Quality and Methodology Information

General details

Title of output: Public Service Productivity Estimates: Total Public Services
Designation: National Statistics
Geographic coverage: United Kingdom
Date of last SQR or QMI¹: August 2013

Executive summary

This report relates to Public Service Productivity Estimates: Total Public Services.

The estimates included in the publication are output, inputs and productivity for the following publicly-funded service areas which represent the whole of Government-funded public services:

- Healthcare;
- Education;
- Social Security Administration;
- Adult Social Care;
- Children’s Social Care;
- Public Order and Safety;
- Police;
- Defence; and
- Other (this includes Economic Affairs, General Public Services, Recreation, Housing, and Environmental Protection).

The included data are provided on a UK geographic basis, and are published from 1997 to the latest available year, usually (t-2); where t is the current year. Total public services productivity growth is calculated by comparing growth in the total amount of output to growth in the total amount of inputs used.

In the publications, Public Service Productivity Estimates: Total Public Services, three sectors (police, defence and other public services) are treated as ‘collective’ services, and therefore output from these sectors is not measured directly. Instead, an ‘inputs–output’ convention is applied, so productivity is constant by definition for these service areas.

The aim of this report is to provide users with information on the usability and quality of estimates included in the publication.

¹ Quality and Methodology Information (QMI) replaced Summary Quality Reports (SQR) from April 2011.
This document contains the following sections:

- Output quality;
- About the output;
- How the output is created;
- Validation and quality assurance;
- Concepts and definitions;
- Other information (relating to quality trade-offs and user needs); and
- Sources of further information and advice.

Output quality

This document provides a range of information that describes the quality of the data and details any points that should be noted when using the data.

ONS has developed Guidelines for Measuring Statistical Quality\(^1\); these are based upon the five European Statistical System (ESS) Dimensions of Quality. This document addresses the Dimensions of Quality and important quality characteristics, which are:

- Relevance;
- Timeliness and punctuality;
- Accuracy;
- Coherence and comparability;
- Output quality trade-offs;
- Assessment of user needs and perceptions; and
- Accessibility and clarity.

More information is provided about these quality dimensions in the sections below.

About the output

Relevance

(The degree to which the statistical product meets user needs for both coverage and content.)

The UK Centre for the Measurement of Government Activity (UKCeMGA) was launched in 2005 in order to take forward the recommendations of the Atkinson Review\(^2\), which aims to improve the measurement of Government output, inputs and productivity, and to establish a regular reporting schedule.

In the years since the publication of the Atkinson Review\(^2\), ONS has developed estimates of Healthcare and Education output, inputs and productivity. These estimates are updated annually, and any methods changes are explained in prior papers and articles, published on the ONS website. ONS also periodically updates estimates of output, inputs and productivity for the remaining areas of government final consumption, based on the Classification of Functions of Government expenditure (COFOG). These are:

- Adult Social Care;
- Children's Social Care;
- Social Security Administration;
- Public Order and Safety;
- Police;
- Defence; and
- Other (includes Economic Affairs, General Public Services, Recreation, Housing, and Environmental Protection).
There are three different statistical outputs published in Public Service Productivity Estimates: Total Public Services:

- a volume index of total public services output, and indices of output by service area;
- a volume index of total public services inputs, and indices of inputs by service area; and
- a derived index for total public services productivity and by service area (output per unit of inputs).

Users of healthcare, education and other ONS public service productivity measures include:

- departments within UK Government such as the Cabinet Office and regulatory bodies;
- the National Audit Office;
- press and general public;
- the Office of Budget Responsibility;
- Institute of Fiscal Studies (IFS);
- The Nuffield Trust;
- academia; and
- international statistical bodies.

These organisations use the productivity estimates in a number of ways. Total Public Service Productivity estimates have been used directly by the IFS in their Green Budget 2012, and in briefings by Cabinet Office. Healthcare productivity estimates have been directly used by the Nuffield Trust. ONS has given advice to government departments on how to incorporate the general methodology of the estimates into their own work. The Cabinet Office has used Total Public Service Productivity estimates directly when briefing Ministers.

Feedback from users is received via user surveys and consultation events. Some users would like our publications to offer more timely statistics as well as a greater level of disaggregation. New methodologies would need to be introduced to meet this user need.

**Timeliness and punctuality**
(Timeliness refers to the lapse of time between publication and the period to which the data refer. Punctuality refers to the gap between planned and actual publication dates.)

Estimates of output, inputs and productivity in the total public sector are published on a calendar year basis, and generally refer to the period (t-2), with t being the current year of publication. Publication of Total Public Services is dependent on re-using data from the latest healthcare and education productivity estimates.

This degree of timeliness is consistent with the publication of data relating to expenditure weights for government services which publish to a (t-2) reference period in ESA table 113. If the reference period were to be moved for example to (t-1), there would be significant increase in the use of estimation to fill data gaps in the productivity articles, in advance of the publication of these datasets.

Provisional publication dates are published on the [ONS website](http://www.ons.gov.uk) and [Gov.uk Statistics Release Calendar](http://www.gov.uk). Actual publication dates are finalised at least one month ahead of publication. In the unlikely event of a change to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully, as set out in the [Code of Practice for Official Statistics](http://www.ons.gov.uk).

To date, each total public services productivity article has been published as scheduled.
How the output is created

A summary of the sources of data and statistical methods used to compile the output is documented in Sources and Methods for Total Public Service Productivity Estimates: Total Public Services. Significant methods changes are published in advance on the guidance and methodology pages to inform users of both the nature and the likely impact of methodological changes.

There are three different statistical outputs published in Public Service Productivity Estimates: Total Public Services:

- a volume index of total public services output, and indices of output by service area;
- a volume index of total public services inputs, and indices of inputs by service area; and
- a derived index for total public services productivity and by service area (output per unit of input).

Output

The data used to create the output series are taken from a range of sources:

- output data for each sector of government are taken from published sources. Estimates of output in the healthcare and education sectors are largely direct volume measures, taken from the published Public Service Productivity articles. These sectors accounted for 55% of government expenditure in 2010. More detail on the methods employed is published in the Sources and Methods papers for Education and Healthcare;
- output for social security administration, adult social care, children’s social care and public order and safety, are based on or taken in chained volume form from the Blue Book. Output estimates in these sectors involve a mixture of direct and indirect measurement. Direct measurement involves weighting activity volumes by their respective unit costs to calculate Laspeyres volume indices. Indirect measurement involves deflating an expenditure series using an appropriate deflator and using an ‘inputs=output’ assumption. These sectors accounted for a further 14% of government expenditure in 2010;
- output in the remaining three sectors - police, defence and other - is calculated indirectly, on an ‘inputs = output’ basis. These accounted for the remaining 31% of government expenditure in 2010.

The estimates of output in the healthcare and education sectors used in the Public Service Productivity Estimates: Total Public Services articles differ from the estimates used in the National Accounts as a result of differences in the approach to capturing changes in quality.

- In the education output series for productivity, quality adjustments are applied to school and initial teacher training (ITT) output. School output is adjusted using the change in the average total point score per student associated with the GCSE exams (in England, Wales and Northern Ireland) and Standard Grade exams (in Scotland). ITT output is adjusted using the proportion of students who pass their Qualified Teacher Status assessment. In the National Accounts series no quality adjustment is applied to education output at present.

- In the healthcare output series for productivity, several quality adjustments are used to capture changes in patient experience, clinical outcomes from general practice and health gain arising from procedures. This quality adjustment process is applied from 2001 onwards. In National Accounts, no quality adjustment is applied to healthcare output at present.
Table 1 summarises the differences between the output estimates contained in the Public Service Productivity Estimates: Total Public Services articles and National Accounts.

<table>
<thead>
<tr>
<th>Government service</th>
<th>National Accounts treatment</th>
<th>Public Service Productivity treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>No quality adjustment.</td>
<td>Quality adjustment based on Average Point Score in GCSE and equivalent exams.</td>
</tr>
<tr>
<td></td>
<td>No Further Education included in output estimates.</td>
<td>Further Education for all ages included.</td>
</tr>
<tr>
<td>Healthcare</td>
<td>No quality adjustment.</td>
<td>Quality adjustment applied based on primary and secondary healthcare performance.</td>
</tr>
<tr>
<td>Adult Social Care</td>
<td>Chained Volume Measure estimated.</td>
<td>As National Accounts.</td>
</tr>
<tr>
<td>Children’s Social Care</td>
<td>Chained Volume Measure estimated.</td>
<td>Looked After Children combined into one output category, and aggregated with non-looked after children expenditure.</td>
</tr>
<tr>
<td>Social Security Administration</td>
<td>Chained Volume Measure estimated.</td>
<td>As National Accounts.</td>
</tr>
<tr>
<td>Public Order and Safety</td>
<td>Chained Volume Measure estimated.</td>
<td>As National Accounts.</td>
</tr>
<tr>
<td>Police</td>
<td>Indirect method used to estimate chained volume measure of output (deflating current price expenditure by a National Accounts deflator).</td>
<td>Inputs estimated using bespoke labour and procurement deflators. Inputs = output convention applied.</td>
</tr>
<tr>
<td>Defence</td>
<td>Indirect method used to estimate chained volume measure of output (deflating current price expenditure by a National Accounts deflator).</td>
<td>Inputs estimated using derived defence deflator. Inputs = output convention applied.</td>
</tr>
<tr>
<td>Other</td>
<td>Indirect method used to estimate chained volume measure of output (deflating current price expenditure by a National Accounts deflator).</td>
<td>Inputs estimated using GDP deflator. Inputs = output convention applied.</td>
</tr>
</tbody>
</table>

**Inputs**

Data for public sector inputs are collected for a range of different sources:

- inputs for healthcare and education are taken from the published Public Sector Productivity articles. These are measured using a mixture of direct and indirect measures. The majority of labour input is measured directly using full-time equivalent (FTE) staff numbers working in these service areas.
- Expenditure on goods and services and capital consumption is measured indirectly. More detail on the methods employed is published in the Sources and Methods papers for Education and Healthcare;
- inputs in four other service areas: social security administration, adult social care, children’s social care, police and public order & safety, are based on General Government Final Consumption Expenditure data, broken into (a) Compensation of Employees, (b) Goods & Services Procurement and (c) Capital Consumption. A suitable deflator (or composite deflator) is applied to each current price expenditure series, to estimate a volume series. More detail on the methods employed is given in Sources and Methods for Total Public Service Productivity Estimates: Total Public Services; and
- for the defence and other sectors of government, a volume of inputs series is produced by deflating total General Government Final Consumption Expenditure data for each service area. A derived deflator is used.
for defence expenditure, and the GDP deflator used for other services.

As the source inputs data for Public Service Productivity Estimates: Total Public Services are available for either financial year 2012-13 or calendar year 2012, no estimation to produce data for the latest years published is required.

**Aggregating service area inputs and output**

The expenditure shares of each public service component are calculated using a breakdown of General Government Final Consumption Expenditure by COFOG. ONS publishes this breakdown in [ESA table 11](#), and provides the data to Eurostat for the European Deficit Procedure (EDP) in accordance with the Maastricht Treaty.

The EDP source is used for the following reasons:

- consistent time series are available for all public service components;
- the data are published on a regular basis; and
- a detailed breakdown is available, allowing us to separate, for example, adult social care and children’s social care from social protection.

It should be noted that before the data are used in the education and total public services productivity estimates, an estimate of expenditure on that part of Further Education dealing with under-19s is added to the Education category.

**Aggregating output**

Estimates of total public sector output are produced by weighting and then aggregating the volume of output in each service area. The weights used in this process are the service area COFOG expenditure weights, and are applied to form a chain-linked Laspeyres volume index of total public service output. This can be represented as follows:

\[
O_{t+1} = O_t \times \sum_i \left( \frac{O_{i,t+1}}{O_{i,t}} \times \frac{e_{i,t}}{\sum_i e_{i,t}} \right)
\]

where:

- \(O\) is a Laspeyres index of output;
- \(e\) is expenditure;
- \(t\) and \(I\) index time and service areas respectively; and
- \(O_{t,0}\) is set equal to 100.

In order to identify the impact of including three sectors in which an ‘inputs=output’ convention is used, Public Service Productivity Estimates: Total Public Services reports the headline results of a sensitivity test which excludes these sectors.

**Aggregating inputs**

Estimates of total public sector inputs are produced in a similar manner. This involves weighting and then aggregating the volume of inputs in each service area, using the same COFOG expenditure weights as in the calculation of aggregate output. This produces a chain-linked Laspeyres volume index of inputs for total public services. This can be represented as follows:

\[
I_{t+1} = I_t \times \sum_i \left( \frac{I_{i,t+1}}{I_{i,t}} \times \frac{e_{i,t}}{\sum_i e_{i,t}} \right)
\]

where:

- \(I\) is a Laspeyres index of inputs;
• e is expenditure;
• t and j index time and service areas respectively; and
• \( I_{t=0} \) is set equal to 100.

**Productivity**

Estimates of total public sector productivity are calculated using the aggregate output and inputs indices produced using the approach above. This can be simply represented as:

\[
P_t = \frac{O_t}{I_t}
\]

where:

• \( P \) is an index of aggregate public sector productivity;
• \( O \) is an index of aggregate public sector output;
• \( I \) is an index of aggregate public sector inputs; and
• \( t \) is an index of time.

Including the police, defence and other sectors in the calculation of productivity will tend to push estimates of productivity growth towards zero. During periods when productivity in other sectors is positive, the 'inputs=output' convention will dampen productivity growth (as productivity growth in these sectors is zero by assumption). During periods when productivity in other sectors is negative, the inclusion of the police, defence and other sectors will tend to raise productivity growth estimates.

**Validation and quality assurance**

**Accuracy**

(The degree of closeness between an estimate and the true value.)

Both the output and inputs series for each service area are constructed using a variety of administrative and National Accounts data. The accuracy of the derived series therefore depends on the accuracy of the source data. Unless ONS has introduced substantial methodological changes, the main source of revisions to each service area's productivity estimates will be changes in source data and expenditure weights.

It is difficult for ONS to provide a confidence interval around its estimates given the multiple sources of data on which the estimates are based. There will inevitably be some margin for error from a 'true' measure of productivity, which is unknown.

As there is no other source of public service productivity estimates that is comparable in methodology, validating our results is difficult. This is achieved through regular triangulation articles, as set out in the Atkinson Review\(^6\). The closest comparison publication is the Multi-Factor Productivity (MFP) estimates\(^13\) produced by ONS for Government Services. These estimates take in Public Administration, Defence & Compulsory Social Security, Education and Human Health and Social Work Activities, and correspond to sections O, P and Q in the Standard Industrial Classification. These estimates use a conventional growth accounting approach to produce MFP estimates and a Gross Value Added measure of output, rather than direct measures of gross output and services delivered. The Multi-Factor Productivity Release 2010\(^13\) suggested that productivity in Government Services fell by 0.1 percentage points between 1997 and 2010. This estimate is comparable to the 0.0% annual average productivity growth estimated between 1997 and 2010 set out in Public Service Productivity Estimates: Total Public Services 2010\(^14\) which are based on direct measurement methods.
Coherence and comparability
(Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain for example, geographic level.)

Coherence of the data in Public Service Productivity Estimates: Total Public Services is good when compared to the Multi-Factor Productivity estimates produced by ONS of the closest matched industries in the National Accounts.

There has been little change in methodology between the estimates published in the previous article\textsuperscript{14}, so data presented in Public Service Productivity Estimates: Total Public Services 2012 provide an accurate comparison over time.

The ONS converts some source data from financial year to calendar year, and aggregates results to a UK level which makes it difficult to make comparisons at a country level. Service areas are also defined by COFOG rather than Administrative Department or Devolved Administration. The different methodology developed for healthcare and education which includes a quality-adjustment, and the inputs–output treatment of three service areas (police, defence and other), mean that direct comparisons between service areas should not be made.

The estimates cover the United Kingdom and, where possible, are based on data for England, Scotland, Wales and Northern Ireland. Where data are not available for all four countries, the assumption is made that the available data are representative of the UK. This can happen for output or inputs data. For example, as adult social care output data are only available for England and Scotland, the assumption is made that the change in output in these countries is representative of the change in output across the UK. Secondly, in the case of the inputs series for some public service components (for example, healthcare inputs), an assumption is made about price movements. Here it assumed that price changes in healthcare services in England are representative of price changes in healthcare services in the UK as a whole.

Finally, in instances where the data are available for all four countries of the UK, there may be slight variations in definitions or reporting conventions which introduce additional, largely unquantifiable effects on ONS estimates.

Concepts and definitions
(Concepts and definitions describe the legislation governing the output and a description of the classifications used in the output.)

ONS analysis of productivity in the public services in the UK is internationally pioneering work. Measurement of outputs follows guidance in the System of National Accounts 1993\textsuperscript{15} and subsequent SNA 2008\textsuperscript{16}, as well as the European System of Accounts 1995\textsuperscript{17} and subsequent European System of Accounts 2010 (ESA 2010)\textsuperscript{18}. Measurement of outputs (including the need to measure change in quality), inputs and productivity follows the principles in the Atkinson Review\textsuperscript{2}. The estimates presented in the article are for service areas classified by the COFOG.

Other information
Output quality trade-offs
(Trade-offs are the extent to which different dimensions of quality are balanced against each other.)

The section on timeliness and punctuality above explained that the public service productivity estimates are produced around 18-24 months after the end of the reference period for data sources. At present the estimates are produced with no need to estimate data to fill data gaps. If timeliness was improved to the year after the reference period, a far greater number of data would have to be estimated than at present. This would inevitably introduce greater uncertainty into the final productivity estimates.
Assessment of user needs and perceptions
(The processes for finding out about uses and users, and their views on the statistical products.)

Productivity releases by ONS have a range of users including:

- HM Treasury;
- Office for Budget Responsibility;
- Government departments, including Department of Health and the Department for Education;
- National Audit Office;
- Health and other spending departments in the devolved administrations;
- Academics and researchers;
- Consultancy companies; and
- Overseas statistical agencies.

ONS has two main ways of obtaining information on users and uses of its public service productivity estimates:

1. Web metrics allow us to see the number of visits and views that our publications receive. Each web metrics report tells us which sections of each report are most viewed. A list of known users is also kept and updated where possible; and
2. User consultation meetings and regular healthcare and education functional board meetings. These meetings allow the exchange of information on data sources, development issues and methods changes that affect ONS public service productivity estimates.

Sources of further information and advice
Accessibility and clarity
(Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the release details, illustrations and accompanying advice.)

ONS's recommended format for accessible content is a combination of HTML webpages for narrative, charts and graphs, with data being provided in usable formats such as CSV and Excel. The ONS website also offers users the option to download the narrative in PDF format. In some instances other software may be used, or may be available on request. For further information please refer to the contact details at the beginning of this document.

For information regarding conditions of access to data, please refer to the links below:

- [Terms and conditions (for data on the website)](#);
- [Copyright and reuse of published data](#);
- [Pre-release access (including conditions of access)](#); and
- [Accessibility](#).

In addition to this Quality and Methodology Information, basic quality information relevant to each release is available in the background notes of the relevant article.

Notification of changes in methodology is published in the public sector methodology section of the [guidance and methodology](#) area of the ONS website.
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