply with the data protection principles.

It is against the law to disclose information relating to an identifiable person or household collected by the census. This is set out in the Census Act 1920. The Census (Confidentiality) Act 1991 extended this to people and businesses working as part of the census. Anyone who unlawfully disclosed personal census information could be prosecuted and fined or given a custodial sentence. The Census (Scotland) Regulations 2020 reinforced these protections, prohibiting the use, publication or communication of census information other than for census purposes.

Everyone who worked with personal census information, including NRS staff, our suppliers and field workers were required to sign an undertaking confirming that they understood the confidentiality provisions of the census legislation. All NRS staff had

Baseline Personnel Security Standard clearance and received regular data protection and information security awareness training. Individual staff could only access data that they needed to perform their role.

No-one can access personal census information through a Freedom of Information request. The Freedom of Information (Scotland) Act 2002 exempts personal census information from disclosure for 100 years.

Key privacy and security measures

Before we processed any personal data, we carried out a data protection impact assessment (DPIA) to identify and mitigate privacy risks. We carried out the assessment because:

- the census was a major programme involving the use of personal data
- we processed personal data using new technology
- the census involved large-scale collection of sensitive information
- we combined datasets from different sources

The DPIA for the Census, published in February 2022, set out measures to reduce the risks to personal data in our systems and processes. With those measures in place, we concluded census operations would not pose a high risk to individuals. We consulted the Scottish Information Commissioner's Office in reaching that conclusion.

Our third-party suppliers were contractually required to meet our information security requirements. They had to demonstrate how they would meet our requirements. Suppliers had to provide security management, business continuity and decommissioning plans to show how census information would be managed securely. We required suppliers to provide independent certification of their security credentials. Security monitoring continued throughout the census collect phase. There were no reportable personal data breaches during the data collection and processing phases. All census information collected and processed by suppliers was tracked to its return to NRS or to secure destruction.

We will retain personal census information and census data permanently in our secure environments. Access to the information and data is strictly controlled by NRS. Census returns will be kept confidential for as long as required by law. Under current arrangements, personal information in the 2022 Census will not be released to the public until 2123.

We produced a privacy notice that explained how we would collect and process personal information. The notice was published on the Scotland's Census website,

and a link to the notice was included in the letters to households giving instructions on how to complete their census return.

Independent information assurance review

Ahead of the collection phase, we commissioned a cyber security and data privacy consultancy to conduct an independent information assessment review (IIAR) of our security measures. The aim of the review was to identify risks to the census systems, services and information and to provide an independent view of our security for stakeholders and members of the public.

The review concluded that NRS had a comprehensive security programme in place. It had been designed to reduce the risk of compromise to the delivery of the census, and to citizen data. The review found that strong controls were in place to detect and respond to threats. NRS implemented four recommendations from the review before we began collecting personal census information. We published the IIAR report on the Scotland's Census website in January 2022 to reassure the public about the security of the census.

Protecting personal data during collection

Census data was collected primarily through an online questionnaire, but also through paper forms. NRS field force staff carried out follow-up visits to addresses that had not returned questionnaires. Visits were also carried out as part of the Census Coverage Survey, which followed up a sample of addresses from the census operation, to assess the coverage across the whole population.

To combat fraud, an awareness page on the Scotland's Census website provided information on phishing scams, online hoaxes, bogus callers, letters, and text messages. Reported scams were managed via the Census Contact Centre, NRS and Police Scotland. NRS undertook daily monitoring reviews to identify fake profiles. NRS and our suppliers used a Cyber Security Incident Plan to take down fake profiles and scam websites.

Field force staff were security vetted. They undertook data protection and information security training and carried photographic identity cards to verify their role.

Protecting personal data during processing

Data processing was primarily carried out using on-premises environments which were later extended into a cloud-hosted storage environment. Both on-premises and cloud-based environments were secured using a range of controls. Access to data and environments was granted based on the principle of least privilege.

Risk assessments of critical data processing activities were undertaken and appropriate mitigations put in place. Systems had key owners and policies, procedures and user manuals to restrict access and protect data.

Monitoring of the processing environments was centralised, with alerting configured where unusual or malicious activity was identified. All data was transferred using secure encryption methods and encrypted at rest and during transfer. Strong, auditable data and security controls were in place between systems and networks.

Protecting personal data in census outputs

Statistical Disclosure Control

Before we published census data, we made sure individuals and households could not be identified. To do this, we used statistical disclosure control (SDC) methods. These methods were applied to the underlying census datasets and census outputs. SDC helped us to comply with the rules and laws that protect the confidentiality of census data. SDC controlled access to data and the level of detail that was available to data users. For the 2022 Census, we used three SDC methods:

- targeted record swapping
- cell key perturbation
- flexible table builder rules

Summary of key lessons

Considering confidentiality, privacy and security requirements from the inception of the programme ensured privacy and information security were baked into systems and processes for handling census information and for assessing suppliers. This 'data protection by design' anticipated risks, avoided design change costs and helped to prevent harm to individuals from processing personal data.

Confidentiality, privacy and security requirements were relevant to all elements of the programme. Establishing a privacy and security workstream to set consistent standards, provide advice and monitor compliance ensured that the programme was informed and assured and that it met privacy and security requirements.

The census programme generated a large volume of information. The adoption of a multivendor strategy for the census resulted in a complex matrix of information assets held by NRS and suppliers. Establishing central oversight of information assets by NRS from the outset of the programme would have assisted with efficient decommissioning of assets and retention of information with enduring value.

Chapter 10 – Managing the census programme

The Census was a large and complex programme and required strong governance to support its successful delivery. This chapter describes the evolution of the governance arrangements through the programme lifecycle, including significant independent external assurance. It describes the costs of the programme and covers the contracted services and resourcing aspects.

Initiation phase

The 2022 Census programme started in 2014-15, with the first year of funding in 2015-16. The programme drew on lessons from other major digital programmes. NRS was a fairly new organisation having been merged from predecessor bodies in 2011 and was still managing legacy structures and digital systems.

An initial focus of the programme was to develop the pathway to deliver its digital components. A third-party organisation was commissioned to develop a procurement strategy and recommend the optimum approach to the procurement, design and build of the digital tools. We knew that other programmes with fixed delivery dates had required significant time to build and test their services.

The programme started before the introduction of the Scottish Government's Digital First Service Standard in 2017 and the Technical Assurance Framework in 2018. In May 2017, Audit Scotland published Principles for a Digital Future which pulled together lessons from digital programmes across the public sector. We used these three sources of good practice throughout the programme to improve our governance and programme management.

Design and build phase

The programme undertook its first external assurance Gateway review in early 2016. The focus of which was to assess the delivery model assumptions in the Outline Business Case, including the procurement route. The review returned an amber delivery confidence assessment and noted positive stakeholder mapping and engagement planning. The review's recommendations focussed on developing a detailed plan for the next phase, a sourcing strategy, filling key vacancies, and benefits profiling.

NRS implemented these recommendations and progressed procurement activity for the online completion and Data Collection Operational Management System (DCOMS) elements of the design. This included a pre-procurement assurance review via the Technology Assurance Framework in late 2017.

In terms of day-to-day control of the programme, our governance approach aimed to provide controls and processes to support the programme delivery team and enable clear and informed decision making.

A Programme Director was appointed in mid-2018 to support the day-to-day control of the programme. In December 2018, NRS commissioned a further Gateway to look at the:

- governance and decision-making arrangements
- alignment of governance with wider NRS and Scottish Government
- delivery model with respect to other NRS corporate services
- scope
- assurance arrangements

Following this review we:

- appointed the NRS chief executive as the programme senior responsible officer (SRO) and transferred responsibility for the delivery of the programme to NRS directors
- reviewed the programme management office (PMO) and appointed a new PMO manager with census programme experience
- transferred financial control for the programme to NRS chief financial officer
- established a contract and commercial management function
- clarified the strategic integrator function in the programme
- revised and strengthened the programme governance structure (see Appendix G) with decision making responsibility resting with the SRO and NRS Executive Management Board

The effectiveness of these changes was then assessed in July 2019 as part of a wider Technology Assurance Framework (TAF) review looking at the programme's readiness to deliver a census rehearsal in late 2019. Recommendations were made for NRS to:

- refresh the business case
- finalise and communicate the new governance arrangements.
- differentiate the respective roles and responsibilities for Strategic Programme Management and Programme Delivery Management
- inject professional project and programme management (PPM) skills and resources
- establish enduring PPM disciplines and Census PMO capability
- develop a roadmap to 2021 with identification of milestones, dependencies and decision points
- ensure that NRS leaders and staff embrace strategic behaviours in parallel with necessary tactical delivery focus

NRS moved to:

- review the programme business case to align it with forward delivery approach and management controls, including benefits management
- appoint service delivery providers (Deloitte and Storm ID) to inject professional PPM and digital programme delivery skills and to create an enduring legacy for NRS via skills transfer
- appoint a new Programme Director to establish and manage the PPM function
- establish a delivery integration function to provide controls in respect of release management, operational readiness assessments and cutover activities, including appointing a director of operations to reflect the move from design to delivery

A follow up review in February 2020 found that progress had been made against these recommendations, with an uplift in governance, planning, control and PMO discipline. The governance structure was changed to incorporate the Change Control Board, reflecting the move from programme design to delivery.

A Delivery Management Forum was introduced in April 2021. The forum focussed on delivering the programme plan, resolving blockers and issues, and managing programme risks. This dovetailed with a reformatted Change and Delivery Board which focussed on the programme's readiness to go live and took decisions on strategic change.

The Delivery Management Forum was a valuable component in the programme governance structure. It was responsible for driving delivery and integration across the programme and acting as a point of escalation for delivery teams. Governance was reviewed every three months to embed continual improvement.

Programme Management Office Handbook

These improved governance disciplines included refocussing the Programme Management Office and the development of the PMO Handbook, through which the programme could be robustly controlled.

Figure x – Programme Management Office remit

The six components of governance control were:

Governance and Reporting

- Design of robust governance models with clearly defined terms of reference
- Increased accountability through definition of roles and responsibilities
- High quality and meaningful programme reporting
- Efficient decision making based on facts

Programme Controls

- Effective control and management of risks and issues
- Execution of mitigation actions
- Controlled management of changes in scope, time and cost

Quality and Assurance

- Management of the programme assurance timetable
- Alignment between project outputs, processes and success criteria
- Management control on approving deliverables and moving through quality stage gates

Delivery Planning and Dependency Management

- Creation and maintenance of an integrated, end-to-end plan and contingency plans
- Identification of critical path
- Identification and management of programme level dependencies
- Milestone and deliverables tracking

Workforce Management

- Robust resource demand and supply estimates
- Identifying the required skillset and associated resource to support the delivery needs of the programme
- Management of resource fulfilment process
- Onboarding and induction of new joiners

Benefits Management

- Deriving value from outcomes
- Standardised measurement and key performance indicators
- Confidence in benefits profile and evidenced realisation
- Track realisation of benefits through delivery

Impact of Covid-19

The full impact of Covid-19 on the programme is discussed in Chapter 3. The July 2020 decision to delay the census to 2022 resulted in replanning across the programme, culminating in a revised plan and budget being accepted by ministers in December 2020. The governance arrangements set out above served the programme well through this replanning exercise.

During the replanning exercise, NRS established a Commercial Task Force to engage with suppliers on commercial impact, including repricing and validation of requirements against contracts. We subsequently issued contract change notes. A model with notes of comfort was deployed to ensure programme delivery continued, while final contract changes were made. Governance evolved again in 2021 as the programme prepared to launch the live collection phase.

Live Collect phase

In February 2022, NRS decided that the collection phase should go live. Governance evolved again to meet the changing priorities of the programme. NRS developed a 'live operating model' for the public facing stage of the programme. This reflected the daily flow of operational information from the field and the need to use this to drive decision making. We introduced a gold, silver and bronze command structure to quickly and proportionately respond to incidents (see Appendix G).

Assurance

The programme had an Integrated Assurance and Approval Plan (IAAP) with three lines of defence. The first line of defence applied controls to manage the delivery of the programme and its component projects. This included implementing a governance framework managed by a Programme Management Office.

The second line of defence was where the programme reported into the NRS corporate governance structure. Given the size of the census programme, the NRS Executive Management Board created a subset of that forum to focus on the

Census. The Executive Management Board (Census) provided a holistic view against our delivery plans, and how the programme could benefit from wider NRS capability and capacity to aid successful delivery.

The third line of defence involved independent external assurance reviews. The timing and scope of reviews were tailored to ensure maximum value for the programme. This line of defence played a key role in the success of the programme, with more than 30 reviews throughout the programme. The channels for external assurance were:

Digital First Assurance (Scottish Government)

Assured the compliance of public facing digital services to Scottish Government's Digital First service standard - set of 22 criteria for digital services.

Technology Assurance Framework (TAF) (Scottish Government)

Assured the compliance to Scottish Government defined standards and best practice for high risk or high value digital programmes in the public sector.

Gateway (Scottish Government)

Assured the compliance to UK Infrastructure and Projects Authority (IPA) project management standards and best practice for high value or high-risk programmes in the UK public sector.

National Statistics Accreditation (Office for Statistics Regulation)

Assured the results of the 2022 Census were correct, accurate and adhered to the UK Statistics Authority's Code of Practice for Statistics.

Independent Information Assurance Review

Assured that we had identified security risks to Census's systems, services and information.

Audit Scotland and NRS engagement with parliamentary committees

In November 2021 the Auditor General drew the Scottish Parliament's attention to the challenges NRS were facing in delivering the census programme. This included the cost of delaying the census until March 2022. The report, prepared under section 22(4) of the Public Finance and Accountability (Scotland) Act 2000, was published and presented to the Public Audit Committee in December 2021. The report highlighted ongoing risks to delivery of the programme, including resourcing and financial pressures. The report was prepared despite a clean annual audit and unmodified opinion to NRS that year and substantial assurance rating from the

Scottish Government's internal auditors given their audits in year and reflection on the Covid-19 response and our replanning exercises.

The Auditor General gave evidence to the Scottish Parliament's Public Audit Committee in December 2021. NRS subsequently gave evidence to the committee in January 2022. NRS also gave evidence to the Constitution, Europe, External Affairs and Culture Committee on four occasions from June to November 2022. The committee sought evidence from NRS to understand the reasons for the lower than anticipated response rate. Reports from these sessions are available online on the committee's webpages.

The Auditor General published a further report in November 2022, again under section 22 of the Public Finance and Accountability (Scotland) Act 2000. The report was published following the census collection phase. It noted that the collection went live as planned at the end of February 2022 but was extended with additional investment due to the lower-than-anticipated return rates. The report found that there was no single reason why the return rate was lower than planned but that it was important that NRS learn lessons to inform future censuses. It noted the Census Coverage Survey, the International Steering Group and our use of administrative data to produce high-quality outputs.

The Auditor General presented the report to the Public Audit Committee in December 2022. NRS subsequently provided written evidence in March 2023 to the Committee in response to follow up questions arising from the PAC session in December 2022. Reports of the Public Audit Committee meetings are available on the committee's webpages.

Digital Assurance Office – case studies

NRS worked with the Scottish Government's Digital Assurance Office (DAO) to ensure that Scotland's Census met digital design and assurance standards. Following the completion of the live census operations, NRS and the DAO captured and shared our experiences from the delivery of the programme. Sharing these case studies may have helped others deliver digital projects. The DAO published case studies on a variety of topics:

- Approach to integrated assurance
- Procurement
- Contract Management
- Resources
- Go Live Checklist
- Information Governance and Standards

- Cyber Security
- Meeting the Digital Standard

Commercial / Suppliers

A range of suppliers supported the delivery of Scotland's Census:

Print Logistics and Paper Capture – APS Group (Scotland) Ltd

Printing of paper questionnaires, mail distribution and tracking; receipt and tracking of inbound paper forms; paper capture; coding of paper and online census responses and responses from the census coverage survey.

Online Collection Instrument – CACI Ltd

Provision of a securely hosted online collection solution with an aim to maximise online response to the Census with a target of up to 70%. Delivering electronic Integration with the Data Collection Operational Management System (DCOMS) and multiple data sources, including the automated tracking with the DCOMS system to facilitate field force scheduling delivering a secure and robust service.

Data collection operational management system (DCOMS) – CACI Ltd

Hosting of the operational information and integration from various sources and suppliers and the creation and management of the Census Address Register, enabling data extraction for census processes. The delivery of a reporting tool with predefined reports and dashboards and the ability to create, save and share ad-hoc reports. An audit trail for all data items included within the Census Operational Management System and integration tool for moving data for future analysis and to support systems and services.

Mobile Workforce Management – XMA Ltd

Provision of mobile devices with defined operating and a field force scheduler and other required software for Census and the Census Coverage Survey. Provision of

- Chromebooks and services for the mobile workforce management
- Tablet client devices for the mobile workforce management
- SIM Cards for the mobile workforce management

Print, Post and Associated Services – Royal Mail Group Ltd

Printing of Census contact letters, post and associated services.

Contact Centre – Arvato Ltd

Multichannel contact centre to support and manage customer contact by telephone, interactive voice response, email, live webchat, post and social media.

Field force recruitment and payroll services – Pertemps

Provision of a recruitment service to source a temporary field force with the right skills for the high number of expected positions throughout Scotland. Managing the end-to-end recruitment process, with all successful candidates recruited as temporary Civil Servants which included the provision of payroll system and services for the temporary field force.

Other contracts supporting Scotland's Census included:

- British Sign Language aids – Deaf Action
- Language translation services – The Big Word
- Information risk, security and data Privacy services – Azets Holdings Ltd
- IT security operations centres – Softcat plc
- Visual branding and identity – The Union Advertising Agency Ltd
- Learning management system (online training) – Learning Pool Ltd
- Managed service for Zscaler – Softcat plc
- Managed Service for Google Workspace – Softcat plc
- Programme and digital service and operational delivery Provider (Lots 1, 2, and 3) – Deloitte
- Programme and digital service and operational delivery Provider (Lot 4) – Storm ID

A breakdown of costs is provided at Appendix F.

Financial management (costs of Scotland's Census 2022)

Strategic objective 6: To do so in a cost effective way

NRS had mechanisms to ensure Census delivered in a cost effective way, including governance arrangements, procurement approaches, change control, prioritised decision making, risk management and mitigation, resourcing controls, planning and regular reviews to ensure prioritisation and budget availability.

The overall costs of the 2022 Census are forecast to reach £140 million. The costs increased from the original estimate due to the one-year delay and the four-week collection extension. The arrangements for cost effective delivery of the Census were sound and realised strong financial decision making, cost control and savings to reinvest in change control priorities.

In 2019-20 the estimated cost of the Census programme was £117 million.

The programme cost did not provide for optimism bias or contingency. The programme's strategic risks noted the possibility of unforeseen changes and their financial impact. The delay in delivery due to the pandemic and the extension due to the low response rate were a consequence of unforeseen change.

Following the decision to delay the Census by one year the estimated cost of the programme increased by £21.6 million to £138.6 million in January 2021. These costs were identified through a replanning exercise and included supplier costs for resourcing, delivery, hosting and licensing, together with other delivery and resourcing costs.

This Auditor General's section 22 report on our annual accounts for 2020-21 recommended that NRS ensure value for money in resourcing, balance our 2021-22 budget and respond to the TAF assurance recommendations before the Census went live in February 2022. We delivered all these recommendations.

The Cabinet Secretary for Constitution, External Affairs and Culture approved and announced to Parliament on 28 April 2022 a four-week extension to the collection period. The additional costs of this extension were estimated at £9.8 million and noted in the Cabinet Secretary's statement. This investment allowed suppliers to support the Census digital and paper response channels, the public assistance and communication channels, and additional interventions to increase response rates.

In the end, the collection extension cost £6 million. Initial estimates included pricing based on suppliers' assessments of likely volumes. This was reduced following discussion with the suppliers. It also included budget for paper and marketing products, which following intelligence from the field operations, NRS decided not to deploy.

The additional costs for the four-week extension increased the programme estimated lifetime cost to £144.6 million (by +4.3%). £2 million of these costs were absorbed in 2022-23 by the programme budget through further efficiencies. The programme worked hard to make further savings from 2022-23 and the final lifetime cost of the 2022 Census programme to the end of 2024-25 is estimated to be £140 million. Savings were realised through robust budget management of the overall lifecycle programme spend, bringing the lifetime cost broadly in line with the estimate in late 2020.

Census Programme (Lifecycle Costs £140 million)

The lifecycle cost of the Census was estimated at £117 million in 2019-20 and rose to an estimated £144.6 million in 2022-23. We increased our cost estimates because of the one-year delay and the four-week extension of the collection period. Through

programme efficiencies, the lifecycle cost is forecast to reach £140 million, an increase of 19.7% against the initial forecast.

The Treasury's Green Book supplementary guidance on optimism bias estimated for equipment or development programmes (the closest category to Census, given the large digital component) that optimism bias could range between 10 and 200%. Our cost increase of 19.7%, set against unforeseen circumstances, is at the lower end of this range.

Despite the increased lifetime cost of the programme, we were confident that the strategic benefits underpinned the investment in the Census programme. The quality and breadth of the Census outputs which were published on time and to budget, demonstrate the overall value realised from the investment.

Around £60 million was spent on procured service contracts (see Appendix F for more detail) with most of the remaining costs being resourcing of the programme within NRS.

Resourcing

The Census had a considerable impact on NRS's budget and resource requirements. Our budget more than doubled in the two to three years around Census Day. Within this we had a dependency on onboarding temporary resources that filled gaps in our skills capacity and capability such as IT, programme and project management, large scale operational delivery and planning and governance. Short-term projects also required contractors to ensure permanent headcount was sustainable post census. Some hard to obtain skillsets were also resourced through the delivery provider contract.

NRS worked closely with the Scottish Government's Digital Directorate and other programmes to best manage the resourcing requirements of such a large-scale programme. A mix of permanent, fixed term appointment, contractors and procurement service frameworks provided the key requirements.

NRS drew its resourcing processes from the Scottish Government's People Services and were reliant on their support to deliver such an undertaking. We were grateful for their work, particularly in such pressured times. The programme experienced significant challenges ramping up core resources in the programme, particularly in 2020 and 2021, with competing resource pressures caused by the pandemic. This resulted in a reliance on very high-cost interim managers. It was the most rapid way we could get people in and maintain momentum in delivering the programme. This increased financial pressures but also the levels of stress for staff working to cover roles that took several months or more to fill.

The programme had well over 200 staff at its peak, comprising permanent, fixed term, contractor and casual staff. NRS had full and part-time allocations to the programme.

We also had staff working on the programme who were part of the ONS and NISRA census in 2021. This enabled us to benefit from subject matter expertise across areas such as our contact centre, business incident management and the Census Coverage Survey.

Our interim manager and delivery provider contracts contained a knowledge transfer clause. We NRS focussed on permanent staff and identifying opportunities for reassignment within NRS so their skills and expertise could be retained.

Summary of key lessons

A predominantly waterfall programme management methodology was adopted from the outset without having fully completed the solution design. This led to confusion, delays and rework throughout the programme lifecycle. In hindsight, adopting more of a hybrid methodology would have been advisable, acknowledging that some aspects of the design were not clear until much closer to the Census go live date.

NRS welcomed the work Scottish Government colleagues took to improve recruitment processes. However, there were significant issues with end-to-end timescales for even short-term roles being extensive, six to eight months were not unknown. This meant we had to use expensive the interim manager route which had not been included in our original budget estimates. Savings had to be found to absorb these additional costs.

The programme improved resource planning and sourcing throughout the programme with a mix of internal recruitment, contractor and contracts to achieve the blend of skills and delivery outcomes. Forward resource and contract planning for the programme remains vital. Recruitment approaches which enabled timely onboarding and avoided expensive contractors, particularly for hard-to-reach skills should be examined with Scottish Government and public sector partners. This would enable better access and sharing of experience and skills sets between major digital programmes.

Initial programme budgets covered some large components but were based on 2011 Census and not designed for a large digital operation. This impacted spend pressures downstream in the programme as the design evolved. NRS should build in budget checkpoints from the start of any future census programme. It should consider contingency for major impacts that could delay delivery and add significant costs, such as the Covid-19 one-year delay and the collection extension which together resulted in additional expenditure.

Early end-to-end design of the integrated digital and operational components is key, with supporting investment to save and reduce against rework downstream in

programme delivery. The end-to-end design should consider the more costly design elements and programme delivery teams and examine whether there are more efficient ways to deliver these outcomes while retaining quality.

End-to-end planning improvements in the programme would avoid drift in delivery adding costs (particularly to supplier service costs and high-cost resources). More time spent on integrated requirement delivery planning and articulation across this end-to-end plan would also avoid or minimise waste in programme and supplier time. Although it is recognised in a major logistical digital delivery, there will be changes required and continuation of robust change control and financial management is key.

A range of changes to strengthen programme management were adopted in 2019 including onboarding of a delivery partner which provided a faster route to hard-to-reach skills. At the same time the NRS chief executive took on the programme senior responsible officer role with all NRS directors taking on specific responsibilities which provided the programme with greater support and delivery capacity.

These changes including a refreshed PMO service and improved clarity and control across all aspects of governance with programme management continuing to develop and strengthen over time and improved integration of statistical, digital and operational elements. This programme has provided NRS with valuable experience and an increased maturity around digital programme delivery that will help shape our approaches across the wider NRS portfolio. Any future programme must build on these approaches and lessons.

Independent external assurance played a very important part in the success of the programme, providing critical analysis at key stages throughout the programme lifecycle.

Chapter 11 – Communications and engagement

Background

A multi-faceted public awareness marketing campaign was developed to reach as high a proportion of the adult population across Scotland as possible. This included extensive TV, radio, social media, print and out of home advertising, and engagement with partner organisations across Scotland to use their communication channels to promote awareness and the value of the Census.

The communications and engagement strategy was aimed at the general population but included targeted activity to reach those groups identified in research as likely to need more encouragement and support to complete the census. This marketing activity was in addition to the census materials such as the postcards and letters.

Timings

Communications and stakeholder engagement activity was undertaken via a range of methods prior to the collect period starting. This included social media, stakeholder newsletters, media relations work and stakeholder engagement activity both online and at in-person events. The bulk of the public facing communications and engagement activity took place between February and May 2022 during the collect phase.

Target audience

Every household in Scotland was asked to complete the census to provide an official count of every person and household in the country. The target audience for the communications was therefore all adults (16+) across Scotland but additional efforts were made to target specific groups within the population identified as less likely to complete, or less likely to complete online:

- Young adults not living with their parents – both students and non-students
- DE socio-economic groups/high deprivation/low income
- Parents of young children (aged up to five years old)
- Those aged 75 and over
- Ethnic minority communities
- People with physical, emotional or learning disabilities or difficulties
- Gaelic speakers
- Those living in rural locations.

Research

Extensive research was undertaken to uncover audience insight and inform the development of the campaign to ensure it was evidence-led. This included desk research and in-depth quantitative and qualitative research, including an exploration of campaigns used in other countries, measurement of baseline awareness and knowledge of the census, and understanding barriers and motivators to completion.

Further desk research and qualitative research were carried out at the end of 2020, to assess how attitudes and barriers may have changed due to the pandemic, in addition to creative testing to identify the most effective approach to creative execution.

Key audience insights

Several audience insights were identified that were taken forward into campaign development:

- Understanding 'the why' unlocked motivation to complete the census
- Personal relevance was important: people needed to make the connection between filling in the questionnaire and the outcomes of census completion
- Several of the less likely to complete audiences needed to be supported, reassured and encouraged
- Since the pandemic, focus was more inward, and mental health and education were especially important
- After the initial lockdowns and restrictions of the pandemic there was a perception that the census was a way for people to regain a voice.

Research also revealed that each of the less likely to complete audiences could be encouraged to complete in different ways. For example, this could have focussed on the availability of help and support for people living on low incomes and those with a disability, those aged 75 and over (specifically that paper questionnaires were available) and for ethnic minorities (specifically that translated guidance was available).

Making clear that it was a legal responsibility would engage young independents who had not participated in a census before. The future benefits for their children could strike a chord with time-poor parents of children five and under. Influencing services in your community and giving your community a voice resonated with those living in rural communities and Gaelic speakers.

Based on research, the campaign was therefore developed on the proposition: 'Complete the census to help make better decisions happen every day about the things that matter to you'. This connected directly to the positive benefits and impacts that census data contributes to, as well as giving people an active, personal role.

Research had also made clear the need for a phased approach to census communications, as had been used in previous censuses in Scotland and in other countries.

The most resonant route from initial testing was further developed and optimised for the three phases using the line 'Scotland's Census. Getting the right things out, starts with filling it in.' across all. The urgency and direct call to action increased from one phase to the next:

- Awareness: to increase awareness/motivate people/make them care
- Persuasion: to reassure/inform people and make it easier – targeted specifically at those groups identified as less likely to complete and thus needing more persuasion and support, focusing on the motivators identified for each group
- Action: to inform people/make it more urgent – making clear that it is a legal responsibility.

The call to action was inherent in the overarching line but also made clear in 'go to census.gov.scot'. The contact centre phone number was also provided in some executions.

Main census collection

The main census advertising campaign launched on 14 February and ran across several channels, including TV, cinema, out of home, radio and digital channels for a period of five weeks to 20 March, with ongoing targeted activity from 21 March. The initial five-week campaign offered 98% of the population an opportunity to see the message a minimum of three times.

The campaign was supported by extensive PR and partnerships to extend the reach of the campaign. Partnership activity was used to target the less likely to complete audiences mentioned but also seldom heard groups who are even less likely to see mainstream marketing activity. Over 200 organisations partnered with Scotland's Census, promoting, sharing and amplifying census messaging within their organisations and to their own stakeholders and networks.

Twelve field marketing events took place across Scotland between 3 and 20 March with a total of 3,963 engagements across the 12 locations, with 305 individuals

contributing to the 'Scotland Connected' artwork and 1,151 digital and printed leaflets distributed to those visiting the stands. These locations were chosen to reach the less likely to complete audiences.

Extensive media relations activity took place, appearing across all major national media outlets, including national, regional and local press, their online channels and broadcast channels such as Scottish Television and BBC. This wide range of activity generated 125 pieces of print, online and broadcast coverage from the beginning of February to the end of March.

A series of 10 online sessions for stakeholders took place in advance of the census live period with 559 individuals representing organisations attending. A further three online sessions were then held during the live period focussing on how to complete the census and the help and support available. A total of 486 stakeholders attended these sessions.

NRS also worked with Education Scotland to engage teachers in the census providing educational materials to help inspire children to learn about Scotland's census.

These images reflect some of the campaign messaging:

Census collect extension

At the end of April an extension to the 2022 census deadline was put in place to allow members of the public more time to complete their questionnaire. Campaign activity was therefore extended into April and May 2022 to support this and to encourage those who hadn't yet completed to do so. Activity ran nationally, with a particular focus on regions and amongst specific audience groups where completion rates were lower.

The extension campaign launched on 7 April 2022 with extensive TV, radio, social media, print and out of home advertising. The combined campaign offered 94% of the population an opportunity to see the campaign at least three times.

Extensive public relations activity took place across all media outlets, including national, regional and local online, print and broadcast channels such as STV and BBC. This wide range of activity generated 438 pieces of print, online and broadcast coverage from 21 March to 12 June.

35 field marketing events took place across Scotland between 14 and 29 May at locations which were chosen to reach the 'less likely to complete' audiences. A further 16 events were held during the extension period supported by National Records of Scotland field staff.

These events were targeted at lower response parts of the country and on engaging with young people, students and ethnic minorities. A further burst of partnership activity was delivered across the extension period, communicating directly to over 580 contacts at a range of partner organisations including local authorities, charities, universities and colleges.

In addition, five local authorities and Third Sector Interfaces carried out engagement activity on our behalf. In Glasgow alone, 161 events were delivered over a two-week period.

Through the main census and extension period:

- TV adverts ran 561 times
- Radio adverts ran 11,873 times
- Press adverts ran 321 times

Evaluation

Detailed overviews of the public engagement campaign during that period, including independent evaluation results, were published on gov.scot. The first evaluation report covered the engagement campaign from February to March 2022. The second report covered the campaign from April to May 2022. These reports included:

- background
- campaign objectives
- target audience
- campaign development
- key audience insights
- campaign creative execution
- media
- supporting activity
- evaluation
- results
- overview of results
- conclusions

Post-collect communications and engagement activity

Following completion of the collection period, communications and engagement activity has continued to be delivered by the in-house NRS communications team.

This has including support for the Census Coverage Survey, a consultation on the census outputs results and the outputs results themselves which began in September 2023 and continued until October 2024.

A summary of the communication results from the outputs data releases is included in the outputs chapter of this report.

Summary of key lessons

The campaign ran during a challenging period for the public, with the Ukraine war, cost of living pressures, Covid-19 still in circulation and general fatigue as the country recovered from the pandemic.

However, findings suggest the campaign had a positive impact on knowledge and action: the target for reported action was exceeded at 57%. This equates to a potential 1.9 million people who took an action as a result of seeing the initial (census collect (main)) campaign activity, including completing their census.

The media strategy was successful in reaching all audiences, and there were good levels of multi-media and multi-stage recognition. Seeing a combination of phases

had an impact on levels of reported action and understanding of the census, demonstrating the value in this approach.

Key campaign messages were successfully communicated with large increases pre to post on the knowledge measures and campaign recognisers knowing more than non-recognisers (e.g. that it's a legal responsibility and the sources of support available to complete it).

The extension campaign successfully built on the original phase of the campaign, making clear the urgency, highlighting the fine and signposting to the required support. Along with the other interventions it nudged many people to complete their census and played an important role in delivering the 89% response rate.

Chapter 12 – Key lessons learned

1. ***Delivering a census on a national scale within a fixed timeframe requires strong governance and independent assurance to maintain control and direction, with oversight across all components, evolving over time to reflect the specific needs of each programme phase.***

There are clear lessons for National Records of Scotland (NRS) and the Scottish Government in relation to the initiation of major programmes and how these are established, resourced, monitored, managed and supported.

The 2022 Census programme was initiated in 2014-15. It became clear in 2016 and 2017, that some significant issues were emerging, particularly on the development of the digital services and operational design. The programme sought advice on digital delivery as our digital function was in its infancy following the creation of NRS in 2011. During 2018, NRS appointed a Programme Director to provide greater capacity for the delivery of the programme. The Gateway Review process was also initiated at this point to independently assure our delivery plans. This gave rise to the Gateway Review report in December 2018, with a red delivery confidence assessment.

At this point there were significant issues to be addressed. NRS increased programme delivery experience in its management team, which implemented a programme improvement plan through 2019 in response to the Gateway recommendations. The NRS Chief Executive Officer (CEO) took on the programme Senior Responsible Owner (SRO) role with all NRS directors taking on specific programme responsibilities. This gave the programme greater support and delivery capacity. It is critical for future major programmes that they are delivered as part of the NRS management structure, to ensure that the relevant leadership and processes are in place to deliver the programme functions. For major programmes of the scale of the 2022 Census, the CEO is the most appropriate SRO to ensure the leadership required by the programme. Programme Director capacity should be in place at the outset of a programme of this scale.

Establishing an effective governance structure at the outset of a programme of this scale is critical. Governance must reflect supporting strategies (such as digital, commercial, financial, resourcing) and be reviewed as the programme evolves. The programme had initiated governance and infrastructure through the early design phase with the establishment of a programme board. However, as the programme grew, the governance and programme management infrastructure did not grow sufficiently with the delivery cycle.

The recovery plan mounted in 2019 was highly effective in driving and evidencing improvement in the programme, including refreshing the governance to support the

different phases of the programme. Successive external assurance reviews verified this.

The programme's assurance regime was used to improve and inform the quality of the service. It included extensive user testing, application of Digital First standards, use of independent Gateway reviews, Technology Assurance Framework and other quality assurance mechanisms. NRS established an integrated assurance plan and a group that brought the assurance providers together to improve coordination and understanding. The Digital Assurance Office's case study on Approach to integrated assurance provides reflections and lessons for the wider Scottish Government.

During the delivery of the census there were significant issues with end-to-end timescales for recruitment for even short-term roles, with up to six to eight month delays. For a fixed delivery programme, seeking to bring in large numbers of staff, these timescales created very significant issues that impacted the delivery of the programme. These in turn created a greater reliance on high-cost suppliers and individual contractors. In many cases, NRS were competing for skills that were scarce in the Scottish, UK and global markets, while offering uncompetitive public sector salaries. Skills to deliver some elements of the programme (such as service design, operational design, logistics, digital) were particularly hard to recruit, yet critical to delivery.

NRS is a medium sized public organisation with approximately 450 staff. It undertakes a range of functions covering registration services, public records, national archives and demographic statistics. Compared to the Office for National Statistics at a UK level, NRS has a small statistical function. In addition, it was anticipated that NRS would deliver a programme of the scale and complexity of the census from within the organisation, without broader delivery support from Scottish Government. Requests for support, while received sympathetically, could not be met due to competing government challenges and priorities, for example the Social Security Scotland programme and later the Covid-19 response. This required extensive contract and recruitment work within NRS to bring in project, IT and technical skills that did not exist within NRS.

NRS took forward a range of resourcing approaches to address these issues. The Digital Assurance Office's case study on Resourcing provided key lessons for wider Scottish Government. In planning a future programme, NRS should ensure it structure is sufficiently flexible and appropriate to initiate, resource and absorb programmes of the scale of the 2022 Census.

Changes to strengthen programme management were adopted in 2019. As resourcing routes had been exhausted to secure the skills to deliver the programme, NRS contracted with delivery providers. This provided a faster route to hard-to-reach skills to deliver outcome-based work packages and support delivery of programme

targets. These were flexible contracts and good practice to support the delivery of time critical programmes which also included skills transfer to help strengthen NRS' delivery approach.

Changes made in 2019 included a refreshed Programme Management Office and improved clarity and control of governance. Our programme management developed and strengthened over time and improved the integration of statistical, digital and operational elements. The programme provided NRS with valuable experience and an increased maturity around digital programme delivery that will help shape our future approach across the NRS portfolio. The Digital Assurance Office's case study on Go Live Checklist provided reflections and lessons for the wider Scottish Government.

The programme had a strong approach to cybersecurity and protection of personal data. Significant and sustained attacks on the census infrastructure, which increased because of the Russian invasion of Ukraine, were all successfully defended. Robust contingency was in place to backup and safeguard citizens' data. The security operations centre provided robust 24/7 monitoring, detection and response capability during the live census operations period. These arrangements were highly effective and any future census should focus on cyber security and fraud risks. The Digital Assurance Office's case studies on Information Governance and Standards and Cyber Security provide reflections and lessons for the wider Scottish Government.

2. ***It is vital that as a digital programme with national delivery logistics, Scotland's Census is designed end to end at the outset to plan the required components and sourcing strategy to achieve the optimum strategic integration that reduces rework and enhances value for money.***

Budget and resource limitations in the early stages of the programme meant that design effort was focused on important higher risk digital delivery components such as the online collection instrument and the system to manage operational interactions such as logistical arrangements and non-response monitoring and follow-up. Providing sufficient time for the digital design and delivery was in line with lessons from other major digital delivery programmes at this time.

Prioritisation of resource on to the digital design meant that the design of several vital operational components such as the data model, contact centre, the field force systems, manual coding arrangements and other parts of the design were developed later into 2018 and 2019. This meant that changes were needed to earlier designs of the digital components and crucially integrations and end-to-end delivery designs were not considered holistically at the start. The result was that re-work was required to ensure the integration across very complex technical, digital and operational systems. This was not well understood by the programme into 2018 and was developed later through the recovery plan, driving change and investing in the

required skills and capabilities which were not held within NRS at an earlier stage in the programme.

The timing of when components should be designed, built and tested should be considered strategically at the start and influence delivery methods, the choice in commercial approaches and be resourced appropriately.

3. ***Scotland's Census requires sufficient early investment to enable time to initiate and resource the programme, develop the end-to-end design, design requirements for components, procure contract services, develop, test and rehearse components to ensure delivery optimises value for money.***

It is vital to note the importance of early end-to-end design and the complexity of technical, digital and operational components which are required to deliver a robust census and manage the scale of data collected and outputs analysis. Scotland's Census is delivered over a ten-year programme cycle, which reflects the delivery complexity and scale.

NRS had embarked on a multivendor strategy for suppliers. This approach had been recommended by an independent report commissioned by Digital Directorate. While this is a legitimate approach in certain circumstances, it resulted in greater complexity and placed responsibilities on NRS to manage and integrate a complex mix of suppliers and interests, for a programme where the full end-to-end digital and operational design was not fully in place until 2019.

The scale, complexity and skills required for this role of strategic integrator were not understood or put in place early enough. For any future delivery, NRS will need to develop a clear strategy and approach for the use of suppliers much earlier in the programme, reflecting the end-to-end design across all digital and operational components, and ensure that the skills to manage these relationships are in place at an earlier stage. NRS put in place a commercial team during 2019 to support the contract management and supplier relationship management. This was good practice but would have benefited the programme if this had been in place earlier.

It is recommended that for any future programme early investment is made in the end-to-end integrated design, including understanding technological advancements to innovate in the gathering and analysis of big scale data. This will ensure that the overarching procurement strategy is based on this integrated approach. This will also enable timely development of requirements to enable the optimum procurement routes which maximise outcome flexibility and approach and the deliverability of the options. For any future delivery using field teams it may be appropriate to consider the use of more than one supplier, or multi supplier contingency.

The Digital Assurance Office's case studies for Procurement and Contract Management provide reflections and lessons for wider Scottish Government.

4. Scotland's Census is multi-faceted and requires realistic cost estimation from the outset based on the end-to-end design to ensure all required components are planned and costed and there is contingency for unforeseen factors in the 10-year delivery cycle.

Scotland's Census was difficult to cost and plan given the scale of logistical operation required across Scotland together with the long lifecycle of the programme. The programme developed an early business case and costings to secure investment from the Scottish Government. While the programme planned ahead, developed a procurement strategy, costed delivery requirements and developed a business case to underpin the spend, there were a number of factors which impacted the overall lifecycle cost which can inform budget estimations for any future delivery. These included:

a. Design factors and the shift to a digital first census
b. Changing environment of cyber and information security since the 2011 Census and the scale of data managed and collected by the 2022 Census programme
c. Difficulties in estimating costs for delivery components pre-procurement, with little precedent on which to base cost estimates
d. It is difficult to estimate volumetric data across the multiple services a census provides to support the public to respond
e. The changing resourcing market over the lifecycle of the programme, making it difficult to attract harder to reach digital, operational and programme management skills and increasing costs of the Field Force recruitment
f. Unforeseen factors experienced during the programme including Covid-19 and survey fatigue. These have been set out earlier in this report. The programme responded to these factors but would have benefited from an agreed forward plan for contingency management

Initial programme budgets covered some large components but were based on 2011 Census and not explicitly designed for a large digital first operation or reflective of the significant technological advancements since the 2011 Census was designed. This impacted spend pressures downstream as the design evolved throughout the programme and the actual delivery costs and full set of design components and procurement requirements and costs were better understood. As has been noted in other lessons, the importance of early end-to-end design and understanding the potential benefits from technological and digital delivery improvements is vital to inform robust lifecycle costs for the programme.

NRS demonstrated good practice in refreshing the census business case in 2019-20 and in the approach taken to replan and cost the one-year extension due to Covid-19.

In developing future programmes, NRS should consider a staged approach to design and costing the overall delivery of the programme, with business case and budget checkpoints in place from the start. NRS should also develop and agree an approach for contingency management with major stakeholders from the outset, given the potential impact on delivery timelines and additional costs.

In addition, NRS should identify and consider the more costly design and delivery elements and examine whether there are more efficient ways to deliver these outcomes whilst retaining quality. Consideration should also be given to the volume based components of the census delivery to minimise financial and delivery risk through design and procurement approaches which minimises volume based contracts or introduce incentivisation to minimise spend.

5. Design in use of administrative data from the outset.

Administrative data was a key feature of the planned design for the 2022 Census and was fundamental to the changes we made to our design in response to lower-than-expected response rates. Any future programme should look to build on this experience to improve the efficiency of the approach and to enhance the quality of the statistics.

Further enhancements may be possible to the planning of the census operation using administrative data. As with any additional use of administrative data, NRS would take care to ensure that this was used in a legal and ethical way.

The 2022 Census had an address-based design to support the post out of initial contact information and to support follow-up engagement with non-responding households. Constructed from administrative data, the address frame was found to be very high quality. There is scope to enhance the frame further by using other administrative sources to indicate whether addresses are, for example, vacant or used as second homes. This could also help improve the planning and efficiency of follow-up activity by identifying addresses that are empty and do not require further engagement. In Northern Ireland, administrative data was used to indicate addresses which should be sent paper questionnaires.

It may also be possible to use administrative data to indicate where there are community level patterns in non-response. While management information was used to highlight clusters of non-responding addresses, it might be possible to indicate patterns in the characteristics of non-responding addresses. This could indicate a need for additional, and proactive, community engagement to encourage response.

Ground-breaking work was carried out to enhance our Census Coverage Survey with administrative data to enable the production of robust statistics. This work has implications for the quality targets set for a future programme in terms of response rates. It also highlights the importance of quality measures for the final statistics arguably being of greater importance rather than the response rates alone. Further work should be carried out to consider how administrative data could play a greater role in the coverage strategy, potentially replacing the coverage survey, but also in contingency planning and bias adjustment.

Quality assurance of individual census processes referred to linked administrative data to spot inconsistencies that needed further investigation. Access to other administrative data could be used to spot patterns in response error or processing errors on other characteristics.

Access to other administrative sources could also be used to further enhance the validation of aggregate census statistics. Understanding the coherence between census estimates and other sources was a vital part of having confidence in the robustness of the census estimates. Where there were no administrative sources, reliance was instead on expert knowledge and comparison to survey data.

Further work should also be carried out to understand whether census data could be linked to administrative data to produce new statistics, or new linked data assets, for research under controlled conditions. As an example, the Central Statistics Office in Ireland uses administrative data to produce income estimates from their census outputs using tax and benefit data, rather than relying on a dedicated census income question.

Any additional use of administrative data would be subject to scrutiny with data suppliers and established processes to ensure legal and ethical would be applied.

6. Future approaches to collect population statistics should maximise digital uptake while ensuring that the census is accessible for everyone.

One of the primary design assumptions for the 2022 Census was that the census would be carried out primarily online. Scotland's Census 2022 was assessed against the Scottish Government's Digital First Service Standard in 2018. The standard was refreshed to become the Digital Scotland Service Standard in 2021. Following early recommendations from the first digital assessment, a Digital Assurance Manager was embedded within the programme.

Ensuring a solid understanding of the Digital Standard to design and deliver, at all levels, was a critical aspect of the 2022 Census programme. This allowed for a more innovative way of gathering census data, improved accessibility and improved

quality. This was supported through the use of greater automated coding and quality assurance of the census responses received from households and individuals. Developing the structures and tools to support these improvements were both informed and reviewed through the Scottish Government's Technology Assurance Framework.

Previously, most census returns were paper based (80% in 2011 and 100% in previous censuses) with responses to questions individually coded by large numbers of staff. This approach brought significant costs, timescales and quality considerations. The move to a digital first census reflected the wider expectations of the Scottish public at the time while also improving the speed and accuracy of analyses and subsequent production of census outputs. 90% of the responses to the 2022 Census were via the online collection tool. However, NRS remained mindful of the potential for digital exclusion. Therefore, paper questionnaires remained available to those who either wanted or needed them. These could be requested via the Scotland's Census website, via the census contact centre or requested during a doorstep visit by a census enumerator. Latterly, some paper questionnaires were issued proactively by NRS.

The option to complete online was highly popular and preferred by most respondents, with just under 2.1 million households choosing to complete their census return this way. This approach also allowed many accessibility needs and requirements to be built into the delivery of the service, which would not otherwise have been as readily available in a traditional paper-based approach. The digital approach also improved data quality during the coding phase, with reduced need for manual coding interventions. There were also high levels of reliability with the online solution, which ran successfully between 28th February and 12 June, with no outages, or major defects. Recognising these successes, the Scottish Government's Digital Directorate noted the census programme as a key case study to be used as a valuable example for other Scottish Government digital programmes.

Future programme delivery should look to maximise this digital offer while also ensuring accessibility. It will also be important to assess how new technologies could be used to improve the efficiency and effectiveness of census processes. For example, Canada and Australia have used artificial Intelligence as part of a chatbot to automate responses to questions from the public about how to complete their census form.

7. ***Fully rehearse end-to-end processes, and test digital and operational end-to-end processes at least two years out from a census in line with international experience. Earlier small-scale testing, like ONS carried out in 2017, should also be undertaken.***

Delivering a census for all households in Scotland is not a straightforward exercise. That is why, as part of our work to achieve this, we carried out a major public rehearsal exercise that tested some of the systems and services. The overall scope of the rehearsal was split into 11 learning areas, which included testing:

- the usability of online and paper census questionnaires
- the public-facing telephone helpline
- some elements of census communications and help for the public
- census ICT systems and operational processes

Although many of the proposed questions for Scotland's Census were used for the rehearsal, it did not set out to explicitly test the language used in the questions. The rehearsal did not test the Census Coverage Survey, nor the count and listing of communal establishments. Testing of the field force was also not within scope of the rehearsal.

The descoping of these components meant that the rehearsal in 2019 was limited in scope. This combined with limited operational readiness testing post-rehearsal meant not all systems, processes and enumeration types were fully tested in a live environment. While systems and processes worked it meant that some elements had to be adapted as we went live adding to complexities at a very busy time. Countries around the world usually rehearse their censuses at least two years before census day to ensure that systems, processes and interactions work. As censuses are typically only every ten years, rehearsals are vital for people to gain experience. Early small-scale testing, like ONS did in 2017, should also be undertaken.

Testing all components with the public for live digital operations should be undertaken. Contracts and systems should allow this vital testing to take place.

8. Work closely with ONS and NISRA throughout, sharing expertise and contracts.

We worked closely with ONS and NISRA throughout the programme for the preparation, design, build, test, delivery and the publication of outputs from Scotland's Census. This engagement was extremely valuable. We applied some of their experiences and lessons from the 2021 censuses to ours in 2022. The way in which we collaborated is set out in more detail in Appendix B.

In addition, learning and support from census taking countries around the world was essential. We are grateful to the International Census Forum for their help and advice. Examples of good collaboration included:

- harmonising topics and questions for UK outputs

- collaborating on question testing, public acceptability research and online and paper question design
- learning from ONS and NISRA operational designs and approaches
- the secondment of staff from ONS and NISRA who worked on their censuses was helpful for incident management, the contact centre and the Census Coverage Survey
- harmonising and sharing methods and code for statistical cleansing and estimation
- seconded expertise from ONS and NISRA on edit and imputation was invaluable.
- using specialist software from Statistics Canada for edit and imputation processing steps
- harmonising on census outputs particularly for UK outputs

Collaborating with ONS and NISRA for any future census is essential to ensure UK harmonisation of census outputs and the coherence of statistics which underpin the wider UK statistics system. Likewise learning from best practice from other census taking countries is important given the scale of census undertakings and the associated risks

9. Work closely with local and community groups to maximise reach and engagement.

The contribution from local and community groups to maximise reach and engagement in the collect phase, should be built in from an early stage for any future census.

One of the strengths of the marketing and communications campaign was the support from stakeholders to extend its reach. The in-house NRS community engagement team built strong relations with local authorities and Third Sector Interfaces. Partners helped target the less likely to complete audiences but also seldom heard groups who were less likely to see mainstream marketing activity. In total over 200 organisations partnered with us to promote, share and amplify census messages within their organisations and to their stakeholders and networks. Over 60 different materials were developed such as posters, radio ads, social media posts and promotional emails and were hosted in an online toolkit. Partners could choose the most effective materials for their channels and audiences. Materials were specific to each of the campaign audiences and were developed and renewed in line with the campaign stages.

During the extension period, five local authorities and Third Sector Interfaces (Dundee, Glasgow, Inverclyde, North Lanarkshire and West Dunbartonshire) carried out paid for engagement activity on our behalf. This included 161 events which were delivered over a two-week period. This was supported by a further 30 events

arranged by NRS field staff and our partnership agency. These activities should be considered as part of the end-to-end design along with the required funding.

10. Population statistics must be supported by access to international expertise

Census taking is unique. It takes place at scale, infrequently and involves a complex combination of components working together. Sharing expertise with other countries was important when we developed the Census programme and responded to the lower-than-expected response rates. This will become even more important as we consider the future direction for census and population statistics. Other countries also aspire to transform their approach to census statistics.

As part of the International Census Forum, NRS, NISRA and ONS collaborate with colleagues in New Zealand, Australia, Canada, Ireland and the USA. This must continue. Many examples show how collaboration has benefited NRS:

- Establishing the International Steering Group which successfully shaped our adapted Census design following the field operation.
- 'Community of Practice' working groups where staff meet virtually to work through topics of shared interest such as communications, testing, and coverage estimation.
- Learning from challenging census experiences such as New Zealand's lower-than-expected response rates in 2018 and Australia's denial of service attack.
- Learning from innovation internationally, such as the use of artificial intelligence in coding and chat bots.

Chapter 13 – Future of population statistics in Scotland

Strategic objective 7: To make recommendations for the approach to future censuses in Scotland

Robust statistics from Scotland's Census 2022 have been published and are being used to make decisions which impact the lives of the Scottish population. They will continue to be used for many years to come. The statistics have made headlines and have made us more aware of who we are and how we live our lives.

Looking forward, we see administrative data playing a greater role in the production of census type statistics. This is consistent with the view taken by other countries National Records of Scotland (NRS) work with as part of the International Census Forum.

We have already recognised that a lesson from the census is that we should design in the use of administrative data from the outset. Perhaps most importantly, we have demonstrated that while overall response rates are important, robust statistics can still be produced with a slightly lower level of response if we integrate administrative data into our design. We should reconsider our quality targets with any future census given our experience.

Scope to go further with the integration of administrative data would be greater with more access to these sources. By far the most important sources for census and population statistics are data on tax and benefits. HM Revenue and Customs and the Department for Work and Pensions data cover most of the population. These data sources have enormous potential to reduce the cost and improve the accuracy of future population estimates.

NRS share an aspiration with other parts of the UK to go further with administrative data and consider whether it could be used to transform how we produce population statistics in Scotland. This could mean no longer carrying out a large-scale data collection exercise. In partnership with other parts of the UK and drawing on international experience, we should evaluate the potential of this alternative approach.

A system based on administrative data has the potential to provide census type statistics every year rather than every ten years. Such a system would need to provide robust statistics representing the whole population without under or over coverage. Furthermore, administrative data is not available on all topics collected by the census.

Regardless of the approach taken to collection and production, there is no doubt that the data from a census, or alternative administrative system, are a vital part of decision making in Scotland. These statistics must stay relevant and so it is important that NRS ensures that it puts in place processes to understand emerging user needs.

Appendix A – Sample census questionnaires

The questions were included in the Census (Scotland) Regulations 2020, which came into force on 16 June 2020. See more on how we developed questions.

Household questionnaire

The main household questionnaire containing all household and individual questions. Up to five household members could be included on this questionnaire.

Household continuation questionnaire

A questionnaire containing individual questions only. Households were able to use this to record additional household members.

Large print household questionnaire

A large print version of the household questionnaire. Up to two household members could be included on this questionnaire.

Individual questionnaire

A questionnaire containing individual questions for one person.

Communal establishment questionnaire

A questionnaire that was completed by managers of communal establishments.

Communal establishment individual questionnaire

A questionnaire containing individual questions for 1 person, used in communal establishments.

Communal establishment individual questionnaire - prisons

A questionnaire containing individual questions for 1 person, used only in prisons.

Appendix B – Harmonisation across three census offices

The statistics bodies of the nations of the UK (ONS, NISRA and NRS) came together in a range of forums that covered the preparation and delivery of the 2021/22 censuses. These included a senior-level UK Census Committee, which met alongside the existing Inter Administration Committee, and working-level engagement between the three organisations, Welsh Government and other users and experts.

The UK Census Committee (UKCC), chaired by the National Statistician, included the registrars general for Scotland and Northern Ireland, the Chief Statistician for Scotland, the Welsh Government's Chief Statistician, and senior census officials from ONS, NISRA and NRS. Its purposes included:

- co-ordination of UK-wide work on censuses and reviewing alternative approaches to meeting future user needs
- ensuring consistency across the UK censuses
- agreeing census delivery plans in a way that takes full advantage of harmonisation of working practices and sharing of research and resources and
- sharing plans and approaches to the use of administrative data for the censuses.

Reporting to the UKCC, a UK Harmonisation Working Group met monthly. Their role was to manage relationships between census programmes of work across the UK, identify potential areas of joint working and manage risks to harmonisation of UK outputs. This included considering the scope, quality and coherence of statistical outputs; statistical methods; user engagement; quality assurance and opportunities to collaborate across the UK.

As part of the November 2020 update on the statement of agreement, the names, purposes and membership of the working groups being used to promote UK census harmonisation were set out. These all included ONS, NRS and NISRA, many included Welsh Government officials, and some also included other organisations. This included a UK Data User Group, which provided a forum for sharing information and feedback between the UK Census offices and UK census data users, and a UK Data working group, which took forward recommendations from the National Statistics Accreditation process that had a UK focus.

Other working-level harmonisation groups included:

- Outputs and Dissemination Harmonisation Working Group (including Welsh Government (WG) officials), which covered outputs products and statistical disclosure control.
- Microdata Working Group (including WG and academic users), which focussed on microdata products
- UK Statistical Quality Working Group, which aimed to maximise our harmonisation in approach to the statistical quality assurance of the 2021 and 2022 Censuses.
- Data Processing Harmonisation working group (including WG), which aimed to identify and document potential areas of joint working and differences in the way the data are processed.
- Edit and Imputation Working Group (including WG and the University of Southampton)
- UK Product Working Group, which discussed the question development work and testing, results and rehearsal findings, to help develop harmonised questions and questionnaires.
- UK Addressing Working Group (including WG), which discussed and shared best practice around the development of the address registers to support the census operations.
- UK and Ireland Geography Harmonisation Working Group (including WG and Central Statistics Office Ireland), which discussed geography information relating to initiatives, policies, standards and census planning and dissemination.

Appendix C – Summary of interventions in the Collect extension phase

Activity / Milestone	Dates	Description
Media activity – (full handling plan including stakeholder engagement to be developed)	28th April	Census Extension. Quote from Cabinet Secretary; Interview; social media
Media activity - Broadcast interview 'Off the Ball' podcast	30 April	Jason Leitch to promote the census and why it matters from a health perspective. Material prepared.
SG Marketing - TV	Live – 22 April	Updated TV with legal responsibility and potential fine message, no date
SG Marketing - Radio	Live – 22 April	Updated Radio – with legal responsibility and potential fine message, no date
SG Marketing - Digital	Live – 22 April	Updated Digital – with legal responsibility and potential fine message, no date
SG Marketing - Out of Home	Live – 22 April	Updated OOH – with legal responsibility and potential fine message, no date

SG Marketing - Press	Live - 2 May	Full Page and Double Page Spread focusing on legal responsibility
SG Marketing – Radio DJ Talk ups	Live – 26 – 29 April	Bauer Radio DJ's talking about filling in Census and the benefits of doing so
SG Marketing – Social Media influencers	Live – 26 - 29 April	3 Social media influencers posting the updated census message
SG Marketing – Media Partnership	12 May	3 Full page advertorials across Daily Record, Evening Times and the Sun, using case study content
SG Marketing – Media Partnership	18 May	Takeover of The Skinny website – targeting young audience
SG Marketing – Media Partnership	19 May	Glasgow Live advertorial – targeting young audience
Letters from NRS to local authority chief executives /Solace/Convention of Scottish Local Authorities. Letters to health boards, non-departmental public bodies, Scottish Delivery Bodies Group	29 April	Update to key contacts on census timeline, encouraging further support

Mail out to all stakeholders via newsletter (4,000 in total on distribution list)	29 April (then to be sent out weekly)	Update on census timeline, encouraging completions
Reminder letters – Online	28 / 29 April	Second reminder letter to those who have started a return online but not completed (c 68,000 households)
Proactive issue of paper forms	Issued in batches. Due for conclusion 01 May	C 114,000 paper forms issued proactively to non-responding households
Media activity – 8 out 10 households completed the census news release, social media - SG and census channels	4 May	Census returns reach 80% as deadline extension takes effect
Media activity – no. calls to the contact centre/translations, news release, social media	6 May	People in Scotland get support to complete the census
SG Social Content Hub content	6 May	Post copy: It is a legal responsibility for every household in Scotland to fill in #ScotlandsCensus2022, either on a paper form or online.

		Visit census.gov.scot With 15 second phone ad (student)
SG Social Content Hub content	7 May	Post copy: Did you start filling in #ScotlandsCensus2022 but not finish? Check your progress online! Find out how far through you are, revisit skipped questions and click submit. Remember it is a legal responsibility to complete your census by the end of May. More info http://census.gov.scot With "how to video – checking your progress"
SG Social Content Hub content	8 May	Post copy: Don't miss your chance to shape Scotland's future Fill in #ScotlandsCensus2022 Visit census.gov.scot
Media activity – targeted local response rates for towns	5 -10 May	Response rates broken down by towns targeted to local media across country. Given the volume these are being issued over several days. (Tailored releases, coverage sent separately)

Media activity – Education assets for primary schools. News release, social media census, Education Scotland social media, private Education Scotland social media groups, Education Scotland newsletter	11 May	Promotion of Education Campaign Schoolchildren count too in census 2022 thanks to teaching aids
SG Social Content Hub content	12 May	Legal responsibility to complete the census. Social media asset.
SG Social Content Hub content	16 May	Video case study from Dads Rock.
Media activity – 1 million field visits, broadcast opportunity with Cab Sec during visit to Glasgow to meet field force workers, news release, social media activity.	16 May	Cabinet Secretary to visit to Easterhouse to meet field force staff.
Media activity – promotion of field events	19 May	Highlighting upcoming field events over the coming days, with specific focus on regional press
Media activity – final days to complete the census	Issued 20 May under embargo for Sunday 22 May	Highlighting legal responsibility, various help and support available, reminder to those who have started but not completed the census
Media activity – news release – LA response rates – 9 out 10 responses in certain LA areas	23 May	Promote the LA areas who have now reached 90%.
SG Social Content Hub content	23 May	Dad rocks video case study

Media activity – news release - one week to go	24 May	Last week to complete the census
Media activity – 25 LA reach 85% or over	26 May	25 LA reach 85% or over
Media activity – 2 million online returns	28 May	2 million online returns milestone
Field force contract extensions	3 May	C 70% of existing field force staff have accepted contact extensions.
SG Marketing - partnerships	3 May	Mailout to 500 contacts/partners, encouraging further support
SG Marketing - partnerships	9 May	Follow up call round to all key groups, including local authorities, equality partners, student groups.
Media activity – targeted local response rates for towns	5 -11 May	Response rates broken down by towns targeted to local media across country.
Media activity – Education assets for primary schools. News release, social media census, Education Scotland social media, private Education Scotland social media groups, Education Scotland newsletter	11 May	Promotion of Education Campaign
Media activity – 1 million field visits, broadcast opportunity with Cab Sec during visit to Glasgow to meet field force workers, news release, social media activity.	16 May	Cabinet Secretary to visit

Redeployment of Census Coverage Staff	From 9th May	c 400 CCS staff being re-purposed to support field force. Training commenced for deployment from 9th.
Implementation of doorstep capture approach	11th May	Field staff retrained and directed to undertake doorstep completion of census returns using electronic systems with paper back up. In hard refusal situations will gather contact details for follow up contact from contact centre to complete a return over the phone.
Final reminder letter	Issued in batches from 13th May	Final reminder letter commissioned with suppliers to go to over 400,000 households who have not yet completed return, including language support. First phase will be targeted first to areas of lowest response.
Media activity – LA response rates – 9 in 10 households in some areas	c19 May	Highlight latest LA response rate and key messages
SG Marketing - TV	Live – w/c 16 May	Updated TV with Time is running out message - legal responsibility and fine
SG Marketing - Radio	Live – w/c 16 May	Updated Radio – Time is running out message - legal responsibility and fine
SG Marketing - Digital	Live – w/c 16 May	Updated Digital - Time is running out message - legal responsibility and fine message
SG Marketing - Out of Home	Live – w/c 16 May	Update OOH - Time is running out message - legal responsibility and fine

SG Marketing - Press	Live – 9 May	Full Page and Double Page Spread focusing on legal responsibility
SG Social Content Hub content	w/b 11	Video case study from Dads Rock.
SG Marketing – Social Media Influencers	Live – w/c 23 May	2 Social media influencers posting the updated census message
SG Marketing - partnerships	18 May	Letter emailed to 21 faith groups across Scotland from the Cabinet Secretary requesting their support with encouraging completion within their communities. Three heads of faith groups have welcomed this and actioned with their communities.
SG Field event with NRS	14 May	Glasgow Central Mosque
SG Field event with NRS	15 May	Hillhead Library
SG Field event with NRS	17 May	Abertay University
NRS field force only	18 May	University of Dundee
NRS field force only	19 May	University of Edinburgh
SG Field event	20 May	Glasgow Central Mosque
SG Field event with NRS field force	20 May	University of Strathclyde
SG Field event with NRS field force	21 May	ASDA Govan

SG Field event	22 May	ASDA Toryglen
SG Field event with NRS field force	23 May	New College Lanarkshire
SG Field event with NRS field force	26 May	Glasgow Kelvin
SG Field event with NRS	27 May	Glasgow Central Mosque
SG Field event with NRS field force	27 May	ASDA Riverside, Irvine
SG Field event with NRS field force	28 May	ASDA Parkhead Forge
SG Field event with NRS field force	29 May	ASDA Clydebank
SG Field event with NRS field force	30 May	Overgate Shopping Centre – Dundee
Compliance letter	24-26 May	Letter warning of risk of case being reported to COPFS for prosecution. Issued to 28,000 households who had firmly refused to complete or had had five or more field visits.
Census stakeholder newsletter to be issued	w/c 16 May	Mailout to around 4,000 contacts including new marketing assets for use
Final countdown mailer issued, along with designated call round.	w/c 16 May	As above

Appendix D – Overview of paper interventions in the collect extension phase

Type	Door drop	Description	Overview	Volume
Planned	28 February 2022 to 4 March 2022	Household Initial Contact Letter	A letter sent to all households advising them to complete the Census. IAC provided for online completion and signposting for further support including paper questionnaires.	2,719,458
Planned	14 March 2022 to 19 March 2022	Postcard	Postcard sent to all households in Scotland advising of the legal responsibility to complete the Census and signposting for further support.	2,719,458
Planned	24 March 2022 to 01 April 2022	Reminder 1 (Household Gentle Reminder, Household Online Reminder, Household Firm Reminder)	A letter sent to all non-responding households advising them to complete or finish the Census. New IAC provided for online completion or signposting for further support. Reminder letter type (Gentle, Firm or Online) depends on Hard to Count rating and whether the household has started an online return.	1,427,685
Planned	05 April 2022 to 12 April 2022	Reminder 2 (Household Firm Reminder)	A letter sent to all non-responding households advising them to complete the Census. New IAC provided for online completion or direction to support (website, call centre).	1,107,778

			Scope extended from Hard to Count 1-3 to include all non-responding households.	
Intervention	14 April 2022 - 20 April 2022	Reminder 3 – Targeted (Household Firm Reminder)	NEW - Additional reminder letter sent to 215,000 non-responding households in areas of low field force, low response and low digital exclusion. Letter highlights potential prosecution.	215,475
Intervention	25 April 2022 to 30 April 2022	Postcard - targeted	NEW - Additional postcard sent to 250,000 addresses in areas of low field force, low response and low digital exclusion (different to third reminder).	243,410
Intervention	27 April 2022 to 04 May 2022	Household Questionnaire pack - targeted	NEW - Paper questionnaires with reminder letter sent to 115,000 non-responding households in areas of low field force, low response and high digital exclusion. Letter highlights potential prosecution.	115,000
Intervention	30 April 2022 to 04 May 2022	Reminder 4 - Household Online Reminder	NEW – Second online reminder letter sent to all households who have started online but not finished. Letter highlights potential prosecution.	68,227
Intervention	12 May 2022 to 19 May 2022	Reminder 5 - Household Firm Reminder	NEW - Additional firm reminder letter sent to non-responding households in areas of low response	395,344
Intervention	24 May 2022 to 27 May 2022	Non-compliance Early Intervention Letter (5+ visits)	NEW – Non-compliance letter sent to all non-compliant households	5,500

Intervention	24 May 2022 to 27 May 2022	Non-compliance Early Intervention Letter (Non-compliant)	NEW – Non-compliance letter sent to all non-responding households with 5 or more visits	23,091
Planned	7 June to 15 June 2022	Non-Compliance Packs	Paper questionnaires with non-compliance letter sent to 6,500 non-compliant households	6,421
Intervention	17 June to 22 June 2022	Targeted Household Questionnaires	NEW – Paper questionnaires with reminder letter sent to 43,000 non-responding households which received no field visits or paper questionnaires	43,616

Appendix E – Benefits of the census

There were seven key benefit categories that summarised the benefits delivered by Scotland's Census, under which various types of benefits, both quantitative and qualitative could fall. These are described below:

Better Resource Allocation
Census data is used to inform budget plans. Census data provides insight into demographic and therefore population demands, resulting in more appropriate allocation of funding.

Better Capital Expenditure
Census data includes detailed demographic information. This is used to inform key decisions around investment in infrastructure and business.

Tailored service planning
The granularity of census data allows decisions to be made at a local level, ensuring decisions made around services are as relevant as possible to service users.

More informed policymaking
Census data can be used to analyse past policy decisions and to provide valuable benchmarking of current economic and demographic trends. This is used to inform future policy decisions.

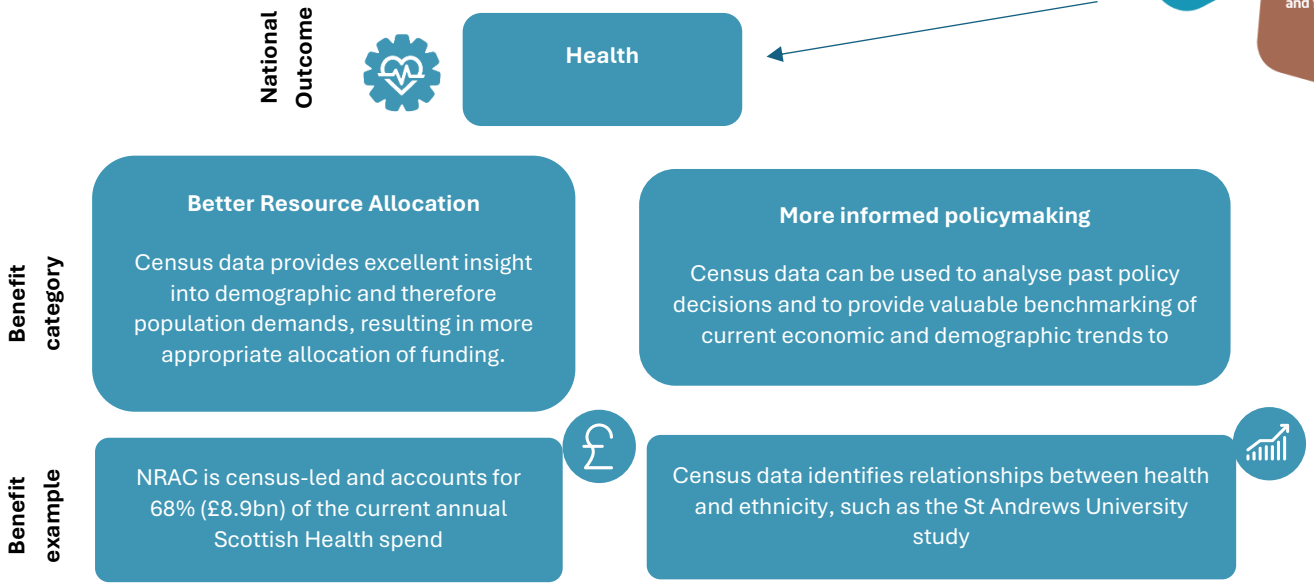
Higher quality research
Census data is a critical source for academic research across a number of disciplines. Better breadth and quality of census data enables more impactful and informed research.

Better indexes/statistical reports
Census data is often used as a key benchmark for other private and public sector reports and indexes. These artefacts in turn inform private and public service improvement initiatives.

All benefit categories and relevant examples can be mapped to Scottish Government National Outcomes.

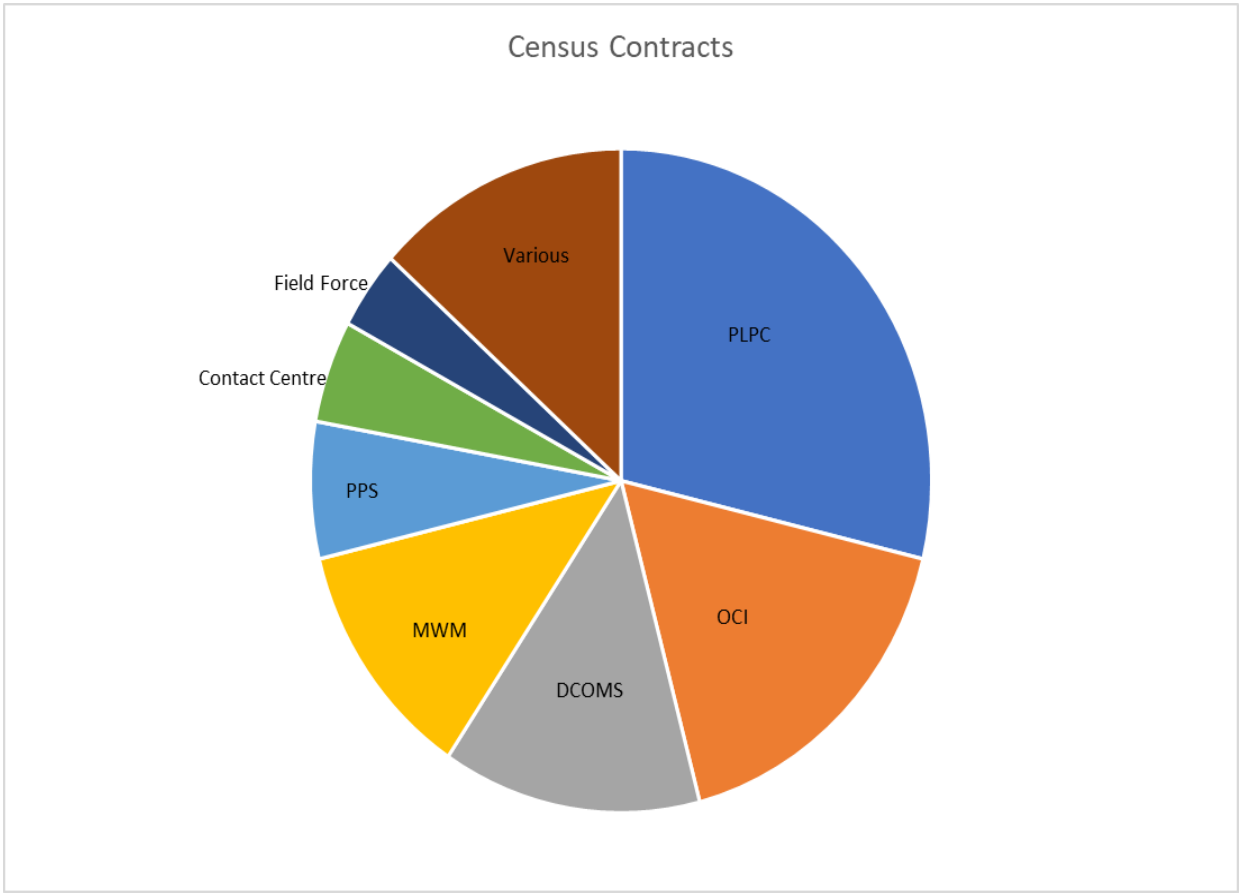
This demonstrates how broad and comprehensive the benefits delivered are, and how they reach all areas of Scottish society in a variety of ways.

The example below illustrates two categories of benefit – better resource allocation and more informed policymaking – and the related examples that contribute to the Health Outcome.



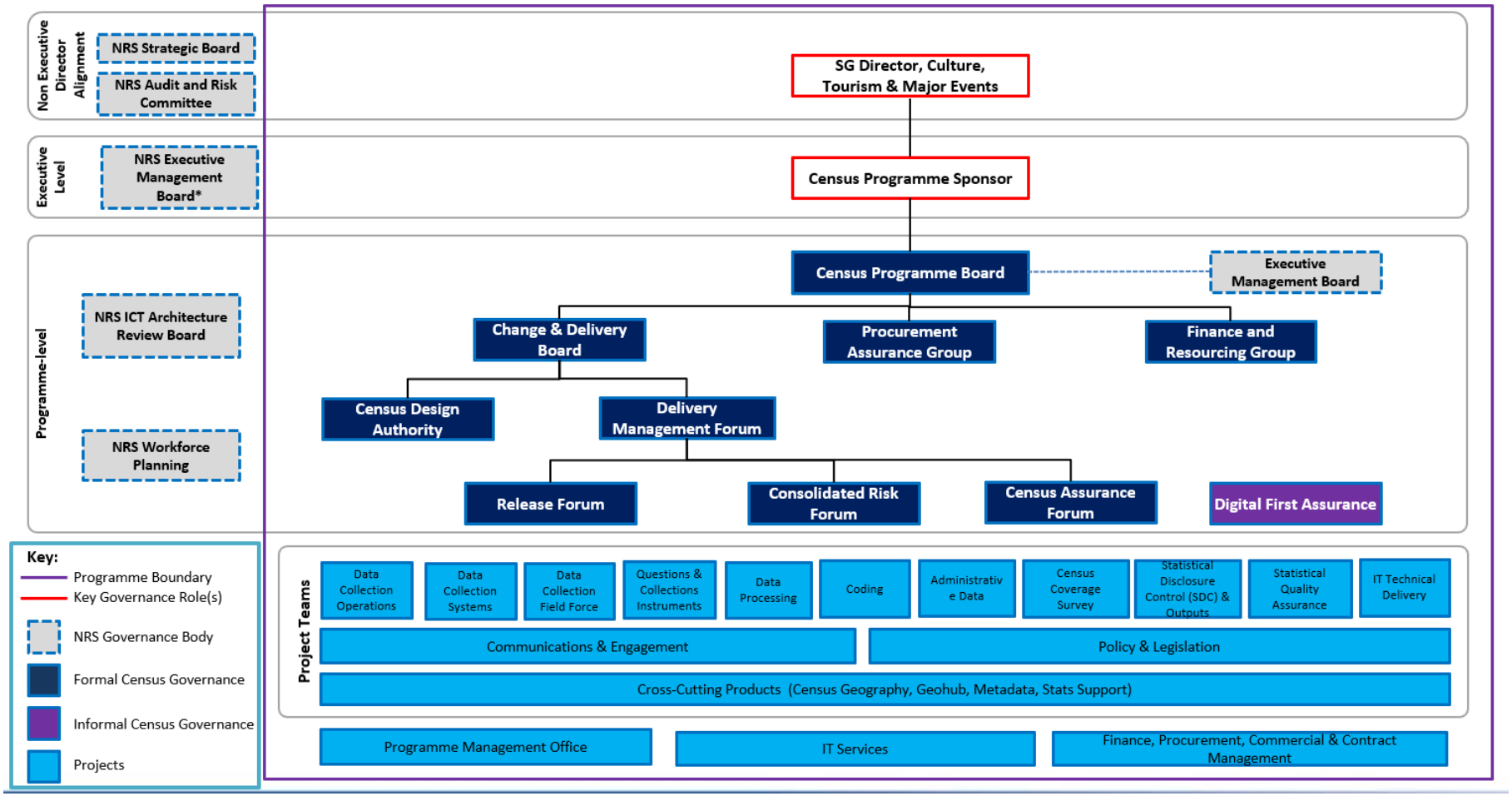
Appendix F – Supplier costs

Contract Title	Supplier	Total Contract Value
Print Logistics and Paper Capture	APS	£17.3m
Online Collection Instrument	CACI	£10.3m
Data Collection Operational Management System	CACI	£8.1m
Mobile Workforce Management	XMA	£7.1m
Print and Post Service	Royal Mail	£4m
Contact Centre Services	Arvato	£3m
Field Force Recruitment & Payroll Services	Pertemps	£2.3m
Others	various	£8m

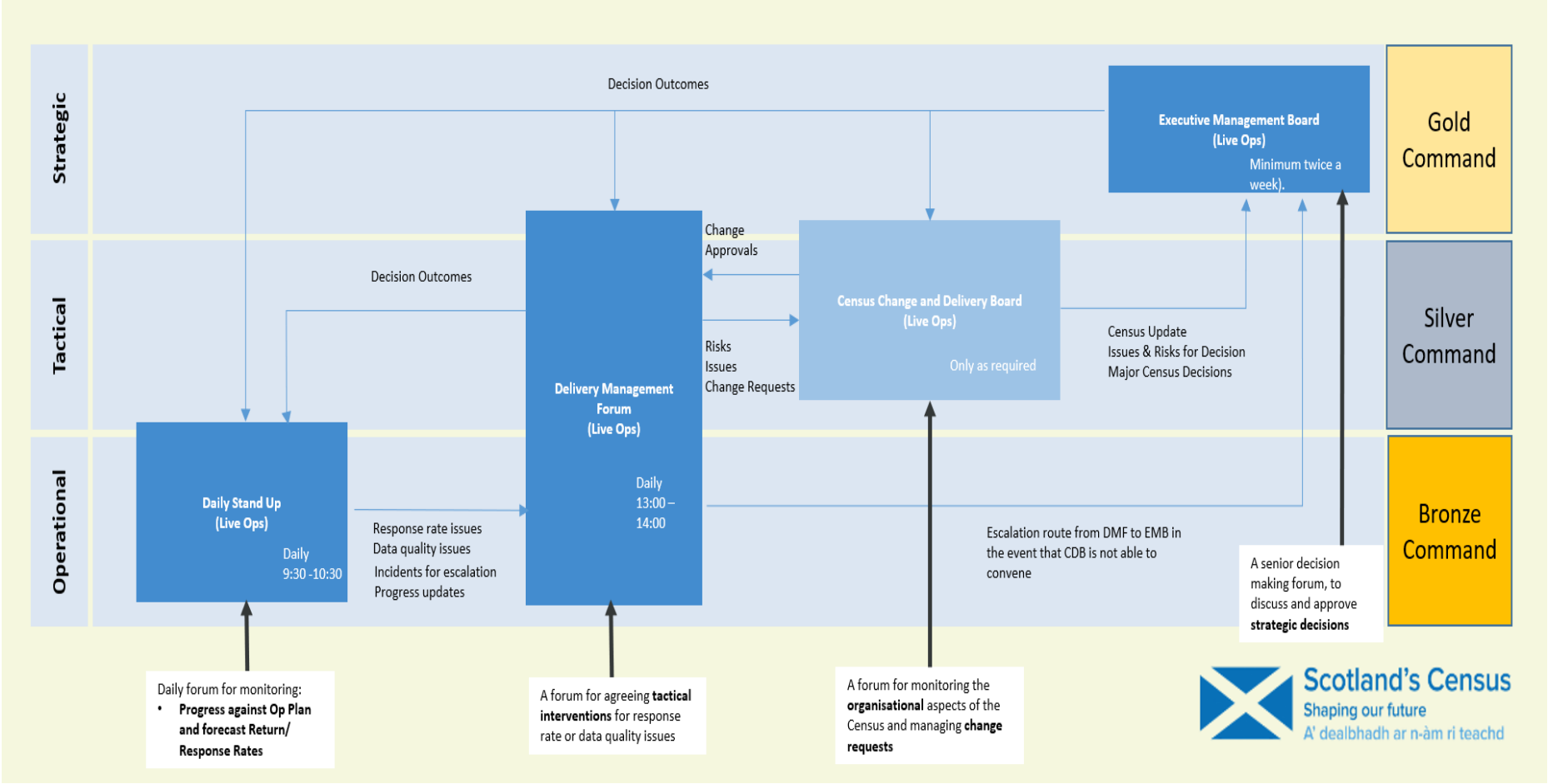


Appendix G – Census programme governance structure

Delivery phase



Live Collect phase



Appendix H – Glossary of terms

Administrative Data - information collected primarily for administrative (not statistical or research) purposes. This type of data is collected by government departments and other organisations for the purposes of registration, transaction and record keeping, usually during the delivery of a service.

Barnett formula - used by the UK Treasury to calculate the annual block grants for the Scottish government, Welsh government and Northern Ireland executive. It therefore determines the overall funding available for public services such as healthcare and education in the devolved nations.

Bias - indicates a potential systematic difference between our estimate and the true population. Bias due to the sampling of the Census Coverage Survey (CCS) has been measured by calculating the difference between the national estimate and the average estimate from the bootstrap resamples used in calculating variance. There are other sources of bias, such as dependence between the census and CCS or over-coverage within the census, which we have corrected for within our estimates. Availability of definitive comparator sources makes it very difficult to estimate any other residual bias in the estimates.

Capture - the process by which a return is converted into a suitable electronic format (in the case of paper returns) and is matched to an electronic template ready for coding.

Census - the official count of every person and household in the country on a given day.

Census Address Register - a dataset containing a list of all census addresses and their sub-addresses.

Census Coverage Survey - a voluntary, independent, post-enumeration, representative, sample survey used during coverage adjustment to produce population estimates.

Communal Establishment - a managed residential accommodation where there is full-time or part-time supervision of the accommodation.

Digital Scotland Service Standard - a set of 14 criteria that all organisations developing public services in Scotland should work towards.

Field Force - individuals working as part of a team who deliver census enumeration strategy and encourage and assist members of the public to complete the census.

Internet Access Code (IAC) - linked to an enumeration address or enumeration sub-address and is provided to the respondent. This can be either a household or a communal Establishment enumeration address or enumeration sub-address. The IAC is used by the respondent when they log into the online instrument and associates the response with an enumeration address or enumeration sub-address. An enumeration address or enumeration sub-address can have more than one IAC.

Labour Force Survey (LFS) - a study of the employment circumstances of the UK population. It is the largest household study in the UK and provides the official measures of employment and unemployment.

NISRA - Northern Ireland's census is run by the Northern Ireland Statistics and Research Agency (NISRA).

Non-Response Follow Up (NRFU) - sometimes referred to simply as 'follow-up' and had two forms: letter and visit. NRFU was flexible and depended on several factors, including but not limited to area characteristics, immediate area return rate, local authority return rate and estimation area return rate. The type of NRFU (letter or visit) was also flexible and dependent on several factors, including area characteristics, previous NRFU activity and time since census day.

Office for National Statistics (ONS) - the UK's largest independent producer of official statistics and the recognised national statistical institute of the UK. The census in England and Wales is run by the ONS.

Outputs - all numbers, tables, graphs, maps and text that show or describe the results of the census. This includes all supporting information and metadata.

Post out - the delivery method by which print products e.g. contact materials and paper questionnaires were delivered to an enumeration address / sub-address.

Processing (data) - the act of taking the information provided on paper and from online questionnaires through an established set of procedures to produce the census results for publication.

Registrar General for Scotland - one of the statutory titles of the Chief Executive of the National Records of Scotland

Rehearsal - a major public rehearsal exercise that tested some of the systems and services to be used in the main census event.

Response rate - the total number of usual residents whose details were completed on a returned questionnaire, divided by the estimate of the total number of usual residents.

Return rate - the number of household questionnaires returned as a proportion of the total active household questionnaires that were in circulation (active refers to all households where the address hadn't been deactivated by the field staff during field operations). Return rates were used during the census field operation to target field staff resources to the lowest responding areas.

Routing - ensures that respondents only answer relevant questions, based on their answers to screening/previous questions. In automatic routing, respondents skip a question without seeing the question they are skipping.

Usual resident - an individual who is a usual UK resident whose usual place of residence is in an individual household, and not in a Communal Establishment.