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**Fishing for sweets: Communicating the methodology for  
measuring census coverage**

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## 1. Introduction

The 2011 Census in England and Wales is designed to provide estimates of the population – a snapshot of the country at a point in time. These estimates are the essential basis for the allocation of resources, such as funding, to the administrative units of the country. In particular, local government (areas known as Local Authorities (LAs)) users are key stakeholders and are generally engaged with the Census and population estimation process. After the 2001 Census, there were a number of challenges to the population estimates from LAs who were not confident in their estimates. The lesson learnt from this was that communications with key stakeholders needed to start much earlier to ensure their understanding of complex methods and address their key concerns. The 2011 Census strategy was to ensure that the methodology and outputs were subject to very high levels of scrutiny in order to increase stakeholder confidence in the population estimates. It was important to communicate the methods used to derive and quality-assure those estimates. Transparency in those communications would be essential, and in line with the Official Statistics Code of Practice<sup>1</sup>.

The stakeholder group consists of a wide variety of bodies and individuals. They include those from a statistical background, such as academics, through to those for whom traditional dissemination routes (including technical papers) could be difficult to access or understand, such as many LA representatives. For past Censuses, the Office for National Statistics (ONS) has engaged well with the first group by being active in publishing methodological papers and presenting research material to a wide audience. However, in the past, communicating methodological and statistical concepts to the second group in a transparent way was not given as high a priority as engaging with a statistical audience.

The key statistical process which had greatest impact on the census population estimates was the coverage assessment and adjustment (CAA) project. This project provided the methodology to estimate and adjust for people and households missed in the 2011 Census. Unlike many census taking countries, the England and Wales census database is directly adjusted by this process so that all outputs include an adjustment for those estimated to have been missed. This was followed by a process of quality assurance (QA), designed to check that the estimates are of high quality against a breadth of other evidence, including administrative data sources. In order to foster trust in their census population estimates, users had to be aware of and understand the methodology and processes used to derive and quality assure them. Interacting with stakeholders was a key part of the communication strategy for the coverage assessment and quality assurance processes, as their engagement was crucial to the success of the 2011 Census.

This paper discusses the different types of communication used by ONS to inform stakeholders about the CAA and QA methodology, and where techniques were employed for the first time to engage with influential, non-technical stakeholders.

## 2. Communications

The communication strategy identified the need for two types of communication;

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<sup>1</sup> UK Statistics Authority Code of Practice for Official Statistics can be accessed here: <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/code-of-practice-for-official-statistics.pdf>

1. Documentation;
  - i. technical documentation and papers for stakeholders such as academics, and advisory groups,
  - ii. more accessible papers on the methodology and principles aimed at users such as Local Authority Chief Executives,
2. direct engagement (face-to-face) through;
  - i. statistical conferences,
  - ii. specific user meetings organised and co-ordinated by ONS.

Documentation on the CAA and QA processes was published from 2006 onwards, with a large volume of material released with the first estimates in July 2012, and continuing publications with the ongoing releases of census data. The duration of the communication period has allowed users to re-visit topics at several points during their development, helping to build on their understanding and allow a very useful dialogue, enabling concerns around the methodology to be suitably addressed or taken into account.

The following sections give some examples of both printed material and direct engagement for a mixture of stakeholders.

## **2.1. In print**

### **Technical users**

Materials aimed at those from a technical or statistical background were generally disseminated through widely used publication channels (such as the ONS website, specialist advisory groups or statistical publications). There were more than 10 papers of this kind that were published over a 6 year period which documented the ongoing methodological development. This continual supply of information allowed for academic interaction and some peer review of the methods. These papers supported some of the specific academic meetings mentioned in section 2.2. Comments and advice from technical specialists were then considered, and modifications to the methodology made where appropriate.

An example of a paper of this kind that was produced early in the publication cycle was the 2009 Population Trends article ‘Coverage assessment and adjustment methodology’<sup>2</sup>.

Later publications either focused on two main areas;

- helping to gain user acceptance of the methodology, and provide suitable indications that the methods had been rigorously quality assured (such as an external independent review<sup>3</sup>),
- providing a statistically rigorous overview of the methodology (such as RSS Series A paper ‘Design of the 2001 and 2011 Census Coverage Surveys for England and Wales’, published October 2011).

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<sup>2</sup> A copy of the paper can be accessed here: <http://www.ons.gov.uk/ons/guide-method/census/2011/the-2011-census/processing-the-information/statistical-methodology/2011-uk-census-coverage-assessment-and-adjustment-methodology---article-from-population-trends-137.pdf>

<sup>3</sup> A copy of the external review can be accessed here: <http://www.ons.gov.uk/ons/guide-method/census/2011/how-our-census-works/how-we-planned-the-2011-census/independent-assessments/independent-review-of-coverage-assessment--adjustment-and-quality-assurance/index.html>

## **Non-technical users**

The main publication aimed at a non-technical audience was a booklet called ‘Trout, Catfish and Roach – The beginner’s guide to census population estimates’<sup>4</sup>. The 16 page, illustrated, colour booklet used an extended analogy of trying to estimate the number of fish in a pond. A sample of the booklet can be found in Annex A.

The analogy helped to explain the concepts that underpin the methodology without using statistical terminology or formulae (which can be discouraging for most users). The booklet included simple worked examples of how estimates are produced for fish in a pond.

The combination of simple language, cartoon-like illustrations, clearly worked examples and a continuous story that was easy to understand made the booklet accessible to an extremely wide audience. Users described the publication as well written, easy to understand by the general reader, attractive, well tailored for the target audience and informative. This resource was available via the website, but was also produced in a printed format in large quantities. Copies were taken to many census events and made widely available to attendees, and it was often referenced as a first point of learning for those with an interest in the methodology.

## **2.2. Interactive**

As with the printed publications, ONS carried out interactive exercises through both the traditional and the non-traditional dissemination routes.

## **Technical users**

ONS engaged with technical audiences through well established academic channels, such as presenting at Statistical conferences (The Royal Statistical Society, British Society for Population Studies, Local Authorities Research and Intelligence Association) and co-organising methodology education events, such as the RSS ‘Counting the population’ meeting in June 2009. These ongoing activities allowed users to engage directly with team members who were leading the methodological development. This had multiple benefits, as it helped to establish and maintain relationships with technical specialists, enabled interested parties to get immediate feedback and allowed the ONS to gauge where the issues of greatest interest to this part of the stakeholder community were. These inputs were used to shape some of the academic papers and later communication events.

These presentations were carried out at various points over the development period, and were constantly updated to reflect latest developments and decisions that were being made about the CAA and QA processes, allowing users access to some of the latest work as it happened.

## **Non-technical users**

ONS initiated a series of workshops aimed at a non-specialist audience, such as Local Authorities. These were run at multiple locations around England and Wales allowing users to go to a session that was reasonably local to them, and also find out what issues were of interest to other stakeholders in their area.

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<sup>4</sup> A copy of the booklet can be accessed here: <http://www.ons.gov.uk/ons/guide-method/census/2011/the-2011-census/census-coverage-survey/trout--catfish-and-roach---the-beginner-s-guide-to-census-population-estimates.pdf>

Census roadshows were run in October 2008 and September 2011. These were designed to provide an overview of all aspects of the census, including the CAA and QA processes, and were aimed at representatives from Local Authorities and other interest groups.

In November and December 2010, a series of 4 interactive workshops were held. These were designed to give attendees a practical demonstration of what the CAA and QA processes did, and how they did it. The concept was for the attendees to try and estimate the number of sweets in a container, demonstrating the methodology without the use of statistical terminology. The container had been prepared in advance, so the 'population' was known.

Attendees worked in teams and drew a sample of sweets from the main container. This acted like the equivalent of the census coverage survey (CCS), and was then used to generate counts of sample members according to their response status to the Census (indicated by a sticker on the sweet) and the CCS. Every attendee used these counts to produce an estimate of the number of sweets in their cup, which could then be scaled to the population of the original container. The exercise allowed users to see how the method worked in practice, and because it was not pre-determined – the sample selection was random – it gave them more confidence in the methodology.

A series of QA materials had also been produced to reflect what would be available to the QA panels once the estimates had been produced. Two scenarios were produced – the first was an example to illustrate how the QA process would work and what the panel members would look for. The second example was used as an interactive exercise. Attendees were asked to take on the role of the QA panel. Fabricated materials were provided, and attendees were asked to QA the estimates for themselves, indicating why they had confidence in the estimates or to indicate areas where they felt further probing was required.

The interactive and step-by-step fashion of the exercise allowed stakeholders to ask questions and check their understanding whilst they were getting practical (albeit simplified) experience of how the CAA and QA processes were carried out. Stakeholders were also encouraged to take the materials from the workshop away with them, thus enabling them to engage their own communities and help others with their understanding of the process. Feedback from these sessions was extremely positive, with 98% of attendees wanting to see similar events planned in the future. The interactive nature of the exercise was highly praised and deemed well thought out and relevant.

As part of the first release of Census data, another series of workshops were run. The purpose of these was to remind users about the methods using the information that would be available with the estimates, and tell them about what was being released. The material was focused on the different adjustments that were made at various points to get to the final estimate. Whilst these workshops were in a more traditional format, they did include a video produced by the BBC. The programme, which was broadcast on the BBC's 'Bang goes the theory' programme, involved estimating the number of black taxi cabs in London using the same statistical method used in the census to estimate the number of missing people. The use of this video proved very successful, as it presented complex theory in a way that was educational and relevant, and reinforcing that the method is widely used in practice.

Following publication, stakeholders were also given the opportunity to interrogate the estimates independently via the Quality Assurance pack<sup>5</sup>, which was published on the ONS website in July 2012. The tool contains data for all of England and Wales, and allows users to explore estimates at Local Authority level, comparing results with wider geographies. The data are also presented in a series of graphs providing comparisons between the estimates by age and sex with administrative data sources, helping to put the information in a wider context. The tool provides a wealth of information in a very easy to access format, with clear branding and instructions making it straightforward to operate. It adds value to the data, and allows users to look at information for a specific area at their own leisure, whilst also providing contextual information, thus helping users have greater confidence in the estimates.

### **3. Conclusions**

There was broad agreement from stakeholders that ONS's communication on the CAA and QA processes was successful.

ONS publications were described as being well written, easy to understand by the general reader, attractive, well tailored for the target audience and informative. In particular, the *Trout, Catfish and Roach* booklet was commented upon as excellent at describing the principles of census estimation, receiving a Commendation from the RSS Statistical Excellence Awards. The main conclusion to draw from this is that written material must be presented in a way to engage the target audience. ONS achieved this by producing materials that were tailored for a general audience with minimal statistical knowledge as well of materials for the statistical community. In doing so, a wider variety of users felt more engaged and informed about the CAA and QA methodology.

With respect to interactive dissemination, meetings were well attended and feedback stated that the early inclusion of workshop sessions was particularly useful in aiding understanding of methodological development. As with the written material, the main conclusion is that interactive material must be tailored to the target audience, and different materials produced to cater to a variety of levels of statistical experience. In addition to this, utilizing mixed mediums for interactive presentations (such as a traditional lecture style, a workshop with examples to work through or a tool that can be independently explored) allows stakeholders to engage with material in way that best suits their own learning preferences, and allows for engagement on multiple levels. Again, the variety of materials, both in terms of level of knowledge assumed and the method of interaction enabled users to feel more engaged and informed about the CAA and QA methodology.

Communication with stakeholders has been on-going, starting during the development period (2006) and is still continuing. This allows stakeholders to engage with the process at multiple points (and with multiple different representatives if they so wish), and clearly see how the methodology progresses over time. It also provides a clear message that ONS is committed to answering their questions at every stage of the census process, and to responding to their concerns as early as possible. This has resulted in far fewer queries about the methodology after the results were published, and better educated stakeholders, which has potentially reduced the amount of challenges to the estimates themselves.

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<sup>5</sup> Available here: <http://www.ons.gov.uk/ons/guide-method/census/2011/census-data/2011-census-data/2011-first-release/local-authority-quality-assurance/the-2011-census-qa-pack.zip>

## Annex A – ‘Trout, Catfish and Roach – The beginner’s guide to census population estimates’ sample

*Trout, Catfish and Roach is a beginner’s guide to understanding population estimates and the role of the Census Coverage Survey. By using the analogy of fishing, this booklet takes readers through a series of easy equations to explain the way we reach our census population estimates. A worked example can be found at the end of this guide.*

### Step one: counting trout



#### How do you find out how many trout there are in your pond?

You could drain it and count the fish I suppose, but it wouldn’t do them much good. Perhaps if the pond was small you could try and catch them all. That would take a while. But there’s nothing like fly fishing, so you decide to give it a go.

At the end of day one, you’ve caught 100 trout. Pretty good!

So how many are there in total? Still no idea, really. So you tag each one, put them all back (you’ve lovingly cared for them all of course), and carry on the next day.

The next day you manage to catch another 50; 25 with a tag, 25 without. So you’ve found another 25 and know for sure there are at least 125. Pretty good. That’ll have to do.

#### But is that all you’ve found out?

Half of those you caught on day two already had a tag. Does that mean half the trout in the pond were tagged on day one? Roughly, yes.

And as you know you tagged 100 on day one, if half the trout in the pond were tagged, you can estimate that there must be around 200 in the pond altogether. *Give or take a few.*

The idea is simple when you take it step by step, but the implications are profound. You’ve only ever seen 125 fish in total, but can estimate with a fair degree of confidence that there are 75 or so more.

#### What does that have to do with the census?



We want to count everyone, but know we miss some. How many? Who knows? Well, we do actually.

We’re not counting fish, we’re counting people, but the principle is the same. We don’t need to tag them - they all have names (and so that we can be sure, dates of birth and addresses too). We

count them in the census, and then we do it again in what we call the Census Coverage Survey. This is called capture-recapture which, like the previous example, is used to estimate wildlife populations. It is also called *Dual System Estimation*.

We don’t count as many second time of course, that would take too long (and our feet would get tired). But we know how many we counted first time and by matching the two lists of people we find out what proportion we counted twice. Just as we did with the trout, we can then estimate the total.

So is a census really as easy as counting fish? Not quite, of course. But that’s enough to go on for now. To find out more, you can read on - and learn about catching roach, tench and catfish too.

### Step two: counting roach, tench and catfish

**So you know how to count trout. But you don’t tend to catch roach, tench or catfish by fly fishing.**

It would be tempting, if you didn’t know better, to say there are only 200 fish in your pond. But as every fisherman knows, you have to know your fish. Trout eat flies. Roach prefer maggots.