

## Executive summary

The Census of Population and Housing is the most important single source of information about the size and characteristics of the country's most valuable resource - its people.

The 2011 Census programme conducted a census in England and Wales in March 2011 and the resulting outputs provide information on the number and characteristics of people and households. This information is invaluable for central and local government to develop policies and to plan and run public services, such as health and education. The outputs are also widely used by academics, businesses, voluntary organisations and the public. It is also used as a reference base for many statistical series such as population estimates and projections and sample surveys.

Running a census is a vast and complex undertaking. Years of planning and testing went into preparing for the field operation: questionnaires had to be designed, tested, printed and sent to over 25 million households in England and Wales; we ran the largest government marketing campaign that year; and 35,000 temporary field staff were employed to help people to complete their census questionnaire. Systems to process this data, quality assure it, carry out statistical analyses and produce and publish statistical data sets that users want, had to be designed and built.

The Office for National Statistics (ONS) started releasing data from the 2011 Census in July 2012 and since then has published over 600 data sets, with over 8 billion cells of data. By March 2014, ONS had 2.3 million page views for 2011 Census data online, over 500,000 page views of the census analyses and over 600,000 page views of the census data visualisations.

Online publishing has not only made the 2011 Census more accessible to the wider general public, technological developments have enabled ONS to present data in more innovative ways, including infographics and data visualisations.

This report contains a wealth of information to support the conclusion that the 2011 Census has been a success. The significant reasons for success were that the 2011 Census programme:

- was planned with the end user in mind and was clear about the benefits that had to be realised. The entire programme worked to a shared vision – the census helps tomorrow to take shape – which recognised how the statistical outputs are used. This vision underpinned our 2011 Census brand, our actions and how we communicated with our stakeholders and the general public
- started with agreed and shared success criteria which were used to design and drive decision making. Continuous monitoring of progress, evaluations from tests and rehearsals and lessons learned, as well as having sufficient people with the right skills and experience, all contributed to the success
- recognised the importance of stakeholder engagement and developed partnerships with local authorities and community organisations. Their understanding of their local areas and communities was a key contributor to the success of the census and they promoted it through their communication channels and ran over 6,000 events to help promote the importance of the census, and
- ensured that the confidentiality and security of the information collected in the census was a matter of the highest priority. There were no significant security incidents in the course of the census field operation and since,

which is a reflection of sound planning and risk management with good mitigations in place

In addition, given the recommendation by the National Statistician about the need for a 2021 Census (chapter 11), this will be an invaluable reference source when considering the design and development of that census.

## Introduction and background (chapter 1)

The planning and design of the 2011 Census took account of lessons learned from the 2001 Census and the changes in society that were expected between 2001 and 2011. Societal changes included: an increasingly ageing population; a more mobile population with more complex living arrangements; increasing numbers of migrant communities; greater numbers of people generally, and more single-person households and dwellings with multiple household occupation.

Noting these and many other comments from users and stakeholders arising from the 2001 Census, the design of the 2011 Census was based on a number of broad strategic aims:

- to give the highest priority to getting the national and local population counts right
- to build effective partnerships with other organisations, particularly local authorities, in planning and executing the field operation
- to provide high quality, value-for-money, fit-for purpose statistics that meet both user needs and inspire user confidence, and which are as consistent, comparable and accessible across the UK as is possible
- to maximise overall response rates and minimise differences in response rates in specific areas and among particular population sub-groups, and
- to protect, and be seen to protect, confidential personal census information

## Consultations and stakeholder management (chapter 2)

A census – which encompasses the whole population – has an exceptionally large number of stakeholders with varying degrees of influence and interest. For the 2011 Census, ONS took a more consistent approach to communicating with stakeholders than it had done in previous censuses. In particular, a programme of local authority liaison was initiated with the aims of:

- raising local authority awareness and understanding of the census and the role that local authorities can play in delivering a successful 2011 Census
- building confidence and trust in the census methodology and the resulting outputs, and
- encouraging their participation and support for the census, and in doing so contributing to maximising coverage of the 2011 Census

In addition, an intensive programme of community liaison built on the innovative community liaison activities undertaken for the 2001 Census.

ONS maintained regular contact with users through a variety of means including the long standing Census Advisory Groups. These represented the interests of users in central and local government, the health service, the academic community, the business sector, organisations with interests in diversity, religion, ethnicity and special needs, and users in Wales. Increased emphasis was given to particular requirements in Wales. In particular, a

Transfer of Functions Order, made in 2006, transferred the responsibility for making census Regulations in Wales from Westminster to Welsh Ministers, and provided the Welsh Assembly with the right to be consulted on the content of the census questionnaire.

A number of public consultations were carried out to determine user requirements for information to be collected from the census (particularly from those questions relating to ethnicity, identity, religion and language), and the geographic bases for presenting the census output.

As a result, new questions were included on national identity, passports held (as a proxy measure of citizenship), year of entry into the UK and length of intended stay, language, second address, number of bedrooms and type of central heating. Some of the regular questions were expanded to reflect both legislative and societal change since 2001, such as the extension of the question on marital status to include civil partnership, and the inclusion of tick-box response categories in the ethnic group question to identify Gypsy and Irish Travellers, and Arabs.

## Post-out and address register development (chapter 2)

Following the successful trial of posting out census questionnaires in the 2007 Census Test, ONS adopted post-out as the prime means of questionnaire delivery for the 2011 Census. Consequently a comprehensive, high quality address register for all areas of England and Wales was a crucial pre-requisite, enabling questionnaires to be uniquely identified and linked to an address before the operation started.

However, none of the three national address products available at that time met ONS quality targets, so ONS had to construct its own address register specifically for the census. To build this the best parts of the national lists were pulled together: Royal Mail's Postcode Address File (PAF) and the National Land and Property Gazetteer (NLPG) maintained by local government. The address list used was extracted three months before census day, but included some properties under construction that were expected to be built by census day.

## Publicity (chapter 2)

Every census presents a unique challenge to marketing communications as it necessitates engaging with every household in England and Wales and motivating them to fill in their census questionnaire. The success of the census depended on making contact with every household in England and Wales, and the target audience for the publicity campaign was, effectively, everyone. The increasing diversity of households, however, made such contact difficult for key population groups such as ethnic minorities, migrants and young adults – which are some of the very groups for which census information is critical.

A key finding from 2001 and subsequent research was that a large section of the population will willingly complete the census if they understand both what it is, and their obligations as a citizen. The recommendation for 2011 was to allocate resource where it was most required, communicating to some extent with the undecided, and to a much greater extent with the hard-to-reach groups.

The creative platform for the 2011 Census campaign was the '*Help tomorrow take shape*' concept. This simple call to action was literally an invitation for everyone to participate in shaping the future of their local environment, in everything from key services such as health and education to local parks and facilities.

## Outsourcing (chapter 2)

As with the 2001 Census, ONS contracted out a number of services. The value of outsourcing some census activities and processes to external suppliers is that such organisations bring with them considerable technical experience and expertise. Given the 10-year cycle of the census, and the short timetable requiring a large temporary workforce, it would not have been appropriate for ONS to recruit and train such personnel itself.

The activities that were outsourced in 2011 covered:

- the recruitment, training and payment of field staff\*
- the printing of the questionnaires
- the delivery of questionnaires\*, and the collection of completed returns via a postal service
- the design of a questionnaire-tracking system\*
- the provision of an online questionnaire completion system\*
- a contact centre
- the translation, printing and distribution of non-questionnaire material and other field logistics services
- the publicity campaign
- the capture and coding of census data in electronic format
- the production of the archival records; and
- the development of a web data access system\*

Activities marked with (\*) were those newly outsourced for the 2011 Census.

## Collection of completed returns (chapter 3)

For the first time in England and Wales, the 2011 Census offered households and individuals the opportunity to complete their return online, as an alternative to the traditional paper questionnaire. Some 16.4 per cent of returns were completed through the secure online census; the majority of completed questionnaires were returned by post, as had been the case in 2001. The online service was regarded as a success, providing a number of benefits to the data collection operation:

- it met the expectations of both the public and census stakeholders for an online questionnaire
- it provided an environment in which the security of the census information could be better protected
- it improved overall responses by offering an alternative to householders who may have been less inclined to complete a paper questionnaire
- it delivered a more accessible census for the disabled community; and
- it avoided the need to scan and capture a significant proportion of the returns, thereby speeding up, and reducing the cost of, data processing

There was an intensive programme of following-up households from which a completed questionnaire had not been received – an essential stage in ensuring the census met its overall quality targets. Posting out of questionnaires enabled the field operation to be designed around the follow-up activity and to focus more resources on non-responding addresses. To facilitate this, a questionnaire tracking system was developed that allowed accurate assessment of the enumeration progress in real time, which meant that field staff could be directed to the areas and addresses where they were most needed.

Special enumeration procedures were adopted to deliver and collect questionnaires from communal establishments and special accommodation sites such as caravan parks, marinas, Gypsy encampments and from special population groups such as rough sleepers.

ONS achieved its 2011 Census response rate targets. The overall response rate was 94 per cent with at least 80 per cent in all local authority areas. In addition, fewer than 5 per cent of local authority areas had a census response rate of less than 90 per cent.

## Census Coverage Survey (chapter 4)

A Census Coverage Survey (CCS) is the main way to check the extent and distribution of any under (or over) count in a census. The 2011 CCS was a separate sample survey carried out over a three to four-week period after the field work for the census itself had been concluded. It took the form of a short interview to check on the coverage of households and people within households, and to collect some basic demographic characteristics (such as age, sex, marital status, ethnic group and economic activity). The information obtained from the survey was used, in conjunction with the census data, to produce a consistent set of census results fully adjusted for under (and over) coverage.

The design and implementation of the 2011 CCS closely followed the successful 2001 CCS, which had achieved a 90.8 per cent interview completion rate. Improvements were implemented for 2011 such as extended fieldwork for low response areas, and greater flexible working hours for interviewers to contact household members. This led to a 90.4 per cent interview completion rate in 2011, despite the sample being skewed much more towards harder-to-count areas than had been the case in 2001.

## Data processing (chapter 5)

As was the case in 2001, the 2011 Census was processed in three main phases:

- *Input processing* – which comprised the main data capture and coding stages
- *Downstream processing* – the edit and imputation stage conducted in parallel with the coverage assessment and adjustment process, and concluding with statistical disclosure control measures
- *Output processing* – the creation of an outputs database, from which all of the census results were produced

Data processing began by scanning the questionnaires and automatically capturing their data. The data were validated to ensure that the values for each question were within the range specified in the relevant coding frame and that there were no duplicate responses. Coders assigned numerical values to written text and ticked boxes, applying coding rules and standardised national coding frames, such as SIC07 (Standard Industrial Classification 2007) and SOC2010 (Standard Occupational Classification 2010).

Respondents to any census sometimes make mistakes in their answers. This results in missing data or invalid responses which are inconsistent with other values on the questionnaire. An edit and imputation method was used to correct inconsistencies and estimate missing data while preserving the relationships between census characteristics.

The coverage assessment and adjustment operation helped ONS to adjust for the number of people and households not counted in the 2011 Census. The extent of this under counting was identified using the post-enumeration Census Coverage Survey (which covered

approximately 340,000 households). Standard statistical estimation techniques were then used to produce an adjusted database from which the final census results were produced. These results also formed the new 2011 base for the mid-year population estimates produced by ONS.

Quality assurance (QA) procedures were built into all stages of data processing and the 2011 Census estimates were subject to a rigorous QA process to ensure they were plausible and of the right overall magnitude.

Overall the methods and data sources used to capture, clean, validate and quality assure the census results were transparent and gave users confidence in the process and hence the census results.

## Confidentiality and security (chapter 6)

ONS recognises that the public needs to be confident that personal information collected in the census will be held securely. As in previous censuses, assurances were given to the public that all the information provided would be treated in strictest confidence.

An independent information assurance review was carried out prior to and during the census operation, covering a wide range of planning, management and implementation activities. The review team noted that, from the outset, ensuring the protection of personal information provided by the public had been a core objective in planning the 2011 Census. They concluded:

*“As a result of our review, we are very satisfied that the three Census Offices are managing Information Assurance pragmatically, appropriately and cost-effectively. We are, therefore, confident that they are capable of delivering their IA objectives and that information will be held in secure environments and that it will be handled in line with best practice and Government standards. The public can be assured that the information they provide to the 2011 Censuses will be well protected.”*

The information collected in the 2011 Census is used solely for the production of statistics and statistical research. ONS applied a statistical disclosure control process that modified some of the data before the statistics were released. The method employed was record swapping, which always introduces some uncertainty as to whether the value of any given small count is the true value. These measures proved satisfactory for protecting statistical confidentiality within the published census outputs. The level of detail available was slightly less (in terms of number of rows and columns) in many tables compared with equivalent outputs in 2001 but it did have the advantage of providing considerably more detail through the inclusion of small counts.

## Output production dissemination and analysis (chapter 7)

The 2011 Census provides the most complex and comprehensive set of information about the population ever produced. The recent growth in the demand for information, especially through the internet and social media, has encouraged a high user expectation regarding content and delivery that includes collaboration and user participation.

The ultimate benefits of the census are only realised when the users of census data make use of the published outputs. Therefore the investment of time and resources in a census can be justified only if the results are made accessible and the outputs produced meet users' needs.



The vision for 2011 was that the web would be the primary dissemination route, and would offer users easy navigation and functionality to customise outputs, charting and thematic mapping. To achieve this, existing ONS web services were enhanced and a Web Data Access programme initiated to provide new functionality in the ONS website. These channels were the primary vehicle for the publishing of the census standard products comprising over 600 data sets, with over 8 billion cells of data. Considerably more than the 360 data sets published from the 2001 Census at the same relative time 10 years ago.

Technological developments have enabled ONS to present data in more innovative ways, including infographics and data visualisations. Infographics in particular are an effective way to summarise census data and highlight key insights. Similarly, data visualisations allow users to explore different variables and have more control over what they want to see. As a result 2011 Census data is more relevant to a wider audience, as evidenced by the large numbers viewing the data and using the online tools.

ONS has aimed to meet users' requirements for statistics at varying levels of detail, for a number of geographies, subject to the overriding requirement to protect statistical confidentiality. These geographies have been created essentially from the same building bricks as in the 2001 Census – the output areas (OAs). These are the smallest area for which census statistics (other than simple head counts) can be released without being disclosive.

ONS has again produced more specialist products including samples of anonymised records (SARs) (often referred to as 'microdata files') and origin-destination statistics.

The 2011 Census analysis programme improved on previous censuses by publishing timely and informative analyses of census data. This programme was overseen by an ONS team responsible for the co-ordination, development, publication and timing of analytical outputs. To achieve this they worked closely with the team that was consulting users on their needs and helping to specify the outputs. Five main approaches were taken to producing analysis that showcased census data: stories, summaries, infographics, video podcasts, and interactive content. Chapter 9 includes selected analyses on census topics.

## Data quality (chapter 8)

The success of any census hinges on producing relevant results to sufficient quality when they are required. Informing users about the quality of the data, and hence its limitations, is also crucial to aid user interpretation and understanding of the results.

Various indicators of data quality were used to guide the 2011 Census programme in its design and decision making. The overall aim of these indicators was to do at least as well as similar measures in 2001. In summary:

- the 95 per cent confidence interval achieved on the population estimate was +/- 0.15 per cent (83,000 people), much narrower than the confidence interval in 2001 of +/- 0.21 per cent (+/-109,300 people) indicating more accurate population estimates
- 97 per cent of local authorities had a 95 per cent confidence interval of +/- 3 per cent or better, compared with 94 per cent of local authorities in 2001
- the overall response rate for England and Wales in 2011 was 93.9 per cent, slightly better than the 2001 overall response rate of 93.7 per cent, and

- all LAs had a response rate above 80 per cent and only 13 had a response rate below 90 per cent, compared with 2001 where 13 local authorities were below 80 per cent and 38 were below 90 per cent

Based on these indicators the overall aim to maintain or improve data quality compared with 2001 has been very successful. Bearing in mind the trend of declining response to, and participation in, social surveys and previous censuses over the last three decades, these were challenging targets which the census has met.

## Evaluating the 2011 Census (chapter 10)

This General Report contains information about the planning, conduct and results of the 2011 Census in England and Wales. It has noted that many aspects of this census were innovative and were successful, including:

- better engagement with users and stakeholders, particularly local authorities, which engendered higher levels of support and confidence in the census
- development of a purpose-built address register to facilitate mail-out of questionnaires and improve management of the field operation, including questionnaire tracking
- use of a reduced and more flexible and specialised field force, to enable more resource to be focused on achieving increased response rates in hard to enumerate areas
- introduction of a secure online census
- improvement in overall response and successfully reducing the variation of non-response across all local authorities, and
- more flexible dissemination of an increased range of census results and analysis across the suite of ONS websites

It also reports that there were, as is always the case in any census, a number of challenges and lessons to be learned for any similar census operation in the future. The main conclusions from the evaluations of several major and innovative elements of the 2011 Census Programme are summarised in themes, including:

- programme management and governance
- the development of an address register
- stakeholder management and the parliamentary process
- data collection and the field operation
- data processing and statistical methodology
- output, content production, and dissemination

## Beyond 2011 (chapter 11)

Given the significant sums of public money spent on each census, ONS carries out regular investigations into the need for collecting such information, and the effectiveness of any alternative methods. Such reviews were, for example, carried out prior to both the 2001 and 2011 Censuses.

During the build-up to the 2011 Census, ONS set up another review programme to assess whether any of the alternative means of collecting census-type information were now viable. Together with National Records of Scotland (NRS) and the Northern Ireland Statistics Research Agency (NISRA), ONS initiated a 'Beyond 2011 Project' to test other models for



producing future population and socio-demographic statistics. Improvements in technology and in government data sources offered the opportunity either to modernise the census or to develop an alternative approach based on re-using administrative data which is already held within government.

Extensive consultation with users helped to inform assessment of the options, as well as the National Statistician's final recommendation that:

- an online census of all households and communal establishments in England and Wales should be carried out in 2021, as a modern successor to the traditional, paper-based decennial census, taking special care to support those who are unable to complete the census online, and
- there should be increased use of administrative data and surveys in order to enhance statistics after 2021 and improve statistics between censuses