








# Survey Methodology Bulletin

## Special Edition: Statistical Quality September 2016

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The Survey Methodology Bulletin is primarily produced to inform staff in the Office for National Statistics (ONS) and the wider Government Statistical Service (GSS) about ONS survey methodology work. It is produced by ONS, and ONS staff are encouraged to write short articles about methodological projects or issues of general interest. Articles in the bulletin are not professionally refereed, as this would considerably increase the time and effort to produce the bulletin; they are working papers and should be viewed as such.

The bulletin is published twice a year and is available as a download only from the ONS website.

The mission of ONS is to improve understanding of life in the United Kingdom and enable informed decisions through trusted, relevant, and independent statistics and analysis. On 1 April 2008, under the legislative requirements of the 2007 Statistics and Registration Service Act, ONS became the executive office of the UK Statistics Authority. The Authority's objective is to promote and safeguard the production and publication of official statistics that serve the public good and, in doing so, will promote and safeguard (1) the quality of official statistics, (2) good practice in relation to official statistics, and (3) the comprehensiveness of official statistics. The National Statistician is the principal advisor on these matters.

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# Survey Methodology Bulletin

## Quality Special

The mission<sup>1</sup> of the UK official statistics system is “high quality statistics, analysis and advice to help Britain make better decisions”. The environment for official statistics is moving at pace, with the advent of the data revolution in particular leading to the use of new data sources for measuring statistics about society. The value of official statistics is in the assurance we can provide to users around the quality of our data and methods, but this means that our traditional approach to statistical quality also needs to evolve. Considering how the introduction of administrative data sources affects output quality, communicating uncertainty, measuring and reducing the burden placed on respondents to our surveys and assuring our users that we take a holistic approach to quality are all vital elements of maintaining a rigorous approach to quality at a time of constant change. This is not only about ensuring or maintaining quality, but also demonstrating, improving and promoting the quality of our statistics. There has therefore never been a more important time to support, improve and communicate the quality of GSS statistics.

This special edition of the Survey Methodology Bulletin (SMB) is dedicated to statistical quality and respondent burden, and focuses on some of the recent work that has been carried out by the Quality Centre at the Office for National Statistics (ONS). Quality Centre is a centre of methodological expertise that provides guidance, advice and support on statistical quality and respondent burden to ONS and the Government Statistical Service (GSS). The team is responsible for developing and managing a number of quality initiatives to support quality assurance, quality reporting and quality improvement activities, as well as carrying out research activity. Quality Centre supports a network of GSS Quality Champions in government departments to share good practice and to support and drive quality improvements across the statistical estate.

This edition of SMB provides a flavour of some of the innovative and varied work that is taking place in order to ensure that we keep pace with the variety and complexity of evolving statistical products and the demands of the data revolution.

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<sup>1</sup> As set out in the UK Statistics Authority's strategy for UK statistics “Better Statistics, Better Decisions”: [https://www.statisticsauthority.gov.uk/wp-content/uploads/2015/12/images-betterstatisticsbetterdecisionsstrategyfor2015to202\\_tcm97-44175-5.pdf](https://www.statisticsauthority.gov.uk/wp-content/uploads/2015/12/images-betterstatisticsbetterdecisionsstrategyfor2015to202_tcm97-44175-5.pdf)

# Quality within ONS – Providing a framework for statistical producers and assurance for our users

*Jill Pobjoy<sup>1</sup>*

## Abstract

A requirement of the UK Code of Practice for Official Statistics is that producers of National Statistics s must define their quality policy and make this available to the public.

To ensure this requirement is met, ONS has a Quality Management Strategy in place which is publicly available to provide assurance to the users of our statistics and includes activities which monitor, improve and report on the quality of statistical products. It also serves as a useful framework for the producers of statistics within ONS. The strategy has recently been updated and re-launched.

The updated strategy reflects the activities that we have in place as an organisation to manage quality and sets out goals for improvement. It is designed to reflect the organisational approach and as such is relevant to all areas of the office. The strategy is supported by a statistical quality framework which sets out the quality initiatives in place for quality assurance, quality control, quality improvement and quality reporting.

This paper will provide more detail on the quality strategy and provide additional information around the quality framework. We will report on progress since the launch of the strategy and how the quality management culture is being embraced in the ONS.

## 1. Background

The Office for National Statistics created a Quality Management Strategy in October 2011 to support the requirements of the Code of Practice for Official Statistics (UK Statistics Authority, 2009) – specifically Principle 4 - “Sound methods and assured quality” and also to provide assurance to users that activities are in place to monitor, improve and report on the quality of statistical products. This strategy covered the period up until March 2015.

It was proven to be a useful framework for quality management at the ONS but had become out of date and no longer reflected all of the activities that were in place to assure, improve and report on quality across the organisation.

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The requirement to renew the strategy therefore provided an excellent opportunity to ensure that the strategy was relevant and reflected current activities and aspirations.

The ONS Quality Centre began updating the strategy in February 2015. A network of divisional<sup>2</sup> quality champions had already been created. Their role included:

- being an ambassador for quality
- promoting the Quality Management Strategy (QMS) within business area
- promoting quality training
- sharing good practice
- networking with other quality champions and the ONS Quality Centre on a regular basis

This network was used to provide feedback on the earlier strategy, and how it had been received in each division.

The outcomes of these discussions highlighted that the links between the strategy and day-to-day activities were difficult to see. In addition to these discussions, an internal stakeholder group with an interest in the Quality Management Strategy was also identified by Quality Centre. This group included representatives from: Internal Audit, Continuous Improvement Zone, Enterprise Architecture, Statistical Training Service, Good Practice Team, Classification and Harmonisation Unit, Digital Publishing and Stakeholder Communications.

A meeting of these stakeholders identified what had worked well and what had not worked so well from the previous strategy. The scope of the QMS was discussed, with the idea that a high-level strategy with a supporting framework may be the most appropriate way forwards.

Quality Centre drafted a revised QMS (ONS, 2015) and, based on existing material developed a supporting statistical quality framework both of which incorporated the initial feedback from the quality champions and other stakeholders. An implementation and communication plan was also developed and both groups were invited to comment on these proposals. All feedback was reviewed and adjustments made where applicable. The finalised documentation was presented to the ONS Business Group.

## **2. The updated strategy**

The updated QMS has been modernised and shortened. The strategy now reflects the activities that we have in place as an organisation to manage quality as well as setting out goals for improvement. The QMS is designed to reflect the organisational approach to quality and as such is relevant to all areas of the office (i.e. those involved in producing statistical outputs and those not). The strategy is supported by a statistical

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<sup>2</sup> ONS is organised into a number of divisions, each of which has a quality champion. Further information on the structure of ONS is available in the organisational chart: <https://www.ons.gov.uk/file?uri=/aboutus/transparencyandgovernance/leadershipteam/ukstatisticsauthorityofficeforationalstatisticsorganisationchart9june2016.pdf>

quality framework which sets out the quality initiatives in place for quality assurance, quality control, quality improvement and quality reporting for those areas that do produce statistical outputs.

The updated QMS sets out an organisational commitment to quality, which was not present in the previous strategy.

This commitment to quality states that as an organisation we are committed to further developing a culture of quality to ensure that we:

- Produce statistical outputs that meet user needs to a level of quality that is fit-for- purpose
- Explain the quality of our statistics to our users by providing up-to-date metadata
- Improve the quality of our statistical outputs and processes through standardisation, continuous improvement and quality reviews

The updated QMS also implements the organisational approach to quality through the following themes:

### **2.1. Governance and leadership**

The strategy is owned by the ONS Business Group<sup>3</sup> which is a senior committee comprising of senior civil servants. The senior ONS Quality Champion is the Chief Methodology Officer of the organisation.

### **2.2. Capability**

The strategy outlines that all staff have a responsibility for understanding the importance of quality for their work and are supported through:

- Receiving training in quality management and how it can be applied. The ONS Quality Centre currently offers several courses, including:
  - a basic course ('Quality @ ONS') covering statistical quality which all staff are encouraged to attend
  - a course specifically for staff involved in the statistical output production process ('Quality Assurance for statistical outputs')
  - a higher level course aimed at Statistical Analysts ('Quality and Statistics'.)
- The availability of a central database to store desk instructions, descriptions of processes and methodologies with the use of this database being processed and monitored. Options are currently being considered in how this central database (known as the Standards and Guidance Database or STaG) can be improved to assist in the standardisation of methods and processes. This will address a recommendation from the ESS

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<sup>3</sup> The strategy is currently undergoing its first annual review. The ownership of the strategy is currently being evaluated given the focus of the Business Group, but it is expected that a senior ONS committee will continue to own the strategy.

Peer Review (Snorrason, Byfuglien & Vihavainen, 2015) of the UK Statistical System conducted in 2015.

### 2.3. Environment

- The strategy states that the ONS Quality Centre operates as a centre of expertise for statistical quality and quality management, providing advice and support to business areas and having responsibility for carrying out quality reviews and related activities.
- The strategy also refers to the Continuous Improvement Zone, a centre of expertise encouraging a culture of continuous improvement. It also provides support to Lean Six Sigma (LSS) Practitioners and assistance to Divisional Continuous Improvement Champions in the development and delivery of Continuous Improvement Initiatives for their area.
- Internal Audit is in place to provide independent assurance of processes and procedures across ONS.

### 2.4. Co-ordination

The strategy explains how ONS Quality Centre co-ordinates, promotes and communicates the Quality Management Strategy across ONS and provides updates on progress to the ONS Business Group<sup>3</sup> every six months.

As mentioned earlier, the network of quality champions, with a representative from each division is also maintained and co-ordinated by the Quality Centre.

### 2.5. Communication

The strategy sets out the results from user engagement activities and the UK Statistics Authority (UKSA) assessments of compliance with the Code of Practice for Official Statistics (UK Statistics Authority, 2009) will inform if our statistics are of the level of quality required by our users.

The strategy identifies that ONS Quality Centre will share examples of good practice across the ONS and more widely across the Government Statistical Service (GSS).

## 3. Quality Initiatives

The ONS Quality Management Strategy is supported by a statistical quality framework which sets out the initiatives in place at an organisational level for:

- Quality assurance - describes how we anticipate and avoid problems
- Quality control – how we respond to observed problems
- Quality reporting – how we inform users on the quality of our statistics
- Quality improvement – how we make improvements to our statistical quality

This statistical framework<sup>2</sup> shows each of the initiatives and includes detail including:

- What it is, what it covers and why it is conducted? (For example: A structured quality assurance walk-through of production procedures is

conducted to ensure QA procedures are reviewed, prove suitable and are robust.)

- Who does it and who is it for? (For example: The Output manager conducts the walk-through with their director to satisfy the director that procedures are fit-for-purpose)
- Where does it sit within the Generic Statistical Business Process Model (GSBPM; UNECE 2013) (For example: The walk-through covers both the Process and Analyse stage of the GSBPM)
- How often it is done? (For example: The walkthroughs are conducted at least every three years or sooner if there are changes to the output manager or the director, or if there are any key methodological changes to the output.)

Quality Centre have supported divisional quality champions to develop a division-led quality framework that sets out any additional local activities, carried out within their business area, against the four quality headings.

#### **4. Quality Goals**

Focussing on the need to continuously improve and to further establish our commitment to quality, there are three quality goals that we will work towards achieving over the next three years:

- i. Continue to embed a culture where quality is seen as everyone's responsibility
- ii. Improve how we communicate quality to our users
- iii. Further harmonise and standardise statistical processes and outputs where appropriate.

Work is underway to address each of these goals.

#### **5. Conclusion**

The updated QMS makes a clearer connection between day-to-day activities and the organisation's commitment to quality, and provides a framework for the activities of Quality Centre. This hierarchical structure means that day-to-day activities can be clearly linked to the overall commitment of the organisation to quality, making it more relevant and achievable for all staff within ONS.

We are in discussions with the network of quality champions to decide on the most effective means of measuring progress against each of the three goals.

Whilst the QMS was intended for ONS purposes it has been shared with the network of quality champions that Quality Centre manage across all Government Departments in the UK and Departments have been encouraged to adopt a similar approach.



Information has been shared by other UK Government Departments where they have adopted the ONS QMS and how it is working successfully within their areas. The strategy will be reviewed and updated where required on an annual basis.

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# Users' understanding of uncertainty measures to describe data quality

*Silvia Manclossi*<sup>1</sup>, *Catherine A. Davies*<sup>2</sup> and *Victoria Ayodele*<sup>2</sup>

## Abstract

The UK Code of Practice for Official Statistics indicates that users must be informed about the quality of statistical outputs against the European Statistical System (ESS) dimensions of quality (relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity, coherence and comparability). For sample surveys, which form the basis of many outputs produced by the Office for National Statistics (ONS), the typical measures of uncertainty that are recorded are standard errors (SEs), confidence intervals (CIs), coefficients of variation (CVs) and statistical significance. Quality Centre at the Office for National Statistics (ONS) has begun work to establish a better understanding of how users interpret information on quality, specifically measures of uncertainty, when using official statistics. We were motivated by a review of current practices for ONS statistical outputs and through exploring the approaches used by other Government departments and other National Statistical Institutes (NSIs). Our work has mainly focussed on how data are used based on the quality information that is provided and whether presenting information in a different way, or using some standard definitions, could improve users' understanding. We have identified the CV in particular as a concept to explore with users, as it may be more difficult to understand compared to other measures, but we have also considered the understanding and interpretation of SEs, CIs and statistical significance. Once this project is completed, its findings will help to inform how we report on quality in the future. This paper sets out the main stages of this project and presents the main research work that has carried out by Quality Centre to date.

## 1. Background

The quality of a statistical product can be defined as the 'fitness for purpose' of that product. More specifically, it is the fitness for purpose with regards to the following European Statistical System (ESS) dimensions of quality: relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity, comparability and coherence [1].

The UK Code of Practice for Official Statistics [2] sets out a number of principles that support the production of official statistics. One of the functions of the Code of Practice is to ensure that official statistics meet the needs of users and are well explained. Principle 4 of the Code concerns 'Sound Methods and Assured Quality', which includes a number of practices such as quality assurance, quality reporting and quality improvement as well as the use of common standards and concepts. In particular,

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<sup>2</sup> Office for National Statistics; e-mail address: [ons.quality.centre@ons.gov.uk](mailto:ons.quality.centre@ons.gov.uk)

Practice 2 of Principle 4 refers to the need to *'ensure that official statistics are produced to a level of quality that meets users' needs, and that users are informed about the quality of statistical outputs, including estimates of the main sources of bias and other errors, and other aspects of the European Statistical System definition of quality'*.

It is important therefore for ONS to report on the quality of data, both to meet our obligations under the Code of Practice but also to provide users with sufficient information on the strengths and limitations of the data so that they can make an informed judgement on what that data are suitable to be used for [3].

The 'Guidelines for Measuring Statistical Output Quality' [1] advise that *'all quality measures and indicators that would be relevant'* to an output should be reported in order to aid user understanding and enable users to determine when an output meets their needs. For sample surveys, which form the basis of many outputs produced by the ONS, the typical measures of uncertainty that are recorded are standard errors (SEs), confidence intervals (CIs), coefficients of variation (CVs) and statistical significance.

In November 2014, the GSS Good Practice Team published the *'Communicating uncertainty and change - Guidance for official statistics producers'* [9]. This guidance was prepared for all staff involved in communicating official statistics and provides practical advice about describing uncertainty and change in statistics to enable users to make better use of the findings that are being presented. The guidance provides a number of approaches to aid the communication of uncertainty and change and can be applied to all sources of information, including surveys, censuses, administrative data and other sources, as well as estimates derived from a combination of these. It includes examples of good practice, as well as standard wording to be used when appropriate [4].

However, it should be considered that users may be unfamiliar with statistical concepts [5] and this could mean that they may misinterpret the data quality. Alternative approaches to presenting statistical accuracy include quality grading and suppression. In the former, the outputs are somehow ranked to indicate those that are of poorer quality and those that are of higher quality. Although this may be intuitively easier to understand, there is some information loss as a formal measure of accuracy is no longer provided [5]. 'Poor' quality results could also be suppressed, meaning that they are no longer published. Quality grading and suppression may be used in addition to the publication of SEs and other measures of uncertainty.

In this context, the use of CVs in ONS' general publications has been questioned several times. Quality Centre has received a number of queries from statistical producers at ONS regarding whether there is a standard policy or approach that sets out an acceptable level of accuracy for statistical outputs. Although there is a long history of work being carried out in this area at ONS, there is currently no specific guidance on acceptable levels of CVs, mainly because of the variety of statistical outputs and the need to tailor quality reporting to individual statistics.

In late 2014, Quality Centre assessed the practices in use at ONS, at a selection of Government Statistical Service (GSS) departments and internationally. This review formed a basis for some more substantial work to establish a better understanding of how users interpret information on quality, specifically measures of uncertainty, when using official statistics, and to make recommendations for good practice.

This project on uncertainty measures was initiated in 2015 and is mainly focussed on how data are used based on the quality information that is provided and whether presenting information in a different way, or using some standard definitions, could improve users' understanding. Given the queries received by Quality Centre and the feedback provided by statistical producers at ONS, the CV in particular has been identified as the most important concept to explore with users, as it may be more difficult to understand compared to other measures. However, we have also considered the understanding and interpretation of other uncertainty measures, such as SEs, CIs and statistical significance.

This paper sets out the main stages of this project on uncertainty measures and presents the main research work that has carried out by the Quality Centre to date.

## 2. Aims

Statistical producers at ONS use different uncertainty measures to provide users with the quality information accompanying statistical bulletins. However there is not a standard approach to how this terminology is defined which could lead to confusion for users. Moreover, in most cases, little feedback has been received from users in relation to their use and interpretation of these measures so it is not clear whether users change how they use the statistics in response to the quality information provided.

Quality Centre's project has therefore aimed to:

- standardise the definitions of uncertainty measures;
- investigate users' understanding and use of uncertainty measures;
- examine the exact boundaries, terminology and presentation for uncertainty measures, in particular CVs

## 3. Methodology

### 3.1. Research steps

This project on uncertainty measures has consisted of three main steps:

- Step 1 (*completed*): desk research aimed at gathering information about how ONS statistical producers, the GSS and other National Statistical Institutes (NSIs) define, use and present uncertainty measures to users;
- Step 2 (*completed*): work aimed to define the main uncertainty measures in plain English by taking into account the main findings from step 1;
- Step 3 (*planned*): investigation of how users understand and use uncertainty measures. In particular, this research step will be useful to

determine whether users use data differently dependent on the CV and whether they would find a different measure more meaningful.

Each research step is described in more detail in the following paragraphs. Throughout the project, Quality Centre has engaged closely with ONS statistical producers and the GSS Good Practice Team.

### **3.1.1 Step 1: Desk research**

In late 2014, Quality Centre investigated what uncertainty measures are used and how they are defined and presented by a range of statistical producers at ONS, the GSS and by other NSIs. The main conclusions from this work are reported below.

#### **Approaches used by ONS**

The study found that colour coded CV ranges were in use by some ONS statistical outputs to highlight estimates with higher CVs. There were however some differences in the colours used between different statistical outputs and the exact definitions of the ranges. Some outputs published CVs without any colour coding and some outputs used text descriptions of different CV ranges, including indicating when CVs are too unreliable to be used for practical purposes. There was also an example where the publication of CVs was ceased as it was deemed that confidence intervals would be more meaningful to users.

#### **Approaches used by the GSS and other NSIs**

The 2014 study of the approach taken by a selection of GSS departments showed that generally CIs are provided rather than CVs and these tended to be presented with an appropriate definition.

As part of the same study, international perspectives were explored by contacting a selection of NSIs. This found that:

- The Australian Bureau of Statistics publish CVs, but these are referred to as relative standard errors and descriptions are provided for higher values that indicate how the data should be used
- Statistics Sweden routinely publish CVs for surveys that are based on probability samples
- Statistics Canada commonly use CVs to indicate the quality of estimates. A grading system is used to indicate whether the CV is at an acceptable level of quality or not.

### **3.1.2 Step 2: Definitions of uncertainty measures**

Besides having explored the current practices in relation to the use of uncertainty measures, Quality Centre collated and compared the definitions of SE, CV, CI and statistical significance used by ONS statistical producers, the GSS and other NSIs.

The main conclusions drawn from this desk research were that:

- in some cases, definitions of uncertainty measures were overly technical and did not provide users with sufficient background information to understand why they are needed and how they are useful to explain how accurate and precise estimates are;
- in other cases, uncertainty measures were explained at length; although contextual information can be beneficial to better understand survey processes and uncertainty, the risk with this approach is that users may miss the key points due to the lack of brevity.

Based on these considerations, Quality Centre has worked with methodologists within ONS and with the Good Practice Team and prepared:

- an introduction page explaining, in plain English, what sampling means for accuracy and precision and what uncertainty measures can be used;
- the definitions of SEs, CVs, CIs and statistical significance and examples of how they are used in practice by referring to ONS examples

The intention is to publish these definitions on the ONS and the GSS websites, encourage their use in statistical bulletins and link these definitions to the ONS Quality and Methodology Information reports and the GSS Good Practice Team's guidance on communicating uncertainty and change [4] to ensure that consistent definitions are available for use across the GSS.

### **3.1.3 Step 3: Investigation of users' understanding and use of uncertainty measures**

This research step is at the planning stage and will aim to answer the following research questions:

- How easy or difficult are measures of uncertainty to understand (in general)?
- How easy or difficult are the definitions provided by ONS to understand?
- Are data used differently depending on the measures of uncertainty provided with estimates?
- What other measures of uncertainty could be used?
- How can these measures be best presented?

In order to address the above research questions, Quality Centre is planning to prepare an on-line survey which will be sent to a list of 'expert' and 'non-expert' users and users of different ONS statistics to ensure that feedback is gathered from a wide range of users. Quality Centre will be working closely with the ONS statistical producers, the Digital Publishing division and the Stakeholder Management team within the Communications division to select a sample of users.

The on-line survey will also include a section asking for personal details should users be willing to participate in focus groups which will aim to gather more in-depth information about users' understanding and use of uncertainty measures.

In addition, Quality Centre will be looking for opportunities to gather feedback from users at ONS user group meetings and to work with other Government departments to gather additional feedback from their users.

#### 4. Conclusions and next steps

The UK Code of Practice for Official Statistics [2] indicates that users must be informed about the quality of statistical outputs against the ESS dimensions of quality [1]. For sample surveys, the typical measures of uncertainty that are recorded are one or more of: standard errors, confidence intervals, coefficients of variation and statistical significance. The Guidelines for Measuring Statistical Output Quality [1] advise that quality measures and indicators should be reported to enable users to determine when an output meets their needs. However, users may be unfamiliar with statistical concepts and, at present, there is not a standard approach to explaining the terminology around uncertainty measures as statistical producers at ONS and in the wider GSS follow different practices.

In late 2014, Quality Centre assessed the practices in use at ONS, at a selection GSS departments and internationally and this review formed a basis for more substantial work to establish a better understanding of how users interpret information on quality. This project was initiated in 2015 and this paper has presented its main stages and the main research work that has carried out by Quality Centre to date. Quality Centre has worked with methodological experts within ONS and with the GSS Good Practice Team to prepare standard definitions of uncertainty measures. The intention is to publish these definitions on the ONS and the GSS websites, encourage their use in statistical bulletins and link these definitions to the ONS Quality and Methodology Information reports and the GSS Good Practice Team's guidance on communicating uncertainty and change [4] to ensure that consistent definitions are available for use across the GSS. The next stage of the work will be to gather feedback from users of statistics about their understanding and use of uncertainty measures to ensure that the quality information provided is meeting user needs.

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# Reviewing Aspects of User Orientated Quality Reporting

*Sarah Tucker*<sup>1</sup>

Statistical Producers are required by the Code of Practice for Official Statistics (UK Statistics Authority, 2009) to provide quality reports to users alongside official statistics.

To meet this requirement, Office for National Statistics (ONS) produce Quality and Methodology Information (QMI) reports for each Statistical Bulletin. QMIs report against the European Statistical System (ESS) quality dimensions and other quality characteristics. They also contain information on the strengths and limitations of data which help users decide upon suitable uses for those data.

QMIs have been published for 5 years, so now is a good time to review how quality information is communicated to users. Are there any gaps in what is provided compared to current user needs? What can be done to extend the use of this information?

The primary purpose of quality reporting has been to help users decide upon suitable uses of the data. It was determined that there could be a step before this, namely to reduce the misuse of the data. Research has therefore been undertaken to look at how ONS can first help users understand how to not misuse the data, and then how the data should be used.

This paper will discuss some work that has been carried out to reduce the risk of users misusing data. The findings from internal focus groups and meetings will be presented, including further work with statistical producers to create web pages for user testing. The paper will explore the results of user testing and the implications for communicating quality information to users in the future.

## 1. Background

ONS are required by the Code of Practice for Official Statistics (UK Statistics Authority, 2009) to provide quality reports to users alongside Official Statistics. For the last 5 years or so, ONS has met this requirement by publishing Quality and Methodology Information (QMI) reports alongside statistical bulletins. QMIs contain static quality information<sup>2</sup>, descriptions of methodological processes and the strengths and limitations of data. They are designed to enable users to understand and determine

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<sup>2</sup> Static quality information refers to information that does not change with each release of a statistic, for example, the sample size could be an example of static quality information.

suitable uses of the data. QMIs also allow us to report on the European Statistical System (ESS) dimensions of quality.

## 2. Reviewing the QMI format

Since the QMIs were designed, there have been many changes in the digital environment affecting how our users consume our information. ONS has been focussing on the agenda “Digital by Default” with recent work researching user personas and developing a new website. Therefore, it was a good time to review how we communicate quality information to our users with an emphasis on increasing accessibility for different types of users.

As a first step to increasing this accessibility, we considered what a QMI does, which, as stated above, is to help users make an informed choice on what the data are suitable to be used for. We then thought about our users’ first need from quality reporting and determined that the first purpose of quality reporting should be to help users reduce the risk of misusing the data. We then explored the possibility of creating a new quality reporting product which combined the idea of progressive disclosure (presenting the most important information first with less important information following after) with the need to encourage users unfamiliar with quality information to access the product. We investigated the effectiveness of presenting vital information to guard against misuse as a set of 4-5 bullet points combined with an overview, on a separate Quality Summary page, which would then lead into the full QMI.

We then thought about what the content of these 4-5 bullet points should be. Should the content be consistent across all outputs or would bespoke content tailored for each set of data be more beneficial to users? We decided to investigate a bespoke approach as, while consistency across user-based products is important, using the same pieces of information for all outputs could risk the information becoming meaningless to our users. A list of potential pieces of information was proposed, with guidance presenting a range of options for statistical producers to consider and select from when choosing what quality information to communicate to users.

## 3. Approach

Statistical producers are experts in their data and what their users need to know about it in order to reduce the risk of misuse. Therefore, it was important to consult them on what should be included in the list to create examples that could then be user tested. This was achieved through a series of focus groups and individual meetings with statistical producers, methodological experts and key stakeholders.

A great deal of information was gathered during this consultation, the information was classified into themes (Guidance, Standards and Definitions, Content, Practicalities and Miscellaneous). In the remainder of this paper, we consider the Guidance, Content, and Standards and Definitions themes in more detail.

### 3.1. Theme: Guidance

When thinking about setting guidance for communicating quality information to reduce the risk of misusing data, we first needed to identify a required outcome for the guidance. What do we want this information to do? We want this information to help our users reduce the risk of misusing the data. What does this mean in practise? How can we reduce the risk?

Feedback from the consultation with statistical producers showed that we can do this by educating our users about the data and how to use it, including context and what they can do with the data. By providing the right information, we can help our users to guard against inadvertent misuse. To do this, we need a set of "rules" to follow to ensure that the right information is provided to users.

In developing these rules the consultation responses underlined the importance of:

- thinking specifically of users of an output case by case basis
- thinking about what users can use the data for and what information is most helpful so that users can make informed judgements on how not to misuse the data
- being transparent
- being helpful
- not being too cautious
- providing examples of good practice to statistical producers

The following rules were therefore developed:

- The most important information comes first. If someone is only going to read one thing about the data, what is the most important thing that they need to know about it? If they are only going to read 2 things, what should they be?
- whilst it is important to include what users want to know, what users *need* to know in order to reduce the risk of misusing the data must always take precedence
- information must always be current, relevant and helpful, and so should be reviewed and updated when necessary
- the most relevant topics will vary from output to output, they must always be the most important and relevant for that data and should never be considered as default topics to be completed on a regular basis
- the information must be consistent with what is in the QMI, there should not be any mixed messages

Therefore, we must create a mind-set of putting the user at the heart of what we are doing, of thinking what is most important for users to know rather than what we want to tell them, or even what just meets our obligations. Information must be tailored for each output and be what is most helpful. All information must be clear and transparent.

### 3.2. Theme: Standards and definitions

During the consultation, participants identified that with such a diverse range of outputs, a one size fits all approach is not appropriate. Conversely, it was also felt that consistency should be maintained wherever possible without the template being too rigid in terms of the content to be included. The design and layout of the pages will help to maintain consistency but an agreed set of standards will support this, some examples given were:

- a definitions statement
- a glossary of essential technical terms

When setting up the pages, writing guidance and drafting the text, we will need to use consistent definitions and, where this is not possible, clearly explain the differences between definitions and give clear reasons for these differences.

### 3.3. Theme: Content

The subject of what content should be on the list to choose from to create a customised selection of information for each output generated a great deal of discussion. There was a general consensus from participants that content needs to be bespoke for each output and not a standard set of questions to be completed. A number of common themes came through strongly (more detail on some of these can be seen below), but is important to stress that content should not be limited to these themes. Whatever is most useful in helping users to reduce the risk of misusing the data should be included. Statistical producers experience and knowledge of their data and their users' needs will play a vital role in ensuring content is relevant and useful to users.

**Uses** - how to use or not use the data was considered to be an important subject to cover for our users. Participants suggested that we could be more proactive in telling our users what the data should or should not be used for. Some examples of what we could specify included: how you can use the data; why you should use this data instead of that data and vice versa; how the data are used; what else is there; how outputs relate to each other, where they are similar and where they are different.

**Quality commentary** - this category has many and varied points to consider while determining what information is most helpful to users regarding reducing misuse. As with all the categories, these points will vary in importance depending on what is going on with the data for each time period. Producers could consider including: the main strengths and limitations of the data; important changes, quality of changes, quality assurance of the data, how the quality of estimates can deteriorate at lower levels; any caveats, warnings or signposts and where particular difficulties in using the data lie.

**Uncertainty** - we need to clearly communicate where data are estimates and explain what that means. We need to communicate any uncertainty associated with the data and to be clear what this uncertainty means in terms of how data should be used.

**Accuracy** - it was felt that users should be informed of what preliminary and revised means and what to expect. Any important issues that affect the accuracy of the data should be discussed, for example boundary changes that require revisions. Any issues of discontinuity and variance would also need to be considered.

**What the data are or are not** - clear descriptions need to be given about the data: what they are; what they are not; what is available and how far back it is available; coverage; what it includes; what it doesn't include.

**Coherence and comparability** - coherence and comparability were strongly favoured as important points to include by statistical producers. Comparisons with other statistics, highlighting where they were the same but also where they were different, was felt to be of particular interest to users of business statistics for example. There should also be some consideration given to the harmonised principles used and the resulting comparability between outputs.

**Sources** - for outputs that are based on administrative data, informing users of the data sources was considered by statistical producers to be of high importance. In discussing data sources, points to consider informing users of could be similarities in sources and differences in outputs, definition of the sources and whether the output is a combination of administrative data and survey data.

**Process** - whilst describing the process of producing the statistical output to users in order to help them reduce the risk of misusing data there are, of course, many aspects that could be discussed. These include, but are not limited to: sample size and response rate, is this information robust and meaningful; periodicity; how is the data calculated (this will be difficult to communicate in the short space intended for this information, but links could be included); links to supporting metadata and methodological documents; non-response rates; whether the data is seasonally adjusted or if it is an index, whether it is based on a basket of goods and when it was last rebased.

The amount of information available to be discussed is wide and varied, and it should be stressed here that the points given above are not a "checklist" but instead a basis for starting the discussion about what information is most helpful to users of each individual output.

#### 4. Background to user testing

Once the internal consultation was complete, it was important to gain views from our users to ensure that this new quality product would meet their needs.

At the time of this project, the development of a new ONS website was in progress, and on the trial website each output had a QMI page that gave a general introduction to the survey. Using the research discussed above, a small team worked together to create an example page for the Business Register and Employment Survey (BRES), containing quality information designed to reduce the risk of misusing data. This page

included a set of bullet points that gave the most important pieces of information required to help reduce the risk of misusing data (see Example 1), followed by an overview giving further detail (see Example 2).

**Example 1: Important points about BRES data included on the example page:**

- the Business Register and Employment Survey (BRES) is the official government source of employee statistics by industry
- it provides employee and employment estimates at low levels of geography and industry for Great Britain; however, as it's a sample survey, there is a reduction in the quality of the estimates as the geographies get smaller
- BRES does not include some of the very smallest businesses not registered for VAT or PAYE
- it underestimates the employment measure as it does not include all self-employed
- it was not designed to be used as a time series; BRES represents a snapshot of the GB economy and time series analysis should be treated with caution

**Example 2: Overview included on the example page:**

Business Register and Employment Survey (BRES) data are used to produce employee and employment statistics and to update the Inter Departmental Business Register (IDBR), the sampling frame used for a lot of our business surveys.

The employment figure is calculated by adding the number of working owners registered for VAT or PAYE to the number of employees employed by a business.

BRES is a point in time survey, based on a certain date in September. Therefore, it is not designed to be used as a time series. BRES is subject to discontinuities over time, such as changes in Standard Industrial Classification (SIC), source data, methodology and reference date. This needs to be taken into account with any time series analysis.

BRES collects employment information from businesses representing the majority of the economy in Great Britain. Northern Ireland data are combined with BRES data to produce high level estimates for the UK. BRES estimates on the ONS website are UK based, those on Nomis<sup>®</sup> are based on Great Britain.

The BRES data and estimates are widely used, both within and outside government, and are a vital source of business employee information. The main users and uses of the output include: Eurostat, the Scottish and Welsh Government, Department of Business, Innovation and Skills (BIS), Workforce Jobs and the Annual Business Survey (ABS). Local Government planning departments are major users of BRES using the estimates published on NOMIS<sup>®</sup> to forecast trends in employment in their specific areas and to claim for Central Government and European funding.

## 5. Task for user testing

The existing trial website page for BRES and the Example page for BRES were provided to a group of expert users identified by the website user team. Alongside the pages, we provided a task for the user team to test against the pages, the questions we asked are below:

- Does the information in this new format encourage users to read this important quality information, particularly users who would not generally access a QMI?
- Does this kind of quality information give users the ability to make informed judgements on how not to misuse data, or at least an indication that there are things to be taken into consideration before using the data?
- Do the users find this type of quality information more or less useful than the original content, or would a combination of the two be helpful?

The target audience for the test were Expert Analysts and Methodology contacts. The test took place between 17th and 30th November, during which 140 users participated.

As stated above, during the test the users were shown 2 examples of supporting information for BRES, Version 1 (the existing trial website page) and Version 2 based on the research described in this paper. Users were asked to choose the version that best described what the page was about and which best informed them on how not to misuse data, along with what needs to be taken into consideration before using the data. They were also asked to comment on likes/dislikes on both pages.

Of the 140 participants, 67% chose Version 2 as the example that best described what the page was about and informed them how not to misuse data and informed them what needs to be taken into consideration before using the data.

Some comments on the example version were:

- "It makes it immediately clear to users what it does/doesn't include."
- "Liked the "important points". These immediately explained the limitations of the data"

The team reported that both versions have a number of positive and negative comments with users liking the simplicity of version 1 and the layout and structure of version 2.

User testing recommended implementing the new format example Version 2, but with some additional work to be done on making the information more concise and easier for users to understand.

## 6. Implementation

With over 100 outputs requiring a new Quality Summary page, we needed to prioritise the order of implementation. We looked at web metrics and correspondence with users regarding the misuse of data to choose a set of 30 outputs to schedule first.

In order to continue the collaborative process of learning through sharing experience, we decided to set up a series of workshops with 4-5 statistical producers to work together to produce Quality Summary pages for publication. This will help us build up a portfolio of good practice examples to share. To address comments from user testing about understanding the language used, experts from our Editorial team will be attending the workshops to further the aim of easing understanding and expanding the accessibility of quality information to different types of users.

## 7. Conclusion

Given the work going on within ONS on developing Users Personas and a new website, it was time to review how we communicated quality information to our users. We identified an opportunity to increase the accessibility of quality information for users by exploring ways to reduce the risk of misusing our data. We consulted internally with statistical producers to identify what kinds of information our users might need to know about a wide range of outputs. We user-tested our approach and are now implementing new Quality Summary pages across statistical outputs.

The Quality Summary page discussed in this paper is only one part of a layered approach to our user based quality reporting that also includes QMIs and quality information contained within statistical bulletins. This approach is described in more detail in table 1.

The analysis from this research will also be used to inform further improvements to QMIs and quality information contained within statistical bulletins.

The 3 quality reporting products will then work together to provide a range of clear and comprehensive quality reporting products that will be accessible to a wide range of users.

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Table 1 A layered approach to quality reporting

	<b>Quality Information in Bulletins</b> (Stand alone in Statistical Bulletin.)	<b>Quality Summary Page</b> (Webpage with QMI PDF attached.)	<b>Quality and Methodology Information PDF</b> (PDF attached to Quality Summary Page.)
<b>Aim</b>	To help users understand data and quality implications for that data in specific releases.	To reduce the risk of misuse of data.	To allow users to make informed judgement on suitable potential uses of the data.
<b>Purpose</b>	Information provided should help users understand how to use the data reported on in the Statistical Bulletin.	Information provided should be the most important points in order to reduce the risk of misusing the data, particularly for inexperienced users or users with limited time.	Information provided is designed to help users decide on suitable uses for the data. Template designed to meet requirements of the Code of Practice. The content is used as part of the Regular Quality Reviews and UKSA Assessments for Outputs.
<b>Type of Information</b>	Dynamic information – changes regularly to be specific to the data reported on for each period. Quality warnings/caveats on specific issues relating to the data reported on in that issue of the Bulletin.	Static information – more general across various time periods.	Static information – more general across various time periods.
<b>Length</b>	Concise – fairly high level information.	Concise – high level information – leads into QMI PDF.	More detailed information. Summarised descriptions of methods used to create the output (linking to further detail) and reports against the 5 ESS Dimensions of Quality.
<b>Presentation</b>	Frontloaded – critical caveats should be up front in the bulletin content. Should include quality warnings/caveats on specific issues relating to the data reported on in that issue of the bulletin.	Frontloaded – most important points first. Should include quality warnings/caveats on specific issues relating to the most common likely misuses of the data.	Specified template. Should include detailed information on strengths and limitations of data.

# Quality Changes when Moving from a Survey to an Administrative Source

*Daisy Hamer*

## Abstract

National Statistical Institutes are increasingly looking to use administrative data for statistical purposes, often replacing survey questions or whole surveys with such data. The purpose of this research is to look at possible changes in quality that result from moving from a survey to an administrative source. The first step to carrying out this piece of research was to conduct a literature review looking at what previous investigations have found and see whether any practical advice could be drawn from this. The second step was to find case studies, working with areas at the Office for National Statistics (ONS) which are, have, or are considering replacing survey data with administrative data and investigating quality changes that result. Research is still ongoing but current findings point to some benefits and some issues that arise as a result of replacing survey with administrative data. These are areas which need to be considered in the development of guidance for statistical producers. This paper will summarise findings from the literature review and the research conducted so far.

## 1. Introduction

### 1.1. Rationale

National Statistical Institutes (NSIs) are increasingly looking to use administrative data for statistical purposes, often replacing survey questions (supplementing) or whole surveys with such data. It is important to understand the potential benefits and issues with introducing and using administrative data, therefore the purpose of this research is to look at changes in quality that result from using administrative data to supplement or replace survey data. This research is undertaken with a view to developing guidance.

### 1.2. Approach

The Quality Centre (QC) at the Office for National Statistics (ONS) proposed to carry out an investigation to assess changes in quality resulting from the use of administrative data to supplement or replace survey data. The first step in carrying out this research was to conduct a literature review looking at previous investigations, from ONS and other NSIs, to understand the approach taken by others and see whether any practical advice could be drawn from this. The second step was to find case studies, working with areas at ONS which are, have, or are considering supplementing or replacing survey data with administrative data, and investigating quality changes that result from this move.

## 2. Literature Review

### 2.1. Introduction

The Quality Centre began this review in June 2015. The investigation began with assessing reports of major European studies such as ESSnet projects; this is a project that involves several members of the European Statistical System (ESS) working together to obtain information or results that would benefit all those in the ESS. These reports were also used to find other previous reports that could be assessed and to find contacts. Various NSIs were contacted directly and asked about what work they had done in areas of quality and administrative data. The reports they provided were appraised and added to the review.

The review assessed reports which looked at how quality in administrative data can be evaluated and what factors in quality should be looked at. The review also assessed reports which looked at quality issues in administrative data.

This section summarises the key findings of the literature review. It discusses what has been found in both:

- how quality in administrative data is evaluated and
- how quality changes when administrative data is introduced to supplement or replace survey data.

### 2.2. Assessing Quality

This section summarises what the review found on methods of assessing and measuring quality.

The review found that there are various different ways of measuring quality in administrative data. Some reports only looked at how to assess the quality of the administrative data sources or the resulting outputs and some looked at how to assess input and output quality combined. The majority of the reports based their methods of assessing quality on the ESS quality dimensions (ESS, 2009) but removed certain dimensions or included new ones. An example of this is a Blue-ETS project (2011), which looked at quality measures for administrative data sources. This study excluded the ESS dimension "Accessibility and Clarity" from its method of administrative data quality assessment but included a new dimension called "Technical Checks", a dimension that is exclusive to administrative data and looks at how useable the files containing the data and the data are. This dimension includes such things as how readable files are and whether the data provided complies with the metadata which should have been provided alongside it. This added dimension seems useful and should be something that NSIs consider and report on when discussing the quality of administrative data sources.

Some of the reports also broke down quality dimensions into composite indicators. An example of this is that if someone wanted to know the accuracy of an output they could look at all the factors that would affect the accuracy of the output (these are the indicators) and combine them to get a mean (this is the composite indicator), which

would then serve as guidance on the overall accuracy of the output. Composite indicators seem like a logical way of assessing quality, however an ESSnet report (2011) states that it can be difficult to derive a composite indicator that is meaningful, and therefore recommends that quality should be assessed in no further detail than acceptable and unacceptable. The report also states that composite indicators are only useful for looking at quality improvements of one output over time and not for comparing different outputs. This indicates that it would not be a useful method for comparing survey and administrative data. Along with this there is subjectivity involved in setting reference values which could cause inconsistency in a quality assessment.

The review also noted that a possible way of measuring accuracy in administrative data would be to develop a framework similar to Total Survey Error (TSE) – which looks at errors which come from every stage of the survey process and is calculated using the Mean Squared Error formulation (Weisberg, 2005) - as some survey errors may be relatable to errors in administrative data. For example in specification error, rather than the issue being a survey question implying a concept different to what is being measured, it could be that a definition in an administrative dataset could be different to what needs to be measured for the output, such as an administrative dataset defining turnover slightly different to how an NSI defines it. Aspects such as this may be a starting point for considering a total error framework for administrative data that could be comparable to TSE, meaning that accuracy in survey and administrative data could be compared through these relatable frameworks. It is recommended that NSIs and working groups on quality in administrative data further consider this possibility.

Overall there are many ways of assessing quality in administrative data and it is difficult to say whether there is a best method. It should also be noted that many of the methods of assessing quality reviewed look solely at how quality can be assessed in administrative data and not how to compare the quality of survey and administrative data. Further investigation at ONS will look into how this should be done.

### **2.3. Quality in Administrative Data**

This section looks at what the review found from previous literature available that that looked at quality benefits and issues that are common in administrative data or that arise when introduced to supplement or replace survey data.

The main issue highlighted in the review was accuracy, which can be negatively affected by problems such as under- or over-coverage, or incomplete or inconsistent data. Other problems can be with data collection or with the ways in which the data are compiled. There may be no quality checks on the data, there could be biases in the way data is input, or data may not be recorded appropriately or at all, as was found by the UK Statistics Authority (2014) when they completed an assessment on police recorded data which is used in statistics for Crime in England and Wales.

An example of accuracy issues comes from a report by Statistics New Zealand (2014) that looked at using administrative data to determine population statistics in their census. The report highlighted that the administrative data used had accuracy

problems in that there was both under- and over-coverage. The report did find that the more different administrative data sources that were linked together, the more accurate the data seemed to be, although there were still issues with coverage of children and people of Maori descent. Because of this it was decided that at that time it was not feasible to use administrative data for population estimates. The report recommended that using more data sets may improve the accuracy but highlighted that the issue of linkage errors is currently inadequately measured.

This shows that accuracy is an important problem for administrative data quality and, whilst there are ways of improving accuracy such as through linking datasets, it is still a problem that needs to be considered.

Another quality issue that was highlighted often in the review was that there can be problems with timeliness in administrative data. A report by the Australian Bureau of Statistics (Pink, 2011) stated that there is often a delay between when the data are collected and when they are available for use. The report also states that there may be a delay in how long it takes for data to be collected, for example in tax data, tax payers may be granted an extension to the deadline for filling out their tax return. This is not only an issue with timeliness but can cause a trade-off between timeliness and accuracy; more timely data will be less complete and waiting for more complete data would make the data less timely.

Trade-offs such as this are not uncommon when considering quality and there can be a trade-off between quality dimensions when administrative data is introduced. The quality dimensions are not completely independent of each other and the introduction of administrative data can cause an improvement in quality in one of the dimensions and a worsening in quality in another. The ESS states that trade-offs like this should be considered in addition to the individual quality dimensions.

The review showed that accuracy and timeliness were found to be common quality issues for administrative data in various types of statistics including business and census statistics. This corresponds with a report by Berka et al. (2010) which stated that accuracy is the most challenging quality dimension in the ESS framework. There are ways of improving the quality in these areas but issues can still occur and NSIs should consider the trade-offs between the dimensions.

One way to address and report on the issues discussed above is to look to the "Administrative Data Quality Assurance Toolkit" produced by the UK Statistics Authority (2015). This toolkit looks at quality exclusively in administrative data and includes, amongst other areas, a section which gives guidance on assessing and improving the way in which the data providers assure the quality of the data.

## **2.4. Discussion**

The reports discussed look at various different quality issues in relation to administrative data. One of the main issues is with accuracy, which can be negatively affected by problems such as over- or under-coverage. However, the reports also show

that there are some methods of dealing with the issues that arise, such as linking data sets (although this can be prone to error).

This review also looked at ways in which quality can be measured in administrative data. It found there are multiple ways of doing this, and each report reviewed measured quality in different ways. The most appropriate way of measuring quality may differ depending on how and where administrative data are being used.

An issue with compiling the literature review has been is that there are a few examples which look at quality changes when survey data is supplemented or replaced with administrative data. There also seems to be little literature which directly compares the quality of administrative and survey data. As a result of this, the Quality Centre is collaborating with other areas in ONS working on a project to measure the quality changes resulting from the introduction of administrative data.

### **3. Case Studies**

Work is currently taking place looking at case studies within ONS of business areas which are, have, or are considering replacing survey data with administrative data and investigating quality changes that result. One of these case studies relates to International Migration Statistics.

Semaphore data (formerly e-borders data) refers to data collected by the UK Border Force (BF) on those who are travelling into and out of the UK, using the new Semaphore system. The Semaphore system collects the travel information of all individuals travelling into and out of the UK including the individual's passport and booking data. ONS have been looking into the possibility of using Semaphore data to improve international migration statistics, possibly by supplementing or replacing certain parts of the International Passenger Survey (IPS) or by combining with other data sources. ONS have produced several reports on the use of Semaphore data for international migration statistics, the most recent (ONS, 2014) assesses a Semaphore dataset from 2009 to 2012. This dataset presented issues related to accuracy and reliability.

There are currently coverage issues with Semaphore data, and the report states that a good level of coverage has yet to be achieved and that this is not an issue that can currently be resolved easily. Over-coverage is also an issue as the way the Semaphore system works means that there are often duplicate records. Some of these duplicate records can be linked to reduce over-coverage but if one or more of the variables are different between the two records that are referring to the same travel event and individual, then this is more difficult to solve. ONS has worked to solve this issue using a de-duplication strategy but the report states that it is still an issue that needs to be resolved before Semaphore data is used.

Another issue is that of consistency as an individual's travel information can change over time; they may therefore have different information each time their details are entered into Semaphore. The report highlights that whilst BF have good tools to clean, categorise, and link the data, there are still improvements that could be made.

A positive aspect in relation to the accuracy of the data is that there is a fairly high level of completeness with 96% of records having complete and valid information, compared to the IPS overall response rate of 79% (ONS, 2015).

The report also states Semaphore data may have issues with timeliness as to ascertain whether a person is a long-term migrant, the individual entering or leaving the country would have to be assessed for 12 months, whereas with the IPS, they would be asked their intentions as part of the survey. This would mean that there would need to be a lag of over 12 months between the end of the reference period and the release of estimates using this data. The current migration statistics have a 5 month lag. However, this issue could be dealt with by using provisional estimates that could then be revised.

Based on the information discussed above, ONS concluded that Semaphore data is not currently appropriate for direct use in migration statistics. However, there is an argument that it may be acceptable to use the data as a source of reference data for other purposes such as an additional source of reference data for the IPS Sample Review. Also the report highlights that Semaphore data is continuously being updated and improved, which means that it may be possible to use the data directly in migration statistics in the future.

#### **4. Conclusion**

Both the literature review and the case study show that there are many quality issues that can arise from the use of administrative data and that there needs to be continued investigation into these sources, both how and what is measured and how these issues can be solved.

It is important to note that just because administrative data has quality issues; it does not mean that it should not be used in statistics. Survey data also comes with many quality issues, indeed Hand (2008) said that "it is rare to meet a data set which does not have quality problems of some kind" (p.36). All this means that for both survey and administrative data, whilst improving quality should be a main concern, NSIs should also know what quality issues their statistics have and be able to report them in a clear manner. Therefore it is recommended that there is further investigation into how quality in administrative data should be measured and reported in order to create guidance on these matters, and also to create guidance on how quality changes resulting from supplementing or replacing survey data with administrative data can be assessed.

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# Developments in measuring the burden placed on businesses responding to statistical surveys

*Ria Sanderson, Denise Williams, Megan Pope, Adam Tucker*

## Abstract

The UK Code of Practice for Official Statistics ([1] UK Statistics Authority, 2009) specifies the need to report annually on the burden placed on respondents to surveys of businesses and households. Whereas information on the time taken for a household to respond to a questionnaire can be measured at the point of collection, it is more challenging to measure the time and hence the cost to businesses of responding to surveys used to compile official statistics. A traditional approach to such measurement of surveys conducted using paper questionnaires is to send a short review questionnaire to a sub-sample of businesses. This review questionnaire gathers information both on the time taken to respond to the main survey and who in the business provides this information; this can then be used to estimate the financial costs to the business.

Such reviews ceased at ONS in 2012 and information on respondent burden was collected through a self-assessment tool used by survey managers to assess the quality of statistical outputs. This used information from previous reviews and knowledge of survey changes to estimate respondent burden. However, it proved difficult to collect high quality information on respondent burden without the data from these review surveys. Therefore, motivated by the aim to improve the measurement of the financial costs to businesses of responding to surveys, a shortened review process has been piloted. In an effort to balance the burden placed on respondents by this process and to make the process as efficient as possible, we have tested the use of statistical modelling to estimate respondent burden for surveys with similar characteristics. If successful, such an approach would reduce the number of review surveys that need to take place whilst still maintaining accurate measurements of respondent burden.

In this paper, we report on the pilot exercise carried out, including the methodology, results and conclusions of this work. We also consider the implications for the future measurement of respondent burden placed on businesses.

## 1. Introduction

One of the eight principles of the UK Code of Practice for Official Statistics (UK Statistics Authority, 2009) is “proportionate burden”, which places an obligation on producers of statistics to limit and assess the burden placed on respondents to statistical surveys. Under this principle, statistics’ producers are expected to “report

annually the estimated costs (for example, on businesses, service providers, or the public) of responding to statistical surveys". ONS reports figures for surveys to businesses and local authorities through the Online List of Government Statistical Surveys<sup>1</sup>. The OLGSS collates information from across government on statistical surveys and includes information on their frequency, mode of collection and respondent burden. The OLGSS will be expanded in 2016 to include information on surveys of households and individuals.

The agreed methodology for calculating the cost of complying with government surveys sets out the approach to measuring burden for surveys of households and for surveys of businesses. This methodology applies to all producers of official statistics in the UK and was established by the [2]Government Statistical Service (GSS) Respondent Burden Task Force (2010). In the case of surveys of households or individuals, the required measurement is an estimate of the total time taken in responding to the survey. For surveys of businesses or local authorities, the required measurement is the financial cost to the business of responding to the survey. This is further broken down to consider the different components where a cost is experienced by a business responding to a survey and requires knowledge of:

- the time taken to respond to the survey
- the number of respondents to the survey
- any external costs incurred by the business in completing the survey, for example accountancy services used
- the number of respondents contacted for validation
- the time spent in the validation of survey responses when re-contacted

The total respondent burden for one instance of the survey, in terms of a financial cost, is calculated under this methodology as

where  $n_{resp,main\_surv}$  is the number of respondents to the main survey,  $med(t_{main\_surv})$  is the median time<sup>2</sup> taken to respond to the main survey,  $n_{val,main\_surv}$  is the number of respondents to the main survey who are re-contacted for the purposes of validation,  $med(t_{val})$  is the median time taken for this validation,  $hourly\_rate$  is the appropriate hourly rate for the occupation, taken from the Annual Survey of Households and Earnings report (ASHE) of the respondent,  $prop_{external\ costs}$  is the proportion of businesses incurring additional costs (such as accountancy fees), and  $med(external\ cost)$  is the median external cost experienced by those businesses who incur additional costs.

Therefore, to measure respondent burden costs placed on businesses, a number of variables need to be collected. The variables related to validation can be collected from internal systems, however information is required from businesses on the time taken

<sup>1</sup> [http://www.neighbourhood.statistics.gov.uk/HTMLDocs/OLGSS/OLGSS\\_interactive.html](http://www.neighbourhood.statistics.gov.uk/HTMLDocs/OLGSS/OLGSS_interactive.html)

<sup>2</sup> The choice of the median was made by the GSS Respondent Burden Task Force (2010). The rationale behind this choice was to limit the impact of outliers on estimates of respondent burden.

to complete the questionnaire and the level of any external costs where these are incurred.

## **2. History of the measurement of respondent burden for business surveys at ONS**

A traditional approach to measuring the costs incurred by businesses when responding to official statistical surveys is to send a short review questionnaire to a sub-sample of businesses. This was the approach taken at ONS until 2012 under the programme of triennial and quinquennial reviews<sup>3</sup>. These were quality reviews that included the collection of information on respondent burden.

In 2012, changes were made to how quality reviews were conducted and the triennial and quinquennial reviews were replaced with the Quality, Methods and Harmonisation Tool (QMHT). This was a self-assessment tool, completed by the managers of statistical outputs, that collected information on respondent burden. This used information from previous reviews and knowledge of survey changes to estimate overall respondent burden for business surveys. However, it proved difficult to collect high quality information on respondent burden without the data from the triennial and quinquennial review surveys.

Use of the QMHT ceased in 2014 following feedback from statistical output managers, which indicated that it did not meet their needs. This left a gap in the availability of up-to-date information on respondent burden for business surveys, which in time, is anticipated will be filled by the use of electronic methods for data collection. However, it is important to ensure that accurate, up-to-date measures of respondent burden costs can be made until such a time that information is available electronically. The importance of this information is not only in terms of meeting the requirements of the Code of Practice; accurate measurements of respondent burden are invaluable in determining any reductions in burden made as a result of an increase in the use of administrative data or from a change in collection mode as well as in monitoring and managing the level of burden placed on respondents.

## **3. Methods for measuring respondent burden placed on businesses**

To address the need for updated information, a project was established to investigate how the respondent burden could be measured for business surveys in an efficient and effective way. Ideas raised at an early stage identified possible approaches to measuring respondent burden. The pros and cons of these approaches are described in Table 1.

A pilot was established to investigate options (2) and (3). Option (1) was rejected at this stage as not all the required information can be collected in this way without

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<sup>3</sup> <http://www.ons.gov.uk/ons/guide-method/method-quality/quality/triennial-reviews/index.html>

evaluating and making changes to a large number of questionnaires. The aim of this pilot was twofold:

- to establish whether a shortened review process can be used to measure respondent burden
- to establish whether respondent burden can be modelled for similar surveys

**Table 1. Possible approaches to measuring respondent burden for business surveys.**

Method	Pros	Cons
1. Collect completion time information on main survey questionnaire	<ul style="list-style-type: none"> <li>• No additional burden placed on respondents</li> </ul>	<ul style="list-style-type: none"> <li>• Only collects time, not external costs</li> <li>• Has to be included as a voluntary question</li> </ul>
2. Conduct a short review survey	<ul style="list-style-type: none"> <li>• Allows all required information to be collected</li> </ul>	<ul style="list-style-type: none"> <li>• Cost – both for the questionnaires and to carry out the reviews</li> <li>• Could be perceived as additional burden to the respondent</li> </ul>
3. Model burden from one survey to another	<ul style="list-style-type: none"> <li>• Information does not need to be collected for all surveys</li> </ul>	<ul style="list-style-type: none"> <li>• Need to identify similar surveys</li> <li>• Relies on variables that are correlated with completion time</li> <li>• Still requires the collection of information for some surveys</li> </ul>

These options were considered in some detail and resulted in a pilot of a new, much shortened, process for reviewing respondent burden; the results of which were used to test a statistical modelling approach to estimating respondent burden. An overview of the pilot and the results of the statistical modelling are presented below.

#### 4. The pilot

It was decided to adopt a similar approach to the triennial and quinquennial review process during the pilot. This meant that a separate, short, voluntary questionnaire was sent to a representative sub-sample of the main survey. The questionnaire collected information on the time taken to complete the main survey (including the time taken to compile the required information), the position (for example, occupation) in the business of the respondent (used to determine an appropriate hourly rate) and the level of any external costs incurred by the business. The process was streamlined significantly in comparison to the old review process to ensure that it was as efficient as possible.

The process was managed centrally and the relevant survey managers were consulted from an early stage. The reviews were scheduled to be sent out approximately 2 days

after the main survey. No changes were made to the response-chasing strategy for the main survey; however, where a respondent had not returned the main survey questionnaire or the review questionnaire, when reminded of the need to complete the main survey they were also reminded of the opportunity to complete the review questionnaire. The pilot was carried out between October 2014 and December 2014.

#### 4.1. Selecting the surveys

It was agreed to carry out the pilot on 3 monthly surveys. Monthly surveys were chosen as they presented the most frequent opportunities for sending out questionnaires. The surveys were chosen on the basis of being relatively similar in terms of structure and in containing only a relatively few number of questions; this was an important decision from the point of view of the statistical modelling. The surveys chosen were:

- Monthly Business Survey (Retail Sales Index)
- Monthly Wages and Salaries Survey
- Vacancies Survey

**Figure 1. Median completion times for a selection of monthly and quarterly surveys from past data. The 3 surveys selected for the pilot are shown as solid circles.**



The Monthly Business Survey (Retail Sales Index) collects information on monthly retail turnover; the Monthly Wages and Salaries Survey collects information on salaries and is the main data source for the Average Weekly Earnings statistics; the Vacancies

Survey collects information on the number of job vacancies in businesses. On the basis of past data, these 3 surveys were expected to show similar completion times. This is indicated in figure 1, which shows the median completion times based on past data for a selection of monthly and quarterly business surveys. They also all use the same sampling frame, the Inter-Departmental Business Register (IDBR) which means that the same potential explanatory variables are available for all three surveys.

## 4.2. Sample sizes and response rates

The sample sizes and response rates for the pilot are shown in table 2. Note the differing response rates between the 3 review surveys. The reason for this is not clear but it may be due to the dates when the surveys were dispatched; both RSI and Vacancies were dispatched in December whereas MWSS was dispatched in November.

**Table 2. Sample sizes and response rates for the review surveys.**

	Monthly Business Survey (Retail Sales Index)	Monthly Wages and Salaries Survey	Vacancies Survey
Main survey sample size	4,959	9,295	6,030
Review survey sample size	501	773	600
Review survey response rate	41 %	71 %	47 %

## 5. Statistical modelling of respondent burden

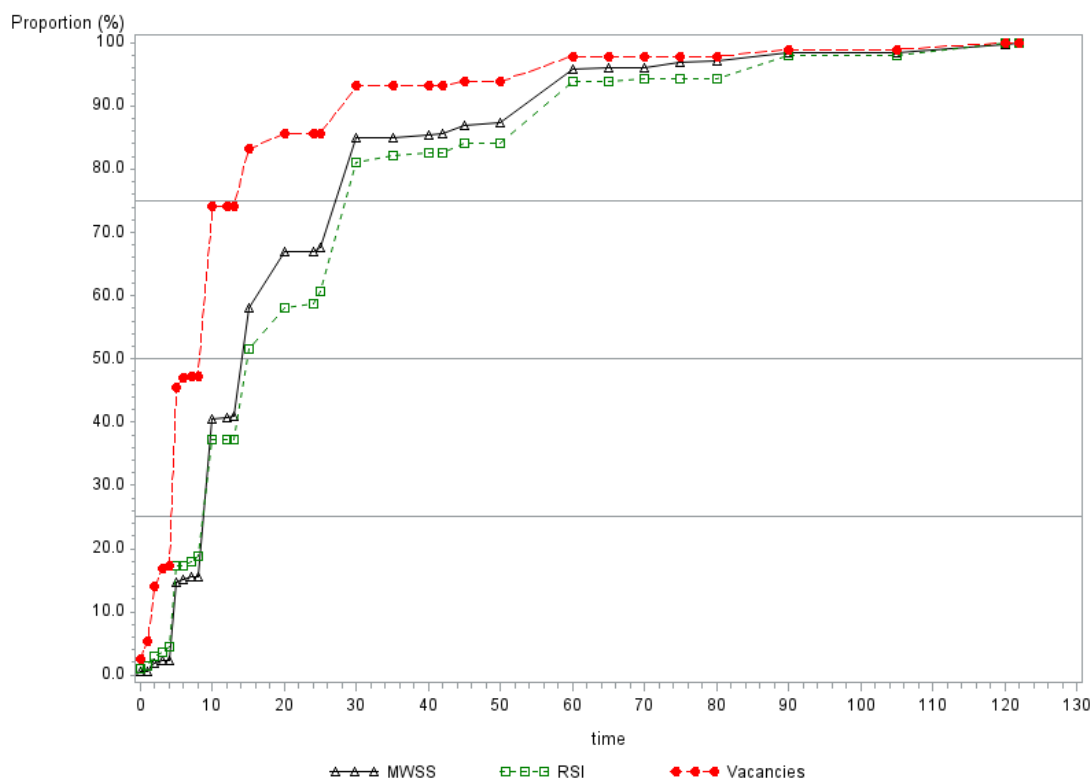
One of the ideas put forwards at an early stage was to consider whether information on respondent burden from one business survey could be used to estimate the burden faced by respondents to a different business survey. The motivation for this approach was to limit the costs of carrying out reviews of all surveys, but also to limit the burden placed on respondents by the additional review activity.

The sampling frame (the IDBR) was used to provide supplementary information for the statistical modelling. Exploratory analysis was conducted to examine whether the time taken to complete the questionnaire correlated with any of the available auxiliary variables. This showed that there is no significant correlation between the time taken to complete the questionnaire and employment size or turnover.

The returned data showed that it is common for respondents to report the time taken to complete the questionnaire to the nearest 5 or 10 minutes as the returned data were clustered around these points. The distributions of completion times across the three surveys differs as indicated in figure 2, which shows the cumulative proportion of businesses completing the survey, as time increases. This figure also highlights the steps in the recorded data. This hides some of the true variation in the data. These non-sampling errors could be a result of the delay between receiving the main questionnaire and the review questionnaire, meaning that the respondent could not recall the true completion time. They may also occur if a different person completes

the review questionnaire in comparison to the main survey questionnaire or it may result from rounding on the part of the respondent.

**Figure 2.** Cumulative proportion of businesses as a function of completion time. The horizontal lines are at proportions of 25%, 50%, and 75%. Only times shorter than 150 minutes are shown.



Despite the weak correlation with the available auxiliary variables, a linear regression model was fitted to the data to try to predict completion time. The aim was to fit a model to one survey and then use this to predict completion times for another survey. Models were fitted using employment and the number of questions in the survey as explanatory variables. The number of questions was chosen as a possible explanatory variable under the assumption that the time to complete a single question of similar complexity may be fairly stable across surveys. As expected given the poor correlations, the models did not perform well. The rounding of the data also masked some of the true variation, which made fitting a successful model more challenging. The analysis was extended to combine data from two surveys to fit the model. This led to an improvement in the  $R^2$  value, but this was still poor (between 0.16 and 0.19). As the pilot concentrated on three surveys that were chosen because of their similarities, it is highly unlikely that this approach would therefore be applicable to other surveys. The analysis showed therefore that trying to model respondent burden from one survey to another, in terms of the completion time, was unviable.

## 6. Next steps

The pilot showed that the streamlined process for measuring respondent burden worked effectively. The streamlined process will be used over the coming months to



provide updated measurements of respondent burden for a number of business surveys. The information collected will help to inform future savings in respondent burden that are expected through the use of electronic methods of data collection and through the increasing use of administrative data.

## 7. Conclusions

There is an obligation under the UK Code of Practice for Official Statistics (UK Statistics Authority, 2009) to report on the burden placed on respondents to government surveys. Whereas this information is relatively easily collected for surveys of households and individuals, where these surveys are typically administered by an interviewer using a computer, it is more difficult to collect the relevant information from businesses who receive paper questionnaires. The GSS methodology for calculating respondent burden for business surveys requires information on the completion times of the survey, external costs incurred by the business and information on the time taking validating the responses through re-contacting businesses where required. The information on validation can be collected internally, but the remaining information still needs to be collected directly from businesses.

In time, this information could be collected through electronic means as surveys are moved from paper questionnaires to electronic methods of data collection. However, due to changes and improvements made to quality review methods at ONS, there is currently a need to update the information collected on the respondent burden placed on businesses. A pilot of a process of sub-sampling respondents and sending them a short questionnaire asking for information on completion times and external costs has been piloted and worked well. The data collected were used to try to model respondent burden from one survey to another by formulating a statistical model of completion time using auxiliary variables from the sampling frame. However, due to weak correlations between completion time and possible explanatory variables and the fact that the way the data were reported masked some of their true variation, the models had very poor predictive power. This approach has therefore been discarded. Over the coming months, the streamlined process of sub-sampling respondents will be used, in combination with existing data on completion times collected via some survey questionnaires, to update estimates of respondent burden.

## References

- [1] UK Statistics Authority, 2009, Code of Practice for Official Statistics, available from: <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/code-of-practice-for-officialstatistics.pdf>
- [2] GSS Respondent Burden Task Force, 2010, "Guidance on Calculating Compliance Costs", available from: <http://www.ons.gov.uk/ons/guide-method/best-practice/gss-best-practice/gssrespondent-burden-guidance/gss-respondent-burden-task-force-guidance/guidance-on-calculatingcompliance-costs.doc>



## Forthcoming Courses

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For further information on the available courses see the Statistical Training Service prospectus:

<https://gss.civilservice.gov.uk/learning-and-development/training-events/training-co-ordinated-by-the-statistical-training-service/>

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Latest timetable:

[https://gss.civilservice.gov.uk/wp-content/uploads/2015/10/GSS-Learning-Curriculum\\_June-2016.docx](https://gss.civilservice.gov.uk/wp-content/uploads/2015/10/GSS-Learning-Curriculum_June-2016.docx)

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(no code)	Introduction Module	12 Sep – 16 Sep
STAT6096	Introduction to Survey Research	03 Oct – 07 Oct
STAT6107	Analysis of Complex Survey Data	17 Oct – 21 Oct
DEMO6020	Demographic Methods I	31 Oct – 04 Nov
STAT6089	Evaluation & Monitoring	14 Nov – 18 Nov
STAT6093	Survey Sampling	28 Nov – 2 Dec
STAT6097	Compensating for Nonresponse	12 Dec – 16 Dec

#### Semester 2 (2016/17)

Module	Description	Dates 2017
STAT6111	Administrative data in Official Statistics	9 Jan – 13 Jan
STAT6110	Official Statistics in a European context	23 Jan – 27 Jan
STAT6095	Regression Modelling	30 Jan – 03 Feb
STAT6104	Further Sampling	13 Feb – 17 Feb
STAT6087	Time Series Analysis	27 Feb – 03 Mar
DEMO6022	Demographic Methods II	13 Mar – 17 Mar
STAT6106	Small Area Estimation	20 Mar – 24 Mar
STAT6088	Elements of Official Statistics	27 Mar – 31 Mar
STAT6091	Index Numbers	03 Apr – 07 Apr

More information: [www.southampton.ac.uk/moffstat](http://www.southampton.ac.uk/moffstat)

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