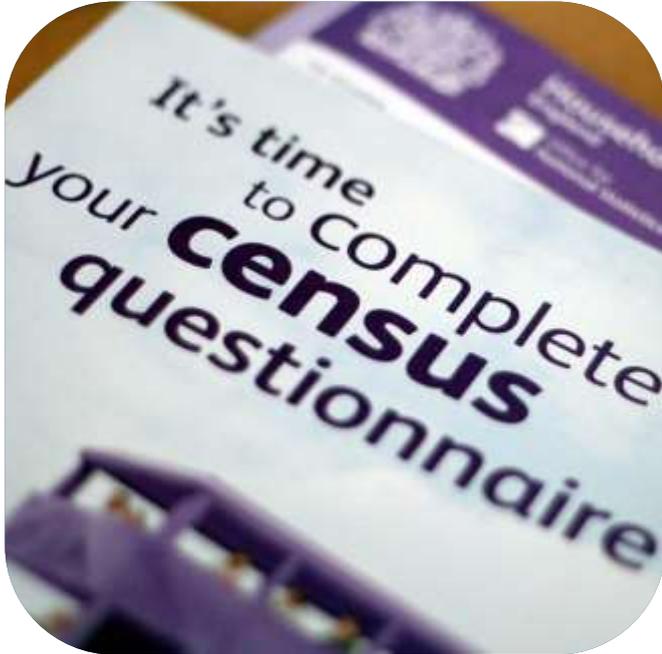


Creating the building blocks of the census with innovative methods for UK population data



Summary

The 2001 UK Census used a new geospatial methodology for small geographical output areas which transformed how population data is used in the UK.

As well as underpinning the 2011 and 2021 censuses, Output Areas have enabled government, businesses and communities to make better decisions, operate more effectively, and target services and support to areas and population groups that need them.

Challenge

Every ten years since 1801 (except 1941) there has been a national UK census, collecting data on the location and characteristics of households, including the type of property and who lives there, where people work and how they get there and other socio-economic characteristics such as income, health and ethnicity.

Although the same questions are asked across the whole country, geographical areas could not be compared spatially or over time because enumeration districts varied in size and boundaries changed over time.

Solution

Professor David Martin (University of Southampton) developed a technique that analysed the data from the 2001 Census to produce a geospatial structure for that data. Output areas enabled local areas to be assessed on a more directly comparable like-for-like basis.

This was done by creating small geographical 'building blocks' from which census data is aggregated and reported independently of the enumeration districts. The 200,000 small geographical Output Areas, each containing around 300 people, are automatically generated based on post-code territories.

Output Areas have a consistent population size, homogeneity of households, and can be [updated in response to population changes](#). This means that geographical patterns of inequality, ethnicity and housing situation are more easily identified and tracked over time. Output Areas can also be aggregated for comparison at larger scales.

Output Areas have been [pivotal to the Census methodology](#) and contemporary population geography in the UK since their first use in the national census of 2001. They were maintained with [updates for the 2011 Census](#) (2.6% of OAs merged, split or reformulated) in response to changes in population and local authority boundaries.

OAs were also used as the basis of the Workplace Zones geography, created for the publication of data about workers and workplaces, and more directly as the platform for ONS outputs including population flow data and microdata.

The ONS [plan to use output areas](#) in the 2021 census as the lowest geographical area at which data are shared, interpreted and used to make decisions.

Benefits

Combining systems and data

One of the key benefits of creating Output Areas was the creation of digital boundaries for use in Geographic Information Systems. As a result, Output Areas have become a fundamental building block of demographic location-based data analysis in the UK.

Linking and comparing information by its location facilitates analysis and decision-making that better recognises variation and similarities between places, which in turn allows for more precisely targeted policy interventions or decision-making. The [AZTool](#), which generates Output Areas from census Enumeration Districts according to parameters such as population size and age distribution, was developed with Dr Sam Cockings and Andrew Harfoot (University of Southampton).

This [was used in the development of the UK 2011 census](#), enabling the collection and analysis of raw census data. AZTool and OAs later underpinned the creation of [Workplace Zones](#), a geographical framework developed with ONS and DfT for workplace-related data.

In one use case, [NHS Digital](#) has used Output Areas to structure large datasets generated from healthcare institutions across the country, allowing disparate indicators and datasets to be aligned and analysed on a geographical basis. This supports the targeting and delivery of healthcare, and helps identify how and why health outcomes vary spatially.

Better decisions

Output Areas are used to structure data and as a tool for informing decision-making across a wide variety of applications. Some examples include:

- Bristol Council’s use of data on tenure patterns to allocate affordable housing resources to deprived areas, and to estimate the prevalence of women subjected to FGM, and target advocacy and support to end the practice. This and other examples were included in the Society’s [collection of short case studies](#) of small area data use in 2014.
- The HMCTS & NAO used OAs in their analysis of the impact of proposed closures to inform decisions on jobcentre estate changes. [See our case study here](#).

- Structuring demographic data in research, such as [work on spatial determinants of health outcomes](#).

Raising awareness

Well-structured data improves public access to useful information. From 2014 to 2017, the ONS Neighbourhood Statistics Service delivered data via a web-based data explorer to support school governors, GPs, church volunteers, charity workers and others in better understanding their local communities. This data is still available via the [ONS](#) and [NOMIS](#).

Businesses and researchers have built innovative and informative applications and websites structuring data using Output Areas, such as the UCL and ESRI-created [Datashine](#) website which maps 2011 census statistics for the public to explore and use.

Making predictions

Professor Martin’s work has now [been extended](#) to near-real-time population modelling using OAs as centroids, and beyond into [dynamic time-specific population modelling](#) and near-real-time modelling to improve security and emergency responses. These tools and implementations fundamentally improve the interoperability, visualisation potential and understanding of population data.

Further reading

The RGS-IBG policy briefing with output area case studies ([upload](#))

Our event on small area population statistics, part of Society engagement with the ONS consultation process and debates in 2013

[Overview](#) of ONS Census geography -

You can read the [ONS’ introduction to output areas](#) here

[Short information](#) on the original 2001 OAs

[The work of the Geodata group](#) within the Department of Geography at the University of Southampton

The archived webpage from the journey time model work [is available here](#).