Beyond the 2011 Census in the United Kingdom

With an international perspective

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The recent census in the UK, taken in March 2011, may also have been our last – since the Office for National Statistics has announced that it intends to explore alternative more cost-effective options for 'census taking' in the future. In this paper, we consider what the options may be, based on approaches and experiences from other countries, and assess their implications for users. We start by reminding ourselves about the value of the census and the strengths and weaknesses of the current approach. We then identify the principal methods being followed in other countries, together with their advantages and disadvantages. This leads us to review methodological work in the UK, building up to the current 'Beyond 2011' ONS project. We focus on administrative records as a possible way of removing the need for a full population survey. Finally, we assess the options and discuss the implications for users in market research.

Introduction

The Census of Population has underpinned survey research in the UK for more than 30 years. Geodemographic classifications were pioneered in the UK in the mid-1970s, using 1971 census results, and launched into the research industry at the 1979 MRS Conference (Bermingham *et al.* 1979). At the time of starting to write this paper, we are in the final countdown to the 2011 census, which 'survived' the 2010 Treasury Spending Review

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unscathed and is due to provide a new generation of outputs commencing in the second half of 2012.

However, 2011 may mark the last ever traditional census in the UK, since the Office for National Statistics (ONS) has announced that it intends to explore alternative options in order to replace the full population survey method by a more cost-effective approach.

The purpose of this paper is to identify future options for the UK, and to assess their implications for users in the commercial sector, drawing on experiences of how 'census taking' is approached in other countries.

The importance of the census

The value of the census cannot be overstated – no other resource provides an equivalent demographic snapshot of the population, taken at a single point in time, by a consistent method, across all areas in the UK.

Census information is collected once and used many times by organisations in the private, public and 'not for profit' sectors, for targeting resources and reducing wastage. It is also widely used by the academic sectors for social and geographical research.

Census outputs are primarily employed by commercial companies to underpin decision making and target resources at local area level, for applications such as:

- targeting local markets – it is critical for retailers to select site locations that will yield the best return on investment in their store networks, and similarly for advertisers and marketers to target their promotional activities (see, for example, Sleight 2004)
- targeting households and individuals – geodemographic classifications such as ACORN, MOSAIC and OAC are driven primarily or exclusively by small area census statistics; their applications are widespread (see, for example JMRS 1989; Webber & Longley 2003; Harris *et al.* 2005)
- designing market research surveys – the census can be used in a variety of ways for survey planning, sample selection and control (see, for example, Lynn & Lievesley 1992).

Current approach

A decennial census has been carried out in Britain for the last two centuries. The UK follows a traditional approach to census taking, under

which census forms are delivered to all households for self-completion and return.

The data collection method has evolved over the decades – for example, until 1991, census forms were delivered and collected by a field force of enumerators who were specially recruited for the task. In 2001, enumerators delivered the census forms and followed up non-returns, however the bulk of completed forms were returned by post. In 2011, both delivery and return of forms are postal, with enumerators focusing on chasing non-returns. The 2011 census also introduces the option of online form completion for internet users.

Census strengths and weaknesses

The census has a number of strengths, which arise from its unique nature.

- It provides a snapshot of the entire population at one point in time.
- It collects consistent information across the UK – although there are minor variations in question topics between the different countries of the UK, the core questions and data collection methods are common.
- Geographical areas may be reliably compared, at varying levels of granularity down to Output Areas (OAs) of around 120 households.
- Successive censuses in similar formats provide possibilities for making comparisons over time – around 95% of OAs should be unchanged between 2001 and 2011, enabling time comparisons to be made at small area level.
- Answers from several questions can be cross-analysed and reported by area.
- New variables can be derived at individual or household level – for example, an approximation to Social Grade was derived for the 2001 census, based on an algorithm supplied by the MRS (see Meier & Moy 2004), and this work is due to be repeated for 2011.
- Researchers can access micro-data from the census in the form of Samples of Anonymised Records (for both households and individuals) in order to produce their own analyses more flexibly, including multivariate analysis (see Dale *et al.* 1995).
- The main census outputs are available free of charge, in order to encourage their use as part of the 'knowledge economy'.

At the same time, there are a number of inherent weaknesses.

- Census taking is carried out only once every ten years and so results become out of date, particularly in areas of change. This is a major issue in a world of increasing population mobility, cross-border flows and economic migration.
- There is typically a two-year processing time before full outputs are published – mainly because the data for missing households and individuals have to be imputed, and the census results are then checked and reconciled with population estimates from other sources.
- There are obvious limitations in the number and types of question that can be asked in a self-completion survey that relies on public participation. For example, the census form does not include an income question, due to concerns about how this could affect response rates.
- Outputs are mainly pre-designed tables – bespoke outputs take more time and cost more to produce.
- Individual-level data cannot be matched with other sources – the census is a 'stand-alone' survey.

Drivers of change

Soon after its election in May 2010, the current government declared aims to cut costs and reduce the intrusiveness of the census. According to the *Daily Telegraph* (9 July 2010):

> Francis Maude, the Cabinet Office minister, said the Census, which takes place every 10 years, was an expensive and inaccurate way of measuring the number of people in Britain.
>
> Instead, the government is examining different and cheaper ways to count the population more regularly, using existing public and private databases, including credit reference agencies. It will represent a historic shift in the way that information about the nation's population, religion and social habits is gathered.

Independently of the government, the Census Offices have been experiencing the difficulty of measuring an increasingly mobile and rapidly changing population.

The ONS 'Beyond 2011' project, initiated in 2009, plans to develop proposals for an alternative approach that addresses the key drawbacks identified above (ONS 2010). The project has received government funding for its implementation.

The next section of this paper explores the different approaches to census taking in other countries, and some of the innovations that have been introduced.

We then focus on the UK and review recent methodological work in greater detail, leading to some possible options that the Census Offices may decide to explore. Finally, we assess these options and consider their implications for market researchers and other commercial users of census data.

Census taking around the world: the different methods being followed and considered

Before looking beyond the 2011 census in the UK it is helpful to understand why and how censuses are conducted in other countries. This will inform the principal methods of census taking and the practical experience that has been gained. We also look at the trends in census taking over the last decade and new developments being explored internationally.

Our focus is mainly on the European Union but other countries, especially those in the United Nations Economic Commission for Europe (UNECE), are also mentioned, particularly where they do things in a different way from the UK and where lessons may be learned.

It has not been possible to explore every aspect of censuses that might be of interest to readers. In particular, aspects such as output geography, census access and distribution agencies, though important, have been beyond our scope. The reader is referred to the Geodemographics Knowledge Base (GKB 2011) for the latest information on these topics.

Census drivers

Let us first consider why countries conduct a census, and review some of the international influences on census taking.

Reasons for conducting a census

National population censuses have a long tradition in Europe and date back to the 17th century (census taking in one form or another can be traced back to antiquity in some parts of the world). They are the only statistical form of investigation that can produce an accurate quantitative picture of the population structure, households and socio-economic conditions of a country at a local level.

Historical overview

During the second half of the 18th century, the Nordic countries were already conducting censuses on a regular basis. By the middle of the 19th century, census taking was institutionalised in most European countries. However, it was not before the Belgian census of 1846 that the main principles of census taking were introduced and internationally acknowledged – the principles being self-enumeration of the whole population with household and individual questionnaires based on scientific methods.

During the 20th century, the population census as one of the main statistical tools became widely adopted throughout Europe. There was also steady growth in terms of the breadth and depth of topics covered by censuses.

Since the 1970s, increasing problems with response rates have prompted some countries to look for alternatives to the traditional questionnaire-based data collection. More recently, pressures from changing user demand and the need to reduce costs have accelerated this trend. In some countries social surveys were introduced as a substitute for the census, while, in others, the already good administrative registers were improved in order to allow for statistical exploitation.

International influences

In the middle of the 19th century, the European and American states agreed on uniform methods for population censuses. Since that time, in all European and most other countries, population censuses have been carried out regularly. From its foundation, the United Nations has recommended national governments to hold population censuses at the end or beginning of each decade (United Nations 2008).

Most countries thus undertake population and housing censuses at least once every ten years. The UN Statistics Division (UNSD) estimates that 223 countries will have conducted a census during the course of the current round 2005–2014 (UNSD 2010). These censuses will have enumerated approximately 98% of the world's population.

The United Nations recommendations also include population and housing census topics, and these have been refined and extended for UNECE countries with lists of so-called core and non-core topics (UNECE 2006). The EU and its member states have now agreed on a minimum set of topic questions, based on the UNECE recommendations, and these are now enshrined in EU regulations (Eurostat 2011). For a list of core and non-core topics see Table 1.

Table 1 List of proposed core and non-core topics for the 2010 round of population and housing censuses, CES countries

Core topics	Non-core topics
Population to be enumerated	
Place of usual residence	
Total population (derived)	
Geographic characteristics	
Locality (derived)	*Urban and rural area (derived)*
Location of place of work	Location of school, college or university
	Mode of transport to work
	Mode of transport to school, college or university
	Distance travelled to work and time taken
	Distance travelled to school, college or university and time taken
Demographic characteristics	
Sex	De facto marital status
Age	Total number of children born alive
Legal marital status	Date(s) of legal marriage(s) of ever married women: (i) first marriage and (ii) current marriage
	Date(s) of the beginning of the consensual union(s) of women having ever been in consensual union: (i) first consensual union and (ii) current consensual union
Economic characteristics	
Current activity status	Usual activity status
Occupation	Providers of unpaid services, volunteers
Industry (branch of economic activity)	Type of sector (institutional unit)
Status in employment	Informal employment
	Type of place of work
	Time usually worked
	Time related underemployment
	Duration of unemployment
	Number of persons working in the local unit of the establishment
	Main sources of livelihood
	Income
	Socio economic groups (derived)
Educational characteristics	
Educational attainment	Educational qualifications
	Field of study
	School attendance
	Literacy
	Computer literacy

(continued)

Table 1 List of proposed core and non-core topics for the 2010 round of population and housing censuses, CES countries (continued)

Core topics	Non-core topics
International and Internal Migration	
Country/place of birth	Country of previous usual residence abroad
Country of citizenship	Total duration of residence in the country
Ever resided abroad and year of arrival in the country	Place of usual residence five years prior to the census
Previous place of usual residence and date of arrival in the current place	Reason for migration
	Country of birth of parents
	Citizenship acquisition
	Persons with foreign/national background (derived)
	Population groups relevant to international migration (derived)
	Population with refugee background (derived)
	Internally Displaced Persons (IDPs) (derived)
Ethno-cultural characteristics	
	Ethnicity
	Language
	Religion
Disability	
	Disability status
Household and family characteristics	
Relationship between household members	*Same-sex partnerships (derived)*
Household status (derived)	*Extended family status (derived)*
Family status (derived)	*Type of reconstituted family (derived)*
Type of family nucleus (derived)	*Type of extended family (derived)*
Size of family nucleus (derived)	*Generational composition of private households (derived)*
Type of private household (derived)	Single or shared occupancy
Size of private household (derived)	Rent
Tenure status of households	Durable consumer goods possessed by the household
	Number of cars available for the use of the household
	Availability of car parking
	Telephone and internet connection
Agriculture	
	Own-account agricultural production (household level)
	Characteristics of all agricultural jobs during the last year (individual level)

(continued)

Table 1 List of proposed core and non-core topics for the 2010 round of population and housing censuses, CES countries (continued)

Core topics	Non-core topics
Living quarters, dwellings and housing arrangements	
Housing arrangements	Availability and characteristics of secondary, seasonal and vacant dwellings
Type of living quarters	Occupancy by number of private households
Location of living quarters	Type of rooms
Occupancy status of conventional dwellings	Hot water
Type of ownership	Type of sewage disposal system
Number of occupants	Kitchen
Useful floor space and/or number of rooms of housing units	Cooking facilities
Density standard (derived)	Main type of energy used for heating
Water supply system	Electricity
Toilet facilities	Piped gas
Bathing facilities	Air-conditioning
Type of heating	Position of dwelling in the building
Dwellings by type of building	Accessibility to dwelling
Dwellings by period of construction	Lift
	Dwellings by number of floors in the building
	Dwellings by materials of which specific parts of the building are constructed
	Dwellings by state of repair of the buildings

Source: UNECE 2006. See referenced paper for full definition of each topic. Derived variables are shown in italics

The principal methods of census taking and their advantages/ disadvantages

The methods used for census taking cover a wide spectrum, ranging from the traditional questionnaire-based census through to those carried out using administrative registers. In between are various combinations of the two, supplemented in some cases by various types of sample survey, either in conjunction with the census (sample enumeration) or as separate activities (household surveys) (Furness 2004).

The traditional census

The traditional census – typified by the UK and many other countries, including major economies such as the US, China and Japan – involves

the distribution of census questionnaires, which are then collected by enumerators, or a combination of enumerators and post-back, and sometimes with the option of web-based response.

What are the advantages of traditional censuses? First is the fact that the national statistical organisation has control over the operation, which means that it can be managed to maximise the statistical potential of the data collected. The comprehensive nature of the census in terms of topic coverage is also a significant advantage. There is also the benefit that the census generates for official statistics in general, through its public awareness campaign. This engenders a sense of national participation and leads to exceptionally high response rates that cannot be matched by a conventional survey. It also presents an opportunity to highlight the importance of objective and timely statistics for society at large.

Cost is normally cited as the main disadvantage of the traditional census, especially when public finances are under pressure. The major costs are for field operations and data processing, and these are being driven upwards by, among other things, the need to maintain response rates in the face of increasing mobility as well as a reluctance on the part of the public to participate (Valente 2010).

The infrequency of the traditional census is also a disadvantage. Starting from scratch every ten years, learning curves both in the national statistical office and in the field can be quite steep, leading to organisational headaches. Additionally, the census data, while current at the time of collection, will less accurately reflect local conditions after five to ten years, and this can be a major problem for some users.

Finally, traditional censuses are finding it hard to grapple with certain sub-populations such as the single young mobile population, people living in ghettos or shanty towns, and marginalised sections of the community. While these groups pose major problems for census takers it is unlikely that any other method of enumerating them would be any more effective.

Sample surveys

For cost reasons, many countries carry out a sample enumeration in conjunction with the census to collect more detailed information on a separate (longer) questionnaire, often referred to as the 'long form', as in the US, Canada and China (although Canada has recently dropped the long form from its plans for 2011, to be replaced by a voluntary 'National Household Survey'). Collecting additional topics from a sample of the population or households during the census operation is a cost-

effective way to broaden the scope of the census to meet the increasing and expanded needs for demographic and social statistics. However, it must not be forgotten that the sample survey has limited applicability for collecting statistics at small-area level, due to sample size issues.

Separately from sample enumeration, some countries employ sample household surveys as an integral part of their census operations. Household surveys are the most flexible of the census data sources. In principle, almost any subject can be investigated through this method. Countries that are using household surveys in this way include France and Germany. In France, for example, a unique 'rolling census' has been conducted since 2004 in which annual sample surveys are combined to cover 70% of the French population over a five-year cycle (Valente 2010).

Household surveys can examine most subjects in much greater detail and can provide a mechanism for meeting emerging data needs on a continuing basis. The flexibility of the household survey makes it an excellent choice for meeting data users' needs for statistics that otherwise would be unavailable, insufficient or unreliable.

While household surveys are not as expensive as full population censuses, they are costly to organise, particularly at the beginning when countries do not have a continuing programme of household surveys. They do not usually provide sample sizes sufficient for detailed local analysis, and they suffer like all surveys from an increasing unwillingness of the public to participate – unless made compulsory.

Administrative registers

The third important data source that is commonly used in many countries is administrative registers. Many social statistics are produced as a by-product of administrative processes and can be very valuable to the overall national statistical system – for example, education statistics from reports by the ministry of education, health statistics from reports based on hospital records, employment statistics compiled from employment services and so forth.

An important benefit of using administrative registers is the fact that the same information need not be collected more than once from the same individual for statistical purposes. Depending on their quality and coverage, the data can be mobilised for statistical reporting – and also merged with other data sources in order to add value to the output being produced. This reduces the burden on the respondent by making use of whatever data is already in the system.

There is a clear financial benefit. Costly large-scale field procedures are avoided, and most effort is concentrated on improving the quality of the registers themselves and using relevant statistical techniques to derive the required output. Some small-scale field procedures would still be required to validate administrative data and ensure that data quality reaches targeted levels.

A civil registration system is one source that many countries have developed, with varying degrees of success. Civil registration is a major foundation for a legal system for establishing the rights and privileges of individuals in a country. Where it is comprehensively maintained, it is the main source of vital statistics. Crucially, some form of civil register or maintained individual and household database is essential as a data spine against which other data sources can be matched (United Nations 2008).

Once such a system is established, the need to conduct the traditional decennial census becomes less important, since the system can already produce basic census-type information. Nordic countries – Denmark, Finland, Iceland, Norway and Sweden – have relied on register-based statistics for their data needs since the 1960s, and have used demographic information from central population registers since the 1970 censuses. Austria now also has a register-based census, and several EU countries combine registers with either traditional enumeration (e.g. Spain, Czech Republic, Estonia, Italy, Latvia, Lithuania) or with sample surveys (e.g. Belgium, the Netherlands, Slovenia). Some countries even use a combination of registers with both enumeration and sample surveys (e.g. Germany and Poland).

Among the disadvantages of administrative registers are that they are often limited in content and their uses may be restricted for legal or administrative purposes. Also, they do not usually have the adaptability of household surveys or censuses in terms of content or subject detail. Administrative sources are often incomplete, inconsistent or limited in their coverage, and in many areas, such as health conditions, nutrition or household expenditures, appropriate administrative data are not available. Moreover, administrative records often focus on the individual and do not provide any information on the household or family, limiting the scope for social analysis.

There are important lessons to be learned from countries that have begun using administrative registers, in terms of the difficulties of transition. A 2007 review by European statisticians highlights many of the issues relevant to register-based censuses, including difficulties with topics and the definitions of variables (UNECE 2007). Two of the countries moving

to a fully register-based census in the 2011 round, Norway and Austria, have documented many of these challenges and show how the UNECE core topic requirements can be largely met, albeit with improvements to the registers and resort to sample surveys for problematic core variables such as Occupation (Statistics Norway 2007; Lenk 2008).

There are other drawbacks to using administrative registers. One is the degree of compliance with the civil register on the part of the public. This has an impact on both the coverage of the register and on the accuracy of the information contained in it. In societies that are highly regulated, the public may be used to and accept the need to register for various public schemes. Even in these cases there may be reasons why individuals would not want to register because of concerns over privacy and the misuse of public-sector information.

Survey of methods used

In June 2009 the United Nations Statistics Division (UNSD) conducted a worldwide survey into census data collection methods for the 2010–2011 round of censuses. In the UNECE region the survey was conducted in cooperation with the UNECE and Eurostat, and the results are shown in Table 2 for the 50 UNECE countries that responded to the survey, including all 27 EU member countries (UNECE Secretariat 2010).

Table 2 Census type and date for 2010–2011 round – UNECE countries

Country	EU	Census type	Census date
Albania		Traditional	01/04/2011
Armenia		Traditional	12/10/2011
Austria	Yes	Register-based	31/10/2011
Azerbaijan		Traditional	13/04/2011
Belarus		Traditional	14/10/2009
Belgium	Yes	Combined (registers + survey)	01/01/2011
Bosnia and Herzegovina		Traditional	31/03/2011
Bulgaria	Yes	Traditional	10/03/2011
Canada		Traditional	10/05/2011
Croatia		Traditional	31/03/2011
Cyprus	Yes	Traditional	01/10/2011
Czech Republic	Yes	Combined (registers + enumeration)	26/03/2011
Denmark	Yes	Register-based	01/01/2011
Estonia	Yes	Combined (registers + enumeration)	18/09/2011

(continued)

Table 2 Census type and date for 2010–2011 round – UNECE countries (continued)

Country	EU	Census type	Census date
Finland	Yes	Register-based	31/12/2010
France	Yes	Rolling census	01/01/2011
Georgia		Traditional	2012
Germany	Yes	Combined (registers + enum + survey)	09/05/2011
Greece	Yes	Traditional	16/03/2011
Hungary	Yes	Traditional	01/10/2011
Iceland		Combined (registers + survey)	Not available
Ireland	Yes	Traditional	01/04/2011
Israel		Combined (registers + survey)	27/12/2008
Italy	Yes	Combined (registers + enumeration)	23/10/2011
Kazakhastan		Traditional	25/02/2009
Kyrgyzstan		Traditional	24/03/2009
Latvia	Yes	Combined (registers + enumeration)	01/03/2011
Lithuania	Yes	Combined (registers + enumeration)	01/03/2011
Luxembourg	Yes	Traditional	01/02/2011
Malta	Yes	Traditional	01/11/2011
Montenegro		Traditional	31/03/2011
Netherlands	Yes	Combined (registers + survey)	01/01/2011
Norway		Register-based	19/11/2011
Poland	Yes	Combined (registers + enum + survey)	31/03/2011
Portugal	Yes	Traditional	01/03/2011
Republic of Moldova		Traditional	01/04/2012
Romania	Yes	Traditional	01/03/2011
Russian Federation		Traditional	14/10/2010
Serbia		Traditional	31/03/2011
Slovakia	Yes	Traditional	21/05/2011
Slovenia	Yes	Combined (registers + survey)	01/01/2011
Spain	Yes	Combined (registers + enumeration)	01/11/2011
Sweden	Yes	Register-based	31/12/2011
Switzerland		Combined (registers + survey)	31/12/2010
Tajikistan		Traditional	01/10/2010
The Former Yugoslav Republic of Macedonia		Traditional	31/03/2010
Turkey		Combined (registers + survey)	2011
Ukraine		Traditional	2011
United Kingdom	Yes	Traditional	27/03/2011
United States		Traditional enumeration with yearly updates	01/04/2010

Source: UNECE-UNSD Survey 2009

For the EU countries, only 41% (11 countries) have planned for a traditional census. The same percentage plan to use a combined approach with the remainder (four countries) conducting a purely register-based census. France is unique in conducting a rolling census.

For non-EU countries within UNECE, a much greater proportion are planning a traditional census (74%), with four countries planning a combined approach and just one country (Norway) conducting a register-based census. The US conducted a traditional census in 2010 but this will be integrated with yearly updates of individual characteristics, based on a large annual sample survey (the American Community Survey).

Trends 2001–2011 and future developments

From the earlier sections, especially the survey of methods, it is clear that the nature of the census and the manner in which it is conducted is changing in many countries. It is therefore useful to explore some of the drivers for change and discuss the trends that are already evident.

The changing needs of census data users

There are many different types of census user – central and local government, commercial companies, secondary distributors, academics, libraries, the media and the general public. While each has its own special requirements, many of the needs are shared – particularly the need to have accurate and detailed information about the population at a local level (Furness 2004).

In a world with accelerating population and socio-economic change, the traditional decennial census is becoming less and less relevant after the first few years between censuses. There is a need for a shorter update cycle, to cope with increasing population mobility, cross-border flows and economic migration. With cost the major barrier to a more frequent traditional census, there is increasing pressure for the use of register-based data and frequent sample surveys to supplement or replace the census.

The impact of technology

The traditional census is being greatly affected in many countries through the increasing use of technology. The impact is being felt in all aspects of the census process – from planning and management, through data capture, processing and storage through to data dissemination. This is

enabling cost containment while also speeding up and enhancing the collection, processing and dissemination of census data.

The internet as a tool for census data collection is growing in importance. In the 2010 census round, nearly half of EU countries had or were planning some form of internet-based self-enumeration (UNECE Secretariat 2010). Challenges with this method include the need for authentication from each household; levels of internet usage in many countries at this stage; and the fear that hackers could compromise the integrity of the census. Moreover, data collected via the internet still have to be integrated into other data streams, including post-back questionnaires and telephone responses.

As a tool for data dissemination, however, the internet is quickly becoming the principal medium, and statistical offices are responding with more electronic publications and effective websites. Technology is also under development for the storage of census data, including data warehouses, which would contain all the data and metadata from a census.

Improving administrative data sources for the register-based census

Internationally, there have been considerable advances in the scope, completeness and quality of administrative data sources over the last decade, as well as successful initiatives to improve the matching of data from different systems (UNECE 2010). Pressures to implement population registers where these are not currently available, together with the availability of new and highly innovative data sources, will tend to fuel this trend.

The challenges of public willingness to cooperate

We have already noted the difficulties that the traditional census has with counting certain sub-populations such as the young mobile and certain marginalised groups. These difficulties are not confined to the census, and have led to a long-term decline in response rate on conventional surveys also. Many countries in Europe have experienced a general difficulty with public willingness to cooperate (Valente 2010) citing issues of security (respondents do not want to open their doors), problems associated with multiple residences, and a general reluctance to provide information that is already available from other sources.

Privacy and data protection

The general public is becoming increasingly concerned about data privacy and the restrictions on civil liberties that population registers might engender (Statewatch 2010). Certainly in Europe the data protection environment is becoming more restrictive in response to concerns over data privacy and security (CEN/ISS Secretariat 2002). This will impact on the scope of administrative data sources that can be mobilised for census-related activities and the speed with which change can be effected.

Survey of changes 2000–2010 census round

The 2009 UNSD survey (UNECE Secretariat 2010) also examined the changes in census methodology that had occurred between the 2000 and 2010 census rounds. The trend away from the traditional census is most marked in EU countries, where seven out of eighteen countries that conducted a traditional census in the 2000 round are conducting either a combined approach (Czech Republic, Estonia, Italy, Lithuania, Poland), a purely register-based approach (Austria) or a rolling census (France) (see Table 3).

For UNECE countries not in the EU, 19 countries (out of 23 countries responding to the survey) conducted a traditional census in the 2000 round and the majority (16) will continue with a traditional census in 2010; the exceptions being Israel and Turkey (moving to a combination of registers and sample survey) and the US (traditional enumeration integrated with a more detailed annual sample survey).

Table 3 Census type in 2000 and 2010 rounds – EU countries

		Census type in 2010 round				
		Traditional	**Combined**	**Register-based**	**Rolling**	***Total***
Census type in 2000 round	**Traditional**	11	5	1	1	*18*
	Combined	0	5	0	0	*5*
	Register-based	0	0	2	0	*2*
	No census	0	1	1	0	*2*
	Total	*11*	*11*	*4*	*1*	*27*

Source: UNECE-UNSD Survey 2009

The UK: seeking new ways of counting the population – opportunities and barriers

Our focus here, when seeking new ways of counting the population, is on administrative records, as envisaged in the Treasury Select Committee's report 'Counting the Population' (House of Commons Treasury Committee 2008), rather than a short-form census (as used in the US), a rolling census (as pioneered in France) or sample surveys (although these may have a supporting role).

The enormous growth of computerised administrative and customer records in the last three decades provides new opportunities for the creation of statistics across a range of topics. The widespread adoption of address postcodes, when linked to grid references, enables the creation of statistics for very small areas. It also facilitates the mapping of results, which has been further encouraged by the ONS's adoption of postcode-based Output Areas as a standard statistical geography. Furthermore, postcodes provide a vital key when seeking to match records from different sources.

The use of administrative files to create statistics has grown steadily, but hitherto this has been characterised by an ad hoc approach, with datasets being created independently by many different organisations using their own sources. There have, however, been some initiatives to take a more strategic view, notably ONS's innovative ideas for an Integrated Population Statistics System in 2003 (ONS 2003c) and its current Beyond 2011 project (ONS 2010). The Treasury Committee's report 'Counting the Population' (House of Commons Treasury Committee 2008) was also a major landmark.

The discussion here centres on England, but we need to remember that data sources sometimes differ in Wales, Scotland and Northern Ireland.

Progress in recent decades

One of the pioneering moves in creating statistics for small areas from administrative records was the publication of unemployment statistics from JUVOS (the Joint Unemployment Vacancies Operating System), which started in 1982. Its statistics were of great interest to organisations such as the Rural Development Commission, which measured unemployment trends in local areas. In the private sector, the 1990s saw the introduction by CACI of initiatives to enable the sharing of customer data on mortgages and savings, to create statistics for small areas on each provider's share of the market.

A major landmark in 2000 was the National Strategy for Neighbourhood Renewal and the report 'Better Information' (Policy Action Team 18 2000). The PAT 18 report sought to tackle the problems of deprived neighbourhoods, commenting:

> Government collects information about the people and the facilities in these areas all the time. But much of this information remains hidden away in the computers and filing cabinets of the people who collected it, unused because its owners did not know how useful it might be for other services to have access to it. Sometimes the owners had never been asked to share it, because no-one else knew they had the information. Sometimes it was not shared because someone thought wrongly that sharing statistics was illegal. Or sometimes it remained hidden away, unshared for a host of other reasons.

The report's recommendations led to the creation of the Neighbourhood Statistics website (ONS 2003a), which provides a one-stop shop for many datasets produced by government departments responsible for communities and local government, education, work and pensions, and health (McGinty 2004). One particularly valuable innovation has been the creation of the Index of Multiple Deprivation (IMD) (Communities and Local Government 2008), which is constructed from a range of sources and updated regularly. However, it should be noted that many of these statistics are published only at local authority level, or in some cases (such as the IMD) for Lower Level Super Output Areas (c. 600 households); hardly any are down to the level of Census Output Areas.

ONS's vision in 2003 for a population system

ONS published two ground-breaking reports in 2003. The first, 'A Demographic Statistics Service for the 21st Century' (ONS 2003b) provided a comprehensive review of the population statistics system.

This was followed in the autumn of the same year by 'Proposals for an Integrated Population Statistics System' (ONS 2003c), which was presented as a discussion paper. The proposed IPSS would combine census, survey and administrative data, linked at individual person level, to create a single, comprehensive population statistics database, to be updated over time. This database would underpin all ONS population and social statistics, resulting in significantly improved, more consistent statistics for the government community, the health service, academia and the private sector. This form of population statistics system would provide highly accurate small area statistics much more frequently and quickly.

The key elements of the proposal were summarised as follows:

- a high quality address register, covering all properties in England and Wales is needed
- a full census operation would be developed and tested, for implementation in 2011
- in parallel, a linked statistical database would be created, combining administrative and survey data by linking at the individual person and household level
- following the 2011 census, the linked statistical and census databases would be combined to create a linked population statistics database
- from 2013 onwards, the linked population statistics database would be updated using administrative records, survey data, the address register, and any future population register, with consideration given to how such data answer user requirements, and
- the linked population statistics database would form the basis of all future population statistics produced by the ONS, including populating the Neighbourhood Statistics system and underpinning the mid-year population estimates series.

A later 'Update on ONS Proposals for an Integrated Population Statistics System' (ONS 2008) referring to a subsequent consultation, reported that 'users generally expressed strong support for the overall proposals … which were described as exciting and visionary. However, nearly all the comments emphasised what a massive undertaking it would be, and a common concern amongst users was that the strategy was high risk and that the proposals did not perhaps fully recognise the risks. Nevertheless, the feeling was that the vision was definitely worth striving for.' It then commented: 'The IPSS is a long-term undertaking and it is inevitable that priority in funding and resource tends to be given to more immediate aspects, such as planning for the 2011 Census and improving population statistics between now and 2011.'

Beyond 2011: the need for a National Address Register

One vital element of a system for integrating administrative and customer records is the availability of a definitive National Address Register, providing a list of all residential (and ideally business) addresses, their postcodes, and also any alternative or alias addresses that are used (such as a house name, rather than number). Such a register is a vital tool when matching records of people or households using the postcode and individual address.

The need for such a register in England and Wales has long been recognised, but repeatedly ran into barriers resulting from the three public bodies involved – the Royal Mail, Ordnance Survey and local government – being unable to agree about intellectual property rights. However, a composite file was commissioned especially for the 2011 census, and in December 2010 plans for a definitive and regularly updated National Address Gazetteer were announced (Communities and Local Government 2010).

Government administrative files: some targets

Administrative records maintained by central government have obvious attractions. They often cover very nearly 100% of the relevant population, whether because of their compulsory nature or, if voluntary, their near-universal take-up. Such information is also gathered using the same methods across England (and sometimes Great Britain or the United Kingdom as a whole). The Treasury Select Committee's 'Counting the Population' recommendations included:

> The development of computerised administrative records in the UK has moved on rapidly in recent years and that development looks set to continue. … We further recommend that the Statistics Authority set out in response to this Report the action that the Authority will take under the powers in the Statistics and Registration Service Act to develop the Government's administrative databases to provide a more accurate and cost effective method of monitoring the population.
>
> (House of Commons Treasury Committee 2008)

Table 4, which draws on work by Professor David Martin (Martin 2008), indicates some of the possible topics that may be available from government files; the list is by no means comprehensive.

Commercial customer records could also be valuable

Large commercial businesses that provide services to the public often build massive customer databases. These are not perfect sources for creating nationwide statistics: they are not representative samples of the population as a whole, and the updating of records, especially addresses and demographics, can also be patchy. However, they do provide large stocks of customers (often >10 million), large flows of new customers, timeliness, very detailed data on customer behaviour, and are potential sources of insight and intelligence. Moreover, the sharing of records within sectors

Table 4 Information collected by government departments

Government department	Database	Possible topics
National Health Service	National Health Service Central Register: GP Patient Registers	• Date of birth • Sex • Address and changes • Births • Marriages • Deaths • Health condition
Department of Work and Pensions; HM Revenue & Customs	Customer Information System (this includes children at birth, as well as the adult population)	• Date of birth • Sex • Marital status • National Insurance – working population • Name of employer • National Insurance – workers from overseas • Income • Benefits (various, including child allowance, retirement pensions, disability) • Household structure
Department for Education	Annual School Census	• Date of birth • Sex • Language • Ethnicity • Free school meals • Travel to school • Educational attainment
Home Office	e-Borders	• Passport details • Citizenship • International migration
Driver and Vehicle Licensing Agency	Driving Licence	• Address and changes • Car ownership.
TV Licensing	TV Licences	• Address • Households
Ministry of Justice/ Registry Trust	County Court Judgments	• Personal debt
Valuation Office Agency	Council Tax Bands for domestic properties	• Property value
ONS	Inter Departmental Business Register	• Workplaces and working populations

to achieve near 100% coverage can be very powerful. Table 5 provides a summary view, based on work carried out for ONS (Dugmore 2009).

An additional possible commercial source is lifestyle information, which is compiled and sold by value added resellers such as Acxiom, Equifax and Experian. Lifestyle lists are built using a variety of sources such as detailed

Table 5 Information collected by commercial companies

Sector	Headline features
Retail	• Records of sales to the public of a huge range of products • Sales channels: superstores and local shops, but also online, catalogue, etc. • Major companies often have 10–15 million customers • Limited demographics collected at time of application • Loyalty cards track spending in great detail
Financial Services	• Wide range of products, e.g. current account, mortgage, savings, loans • Various sales channels – branches, ATMs, online, post, etc. • Several companies have >10 million customers; they aim to create a customer (c.f. product) view • Detailed demographics collected for some products, e.g. mortgages • Current accounts and credit cards track spending in great detail • Pooling of databases is well established, e.g. mortgages, savings, credit, fraud
Electricity (and Gas)	• Electricity has 100% coverage, gas c.80% • Company coverage across the UK is often patchy/regional • Minimal demographic information • Much effort is put into maintaining address/meter files • Good data on fraud and debt • Pooling of databases is well established – meter list used by ONS for 2011 census to identify multi-occupied addresses; Department of Energy and Climate Change statistics on energy consumption
Water	• Each water company has its own territory (NB) • Many properties are still billed according to rateable value (c.f. metered) • A great deal of effort is put into maintaining address files • Minimal demographic information • Good data on debt
Telecoms	• Mobile telephone and broadband now has three main players, each with >15 million customers • Mobiles – Post Pay (monthly contract – an application form is filled in) • Mobiles – Pre Pay (little information collected) • Address information – only basic postal address for c.50% on contract • Transaction information – stunning: full detail of every call, inc. location

questionnaires, and product registration information. They offer millions of records of named individuals, which are valuable for direct marketing purposes – but, if being considered as input to a population register, their recency and quality would need to be investigated.

Government sample surveys: a supporting role

In its proposals for an Integrated Population Statistics System, ONS envisaged that a linked statistical database would be created, combining administrative and survey data by linking to the individual person and household level. The Office has a long tradition of carrying out large

sample surveys, which question respondents in considerable detail. Examples include the Annual Population Survey, General Household Survey, Expenditure and Food Survey, and the recently introduced Wealth and Assets Survey. These are conventionally used to produce estimates at national, regional and sometimes local authority level. When integrated with other sources, such as the census, or administrative records, there is scope to produce modelled estimates for small areas; ONS's estimates of Household Income for Middle Layer Super Output Areas provide one example.

Opportunities, limitations and barriers

Prospective users of statistics created from administrative and customer records see several attractions: near 100% coverage (if the sources are compulsory, have universal take-up or are pooled); statistics for very small areas; annual or even more frequent updates; and the additional possibility of information about topics not hitherto questioned in the census – income and expenditure are ready examples. An obvious attraction to the government is that such a system should be much cheaper than a traditional census.

Turning to the limitations, some census topics appear not to be readily available from existing systems. Examples include ethnic group, religion, language and various features of employment. In some cases there may be scope to turn to alternatives as proxy measures. However, all such information is at the mercy of any future changes to administrative systems – for example, welfare reform.

And what of the barriers to progress? At the technical level, it is much easier to produce univariate statistics for one topic than to reliably match files of both addresses and names to create an integrated database which has several topics (and which can therefore be used to produce cross-tabulations). The law may also present barriers – real (such as the Data Protection Act) or imagined. The Statistics and Registration Service Act 2007 does, however, enable the sharing of files within government. A third factor is public perception, and the role of the press and politicians, who may view this activity in various ways, ranging from a malevolent ID database, through to a dull if worthy population statistics system. Overcoming barriers to creating such a system will require both political will and also management stamina by the UK Statistics Authority.

Politics, priorities and prototyping

The ONS initiated a small Beyond 2011 project in 2008 and this led to funding of the current programme, which will test and evaluate models for meeting future user needs and make recommendations in 2014. It aims to develop a range of options for the production of population statistics beyond the 2011 census, and is considering how a number of different data sources could be used to produce the key information needed to support effective decision making. The project has been put together under the auspices of the National Statistician and the Registrars General of Scotland and Northern Ireland with input from a wide range of government departments. Francis Maude, now Minister for the Cabinet Office, speaking in February 2010, welcomed 'Beyond 2011', which he thought could lead to more timely and cost-effective data (Maude 2010).

The vision in Beyond 2011 is for a definitive National Address Register to provide an essential 'spine' to which other records can be matched. The project has also identified the importance of taking snapshot copies of a range of government administrative files at the time of the census in March 2011. These can be used both to help quality-assure the census, and also to provide an assessment of sources for their future use. The possibility of obtaining summary statistics from customer files held by commercial companies is also being investigated.

We know from the experience of other European countries that the development of a population register can take many years. Rather than seeking perfection in matching individual records at the outset, there is a strong case for prototyping, initially assessing and comparing datasets at aggregate local authority, Output Area and postcode level. Such provisional univariate statistics will be of value to users who, in turn, will be able to comment on their validity. The best should not be the enemy of the good. It is to be hoped that such progress will be a successful journey to a new system, but we shouldn't abandon a traditional census without a proven alternative.

An assessment of options for the UK

Against the current economic and political landscape, it seems highly unlikely that the traditional census can remain unchanged. The cost of running such an exercise, coupled with declining compliance levels, the time lapse to produce usable results and the need for more regular updating, suggests that a traditional census is no longer a sufficient solution to the UK's information needs.

The vision of the 'Beyond 2011' project would replace the current census system with a system that relies primarily on the consolidation of administrative records to produce aggregated statistics. One option may be to use the spine database provided by a new National Address Register to generate statistics for numbers of households and population.

However, the wish list of requirements for such a replacement system presents a daunting challenge:

- establishment of a National Address Register to provide the spine for the new system
- ability to provide small area statistics – to OA level
- coverage of most current census topics – perhaps with some substitution of valuable but, to date, omitted topics such as income
- consistent coverage of information across the whole population base – with imputation or synthetic estimation where data do not exist
- regular (ideally contemporaneous) updating of information
- universal access to data and/or information derived from data – for commercial organisations as well as the public sector and academic institutions
- a fully integrated solution for the entire UK.

These challenges will take a substantial amount of time and effort to be addressed and delivered against, and, in our opinion, it currently seems unlikely that they could be fully developed in time to replace the existing system in 2021.

Challenges for the new system

In order to achieve the most radical revolution in information provision, the National Statistician would need to instigate a major modernisation of the current structure of the official statistics framework. The current administrative systems will need to be able to 'talk' to one another, or at least 'talk' to a centralised information repository. This will require not just the creation of a centralised framework, but also the modification of existing administrative systems to enable the extraction of data in a suitable format.

As outlined above, there may be data protection barriers to the use of personal data for purposes other than that for which it was collected. There are also real political and public perception barriers to this proposal. The notion that the state could not only be watching, but may also have a

fairly complete view of an individual's life will surely be too much for the media to resist. The political parties cannot be guaranteed to support this initiative, for reasons that may be entirely disconnected from the actual issues involved. The issue of public perception will need extremely careful and delicate handling if this new enterprise is to gain public support. Positioning will be critical, reassuring the public that the new system would be used to produce aggregated statistics, rather than information about individuals.

There are major issues relating to disclosure control that will need to be addressed. Over the last two decades, the issue of protecting individuals from identification from census data has rightly gained prominence. To date, the Census Office has, in our opinion, taken a rather conservative stance on this risk and on the perception of risk. The restrictions that exist now in terms of analysis and access to census data are significant. It is inevitable that the consolidation of many different administrative data sources will increase the public perception of risk of disclosure. If the new system is to be of maximum value to both the commercial and public sectors, then finding the right balance between protecting citizens' anonymity and maximising access to the data will be critical.

A major challenge will be that, in order to provide more regularly updated information, the level of detail that is currently available from the census may have to be scaled back. Given the need for more information and detail rather than less, this may be a difficult pill for users to swallow.

Implications for market research

The census currently provides the research industry with population and demographic statistics for a range of geographies that form the basis for profiling area populations, designing samples and weighting surveys. The addition of Social Grade (the commercial research industry's socio-economic classification) to the 2001 census has increased the usefulness of this data. The introduction of the Samples of Anonymised Records (SARs) in 1991 provided a valuable tool to commercial and academic organisations to enable a deeper, multivariate understanding of the population, albeit only to higher geographic levels. This has allowed more targeted analysis and profiling of niche populations, as has the development of derived classifications such as the Index of Multiple Deprivation (IMD) and a suite of geodemographic classifications for OAs, wards and local authorities.

The development of commercial geodemographic classifications that use census data as their foundation has revolutionised the marketing industry, from which the research sector has benefited. It would seem to be essential that any new census system continues to provide the level of small area information that makes this possible.

But, in addition, there are some major omissions from the range of data currently available from the census. Income is a primary example – used throughout the commercial research sector as a key discriminator and predictor of behaviour and consumption, but not available as a discriminator from census small area statistics. There are other examples, such as internet access and usage, ownership of household durables, health status, receipt of benefits, etc. The integration of administrative records and large social survey datasets, combined with imputation and synthetic estimation would greatly enhance the value of the census offering to the research community.

The other key issue for the research industry is the recency of data and the timeliness of dissemination. The 2001 census data were not released until 2003, which means that they were at least two years out of date at the point of release and would be around 12 years out of date by the time they were replaced with data from the 2011 census. A major benefit of a register-based system would be that the data could be updated on a far more regular basis – annually or perhaps more frequently. This would have clear financial benefits for our sector, making sample designs and therefore fieldwork more efficient.

Conclusions

The requirements for a replacement to the 'traditional census' will take a substantial amount of time and effort – in our opinion, it seems unlikely that they could be fully developed in time for 2021 and we should not abandon the established approach until a proven alternative exists.

Nevertheless, the prospect of a modernised approach to census provision in the UK is exciting for the research community and for the commercial sector in general. The cost and time taken to produce a comprehensive survey of the population via the current methodology is at odds with the needs and expectations of our fast-changing, fast-moving society. It cannot provide up-to-date information such that we receive from other sectors, which we have come to both expect and rely upon. There is a real cost to business of basing decision making on out-of-date and thus inaccurate information.

The information society in which we operate is defined by the creation, diffusion, integration and manipulation of information. This is acknowledged as a significant route to knowledge and wealth creation. There are manifestations of this in every aspect of market research. We are constantly integrating data sources and using these as the basis for knowledge creation – modelling relationships, creating broader views of behaviour and deepening understanding in ways that would not be possible from single data sources.

In this context, the notion of creating a holistic view of the population by integrating and enhancing existing data sources seems perfectly appropriate.

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