Sources & Methods for Public Service Productivity Estimates: Total Public Services.

1. Summary

This note sets out the sources and methods used to construct estimates of productivity for total public services, most recently presented in Public Service Productivity Estimates: Total Public Services, 2010 (ONS 2013a). It contains (a) a summary of the data sources employed, (b) a breakdown of how ONS calculates estimates of productivity in each service area, (c) a description of recent methodological changes, and (d) a discussion of the strengths and weaknesses of this approach.

At the most aggregate level, ONS estimates of total public service productivity are based on the ratio of output to inputs. Adopting $P$, $O$ and $I$ to indicate productivity, output and inputs respectively, and including a subscript $t$ for time-periods:

$$P_t = \frac{O_t}{I_t}$$

Total public service output and inputs indices are calculated by aggregating output and inputs for the following service areas. Total public service productivity is then calculated by dividing this index of output by the index of inputs.

- Healthcare
- Education
- Adult social care
- Children’s social care
- Social Security Administration
- Public order and safety
- Police
• Defence

Other (this includes general government services, economic affairs, environmental protection, housing and recreation).

The included data is provided on a UK geographic basis, and is published from 1997 to the latest available year, usually t-2. 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 publication, Public Service Productivity Estimates: Total Public Services 2010, (ONS 2013a) 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=outputs’ convention is applied, so productivity is constant by definition for these service areas.

For most service areas, output is measured by activities performed and services delivered, together with quality adjustments for healthcare and education. Inputs comprise volume estimates of labour, goods and services, and capital used in delivering public services. For most service areas, inputs are measured indirectly - using current expenditure adjusted by a suitable deflator. Further information on this is included in the Background notes and Quality and methodology information sections of Public Service Productivity Estimates: Total Public Services 2010 (ONS 2013a) publication.

2. Output

Different measurement techniques for output are adopted for different service areas. Healthcare and education, as well as adult social care, children’s social care and public order and safety all involve some degree of direct volume measurement.

Output estimates for police, defence and ‘other’ are all based on the ‘output=inputs’ convention. Within healthcare, we assume that output=inputs for approximately 9% of output; this output is services delivered by non-NHS providers. Similarly, within children’s social care, we assume that output=inputs for approximately 60% of output; this output relates to ‘non-looked after’ children. Together, these account for approximately 4% of total expenditure in 2010. Therefore in total, approximately 36% of output is measured using the ‘output=inputs’ convention. The other 64% is measured directly by activities performed and services delivered.

2.1 Healthcare

A detailed explanation of the data sources and methods used to calculate Public Service Productivity Estimates: Healthcare statistics is given in ONS (2013b). The key points are repeated here for completeness.

Two concepts are used to measure healthcare services in the UK. The quantity of delivered healthcare services is a cost-weighted activity index. Healthcare output consists of the quantity of healthcare adjusted for changes in the quality of delivered services. The reasons for quality-
adjusting public service output are well-documented and follow from recommendations made in the Atkinson Review (2005).

The quantity of healthcare is estimated using data on a range of healthcare services provided within the following sectors:

Hospital and Community Health Services (HCHS). This includes hospital inpatient, day case and outpatient episodes. These procedures are distinguished by Health Resource Group (HRG) and include some recorded activity provided by non-NHS providers.

Family Health Services (FHS). This includes GP and practice nurse consultations, publicly funded dental treatment and sight tests.

GP prescribing. This includes all drugs prescribed by General Practitioners.

Non-NHS provision. This is the indirectly measured component added this year which uses an inputs=output approach to estimation.

Table 1, taken from ONS (2013b) describes data sources and geographic coverage for healthcare quantity.

**Table 1: Data sources for estimates of UK healthcare quantity and output**

<table>
<thead>
<tr>
<th>Geographical Area</th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital &amp; Community Health Services</strong></td>
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<tr>
<td><strong>Inpatients</strong></td>
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<tr>
<td>Day case</td>
<td>DH RC</td>
<td>WG analysis</td>
<td>SG analysis</td>
<td>DHSSPS analysis</td>
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<tr>
<td>Other</td>
<td>HSC IC</td>
<td>WG analysis</td>
<td>SG analysis</td>
<td>DHSSPS analysis</td>
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<tr>
<td><strong>Outpatients</strong></td>
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<td>DH RC</td>
<td>WG analysis</td>
<td>SG analysis</td>
<td>DHSSPS analysis</td>
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<td></td>
<td>HSC IC</td>
<td>WG analysis</td>
<td>SG analysis</td>
<td>DHSSPS analysis</td>
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<tr>
<td><strong>Family Health Services</strong></td>
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<tr>
<td>Ophthalmic</td>
<td>General Ophthalmic Council</td>
<td></td>
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<tr>
<td>Dental</td>
<td>General Dental Council</td>
<td>SG analysis</td>
<td>DHSSPS analysis</td>
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<td>GP Consultations</td>
<td>Survey Data</td>
<td></td>
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<tr>
<td></td>
<td>1997-98 - 2008-09</td>
<td>Imputed</td>
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<td></td>
<td>2008-09 – 2010-11</td>
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</tbody>
</table>
Healthcare quantity is aggregated first by country, and then into a UK aggregate using a cost-weighted Laspeyres index.

A quality-adjustment factor is then applied to UK output, based on the following elements and data from England:

- Health gain
- Short-term survival rates
- Waiting times
- Results from the National Patient Survey, and
- Selected primary care measures

Table 2, taken from ONS (2013b) provides detail of the coverage of the quality-adjustments.

### Table 2: Measures of quality

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sector</th>
<th>Health Gain</th>
<th>Short term Survival</th>
<th>Waiting Times</th>
<th>National Patient Survey</th>
<th>Primary Care Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital &amp; Community Health Care</strong></td>
<td></td>
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</tr>
<tr>
<td>Day Cases</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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</tr>
<tr>
<td>Elective Inpatients</td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td>Non-elective Inpatients</td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td>Outpatients</td>
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<td>Emergency</td>
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<tr>
<td>Mental Health</td>
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<tr>
<td>Other</td>
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<tr>
<td><strong>Family Health Services</strong></td>
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<td>GP Consultations</td>
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<td>Y</td>
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<tr>
<td>Ophthalmic Serv.</td>
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<td>Y</td>
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<tr>
<td>Dental Serv.</td>
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<tr>
<td>Other</td>
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<tr>
<td><strong>Prescription Drugs</strong></td>
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<tr>
<td><strong>Non-NHS Provision</strong></td>
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</tbody>
</table>

2.2 Education

A detailed explanation of the data sources and methods used to calculate Public Service Productivity Estimates: Education statistics is given in ONS (2012a). The key points are repeated here for completeness.

Education output consists of an estimate of quantity, which is then adjusted for quality. The reasons for quality-adjusting public service output are well documented and follow from recommendations made in the Atkinson Review (2005).

Quantity is the sum, weighted by cost of education, of full-time equivalent (FTE), publicly-funded pupil and student numbers within the following sectors:

- Pre-school education, including places funded in the private, voluntary and independent sector (PVI).
- Government maintained primary, secondary and special schools. For England only, City Technology Colleges (CTCs) and (City) Academies (CAs) are included. All of these figures are adjusted for attendance.
- Further education colleges.

Table 3, drawn from ONS (2012a) provides detail of the components of education quantity and geographical coverage.

**Table 3: Sources of education output data: 1996 to 2010.**

<table>
<thead>
<tr>
<th>Schools</th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>DfE</td>
<td>WG</td>
<td>SG</td>
<td>DENI</td>
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<tr>
<td>Expenditure Attainment</td>
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<tr>
<td>Initial Teacher Training</td>
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<tr>
<td>Students</td>
<td>DfE</td>
<td>WG</td>
<td>SFC</td>
<td>DELNI</td>
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<tr>
<td>Expenditure</td>
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<tr>
<td>Health Professional Training</td>
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</tr>
<tr>
<td>Students</td>
<td>DH</td>
<td>WG</td>
<td>SG</td>
<td>DHSSPSNI</td>
</tr>
<tr>
<td>Expenditure</td>
<td></td>
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<tr>
<td>Further Education</td>
<td></td>
<td></td>
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<tr>
<td>Students</td>
<td>The Data Service</td>
<td>LLWR</td>
<td>Infact</td>
<td>DELNI</td>
</tr>
<tr>
<td>Expenditure</td>
<td>LSC</td>
<td></td>
<td>SFC</td>
<td>-</td>
</tr>
</tbody>
</table>
| Notes: 1 DfE: Department for Education, DH: Department for Health, WG: Welsh Government, SG: Scottish Government, LSC: Learning and Skills Council, LLWR: Life-long Learning Wales Record, SFC: Scottish Funding Council, DENI: Department of Education Northern Ireland, DELNI: Department for Employment and Learning Northern Ireland, DHSSPSNI: Department for Health, Social Services and Public Health. 2 Student data are provided on an academic year basis, while expenditure data are provided on a financial year basis. Data in academic and financial years are converted to calendar years by applying a cubic spline process.
Output in Primary and Secondary schools, CTCs and CAs is adjusted using the average point score (APS) per student in GCSE level examinations which are normally taken during the student's eleventh year of schooling. Education output in Scotland – where the Standard exams are taken in place of GCSEs – is quality-adjusted using the APS associated with these examinations. Growing average point scores are deemed to reflect greater scholastic attainment arising from improvements in the quality of education delivered.

The delivered quantity of Initial Teacher Training (ITT) courses is also adjusted for quality. In this case, the proportion of students who achieve Qualified Teacher Status (QTS) each year is used as a quality indicator.

As exam performance varies across geographical areas, the APS quality-adjustment is applied to Primary and Secondary school, CTC and CA output in each country separately. The APS at GCSE level for England and Wales are provided by the Department for Education and the Welsh Government respectively, while the APS associated with the Standard exams in Scotland are provided by the Scottish Government. For reasons of data comparability and availability, the level of education quantity in Primary and Secondary schools in Northern Ireland is quality adjusted using the APS of English schools.

ITT quantity in each geographical area of the UK is adjusted using the QTS award rate for England, which is also provided by the Department for Education. Here the implicit assumption is made that changes in quality in ITT in Wales, Scotland and Northern Ireland follows the trend in England.

Estimates of quality-adjusted output are carried out in several steps:

1. Time-series data are compiled using (a) the number of students, (b) the level of expenditure in each educational service and (c) the APS at GCSE level for England and Wales, the APS for Standard examinations in Scotland and the Initial Teacher Training QTS award rate in England. Attendance at Primary, Secondary and Special schools, as well as CTCs and CAs is adjusted to account for student absence.

2. The quality-adjustment measures for schools and ITT are converted into indices such that:

\[ q_{lt} = q_{lt-1} \cdot \left( \frac{APS_{lt}-APS_{lt-1}}{APS_{lt-1}} \right) \]

3. A chain-linked Laspeyres volume index of quality-adjusted output is produced for each educational sector and aggregated to a UK level, such that:

\[ V_{lt} = V_{lt-1} \cdot \left( \sum_j \left( \frac{q_{ljt}}{q_{ljt-1}} \cdot \frac{APS_{ljt}-APS_{ljt-1}}{APS_{ljt-1}} \right) \right) + 1 \]
Where:
- $i, j$ and $t$ index educational sectors, geographical areas and time respectively
- $L^{\Delta}_{i}$ is a chain-linked Laspeyres index of quality-adjusted education output by sector
- $A_{i,j,t}$ is the number of students in each sector and country
- $q_{i,t}$ is the level of quality achieved in delivery
- $x_{i,j,t}$ is the level of expenditure in current price terms
- output in the initial period, $t=0$, is set equal to 100
- for educational sectors which are not quality-adjusted, $q_{i,t} - q_{i,t-1} - q_{i,0} = 0 - 1$

When education sectors are aggregated together using their relative cost weights, an overall UK level, chain-linked Laspeyres volume index of quality-adjusted output is calculated such that:

$$L^{\Delta}_{t} = L^{\Delta}_{t-1} \cdot \left( \sum_{i} \left( \frac{L^{\Delta}_{i,t} - L^{\Delta}_{i,t-1}}{L^{\Delta}_{i,t-1}} \cdot \frac{x_{i,t}}{\sum x_{i,t-1}} \right) \right) + 1$$

Where:
- $i$ and $t$ index educational sectors and time respectively
- $L^{\Delta}_{t}$ is a chain-linked, aggregate UK, Laspeyres index of quality-adjusted education output
- $L^{\Delta}_{i,t}$ is a chain-linked Laspeyres index of quality-adjusted education output by sector
- $x_{i,t}$ is the level of expenditure in current price terms for each sector
- Output in the initial period, $t=0$, is set equal to 100

The use of the APS at GCSE level as a quality-adjustment has come under scrutiny in recent months. A discussion of the relative merits of this approach is included in ONS (2012b).

### 2.3 Adult Social Care

The measure of adult social care output is based on the quantity of social services activities measured either in terms of time (for example, number of weeks of residential care) or number of items (for example, number of meals provided).

A total of 23 activities in England are included in the measure. Activities are weighted together by their share of net expenditure to generate the overall measure of output growth. These weights are updated annually.

Data for adult social care activity in Scotland from 2002 are also now being used. There is a different system for data collection in Scotland, so 17 activities are used. The addition of data for Scotland brings the total coverage to an estimated 85 per cent of net expenditure on adult social care across the UK.
The activities cover a variety of services: assessments of need, day care, home care (home care and provision of meals and, in England, also provision of equipment) and provision of care home places. Care home places are divided in England into residential and nursing care, but this breakdown is not available for Scotland. As the nursing care element of costs in care homes is now NHS funded, the remaining costs are not greatly different. Where the data are available, services are measured separately for different client groups. These are: older people aged 65 and over (including those with mental health needs) and younger adults aged 18 to 64 with physical disability, learning disability or mental health needs.

2.4 Children’s Social Care

Children’s Social Care output consists of data regarding activities and expenditure. Activity data is used to estimate the part of the output which is measured directly—the looked after children component of the service. Expenditure data is used partly as cost weights to aggregate the components in the direct part of the measure, and also for the part of the output which is measured indirectly using the output=inputs convention. This indirectly measured part of the output refers to non-looked after children.

Activities data is taken from the ‘children’s and families services’ section of the Personal Social Services Expenditure Return (PSS-EX1), and is composed of the following five datasets:

- A count of the total number of days during the financial year that looked after children spend in placements, this includes days spent in short term placements. (N.B. This data excludes unaccompanied asylum seeking children)
- Activities from other looked after children. This is calculated by subtracting the sum of measured children looked after activity from total children looked after activities.
- Fostering services, which is an aggregate of activities data on children placed for adoption and also foster placements.
- The amount of children currently in secure accommodation.
- Children’s homes (an aggregate of activities data on residential schools and children’s homes).

Expenditure data is composed of net current expenditure (£000s) on the following services, and is taken from the ‘Children’s and families services’ section of the Personal Social Services Expenditure Return (PSS-EX1).

- Fostering Services
- Secure Accommodation
- Children’s Homes
- Other Children looked after
• Non-Looked after Children

• Total expenditure on Children’s and families services

Expenditure on non-looked after children is split into expenditure on pay (assumed to be 75% of the total in each year) and procurement (assumed to be 25% of the total in each year), which are then deflated separately.

Expenditure on non-looked after children are converted into calendar years, lagged, and backcast to produce a series of appropriate length, then deflated using pay and procurement deflators. The resulting real expenditure series is then converted to an index, and the index growth is weighted by the share of the UK total Children’s Social Care accounted for by non-looked after children.

To calculate an index for looked after children, activity in fostering, children’s homes and other is aggregated into a single series, with secure accommodation left separate. These two series are weighted by expenditure shares to produce a direct measure of CSC output on a financial year basis. These estimates are splined, lagged and backcast to produce a series of appropriate length. The two contributions to growth are then summed to produce an aggregate output series for Children’s Social Care.

2.5 Social Security Administration

Social Security Administration (SSA) output is a quarterly measure of the output associated with the administration of different types of benefit, including the output from processing new benefit claims and the output from maintaining existing benefit load. In total, there are 29 sub-component activity series in the SSA output system, each with a corresponding unit cost series. These sub-components are aggregated to form a chained volume measure of SSA output.

2.6 Public Order and Safety

The aggregated Public Order & Safety index (excluding Police) consists of the following components:

• fire

• courts

• probation

• prisons

All Public Order and Safety output, except for Police, is currently estimated using activity indicators, without quality adjustment, which are used as proxies for outputs.
For each Criminal Justice System (CJS) agency except the Police, a cost weighted activity index (CWAI) is constructed.

**Fire**

There are 55 categories of fire output activities, which are categorised into three groups:

- Fire Response (FR)
- Fire Prevention (FP)
- Fire Special Services (FS)

These groups all form part of the Fire Rescue Service (FRS). Activity measures for the FRS are based on the number of incidents attended for Fire Response and Fire Special Services activities, and staff hours spent on Fire Prevention activity.

Appropriate cost weights are based on Fire Response unit costs and the proportion of staff time spend on each incident type. The output measure combines the different activities into a single cost weighted activity index (CWAI) using the associated unit costs as their weights, and an overall output index is then constructed as a chain linked Laspeyres index using the previous year’s prices.

**Courts**

The outputs of the criminal courts are currently estimated using direct output methods. The output of the Magistrates’ and Crown Courts are measured separately.

**Crown Courts:** Data are provided on the number of Crown Court cases broken down into the following categories:

- Committals for Trial: Actuals
- Cases for Sentence: Actuals
- Appeals: Actuals

Using base year expenditure weights, the three series are then weighted together to form one index. Base year expenditure weights are calculated by the product of the total number of cases of a particular type and the average cost of a case in the base year.

**Magistrates’ Courts:** For the Magistrates’ Courts a ‘weighted caseload’ is available from which an output index can be calculated. Completed proceedings are counted in 14 case types (see below). Weightings are then applied to each case type, to provide an overall unitary value of caseload. The weights are calculated from large samples of cases and reflect the average time required to complete each type of case.
• Indictable: Adult indictable and triable either way offences
• Breaches: All breaches and revocations of sentences
• Non-motor Summary: non-motoring offences
• Motoring Summary: motoring offences
• Youth: All youth crime, indictable and summary, including breaches
• Section 8 Children Act: section 8 orders (private law)
• EPOs Children Act: emergency protection orders
• Care Proceedings: Children Act care proceedings (public law)
• Other Family/Child: All other family proceedings and Children Act cases, e.g. adoptions, financial etc.
• Licence Sessions: Licensing applications heard by licensing committees
• Licence Petty: Licensing applications heard by magistrates in petty sessions
• Other Civil work: Any other civil complaints, made to obtain an order, e.g. dangerous dogs.
• Means enquiries: All means enquires with defendant present
• Legal Aid: All applications for legal aid granted or refused

Probation

Probation output is currently estimated using direct output methods. The National Accounts make use of work in the late 1990s, working with the Probation Service, to develop a cost-weighted activity index, based on the following activities:

• Probation starts
• Community service
• Combination orders
• Licences
• Numbers of pre-sentence reports (PSRs) completed
• A measure of probation work done in the family court
The measure uses weighted implied workload hours for the above activities. The data are based on activity sampling exercises carried out in 1997 and 1998.

**Prisons**

Output for prisons is measured by the average number of prisoners in UK prisons. This data is collected on a monthly basis and coverage is for the whole of the UK.

**2.7 Police**

For police services, it is hard to place a value on services supplied, as there are no market transactions and services are collectively consumed. The output of police services has been measured by the volume of inputs. This convention regarding the volume of government outputs is referred to as the ‘output=inputs’ convention.

Police inputs are estimated by deflating expenditure on labour, goods and services and capital. The deflator for labour expenditure is constructed from data on police and administrative occupational codes in ASHE (Annual Survey of Hours and Earnings). The deflator for goods and services expenditure is constructed from Subjective Analysis Returns (SAR) within Local Government financial statistics and Producer Price Indices. The deflator for capital consumption is derived from Public Administration current and constant price series.

A cost-weighted Laspeyres index is then calculated for the volume of Police inputs, using chain-linked expenditure shares, and assumed to equal the volume of Police output.

**2.8 Defence**

Defence output figures follow the same ‘output=inputs’ convention as police services, as again, it is difficult to place a value upon the services supplied, owing to the fact that there are no market transactions and services are collectively consumed.

The volume of inputs is estimated by deflating current price expenditure on defence (defined by COFOG 2), by a derived deflator. The deflator is derived from current price expenditure on defence and constant price military defence expenditure.

The resulting constant price expenditure series on defence is converted into an index, and assumed to equal the volume of Defence output.

**2.9 Other**

Central government expenditure data is obtained for the following categories:

- General Public Services
- Economic Affairs
- Environmental Protection
Sources & Methods for Public Service Productivity Estimates: Total Public Services.

- Housing
- Recreation
- Other

Total current expenditure on the above categories is deflated using the GDP deflator to obtain a constant price expenditure series. This series is then used to generate an index of volume of inputs which is assumed to equal the volume of output.

3. Inputs

Inputs comprise the volume of labour, goods and services and capital used in delivering public services. These series are aggregated together to form an overall estimate of the volume of inputs used to provide each of the public services identified in the Total Public Services articles.

The following sections describe in more detail, the data sources, and methods used in each of the sectors.

3.1 Healthcare

A detailed explanation of the data sources and methods used to calculate Public Service Productivity Estimates: Healthcare statistics is given in ONS (2013b). The key points relating to inputs are given here for completeness.

Inputs to publicly-funded healthcare are broken down into three components:

- Labour input, such as hospital consultants, registrars, nurses, technical staff, ambulance staff and support, General Medical Practitioners (GPs) and practice staff.

- Goods and services input, such as pharmaceutical services, dental and ophthalmic services, and intermediate consumption by hospitals and GP practices. This component also includes GP prescribed drugs and services provided by non-NHS organisations.

- Capital consumption – this is a measure, in volume terms, of the amount of capital stock used each year and is made up of depreciation and other capital charges.

The geographical coverage of the inputs data varies across the countries of the UK and was improved for Public Services Productivity Estimates: Healthcare 2010 (ONS 2012c). Table 4, which is taken from (ONS 2013b), provides details.
### Table 4: Data sources for estimates of UK healthcare inputs.

<table>
<thead>
<tr>
<th>Country</th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
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<tbody>
<tr>
<td><strong>Labour</strong></td>
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<tr>
<td>HCHS</td>
<td>HSCIC</td>
<td>Welsh Government</td>
<td>Scottish Government</td>
<td>DHSSPSNI</td>
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<tr>
<td>GP Services</td>
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<td>Welsh Government</td>
<td>Scottish Government</td>
<td>DHSSPSNI</td>
</tr>
<tr>
<td>Health Administration</td>
<td>DH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goods &amp; Services</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCHS</td>
<td>DH</td>
<td>Welsh Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental</td>
<td>DH</td>
<td>Welsh Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ophthalmic</td>
<td>DH</td>
<td>Welsh Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMS</td>
<td>DH</td>
<td>Welsh Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP Drugs</td>
<td>As for output</td>
<td>As for output</td>
<td>As for output</td>
<td>As for output</td>
</tr>
<tr>
<td>Non-NHS Provision</td>
<td>DH</td>
<td>Welsh Government</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK Capital consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK National Accounts</td>
<td></td>
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</tr>
</tbody>
</table>


These separate estimates are weighted and aggregated to produce a single healthcare inputs volume index. Where data is not provided by a country, it is assumed that this component grows in line with the rest of the UK.

Table 5 (ONS 2013b) gives each component of goods and services expenditure and its matched deflator and data source. The geographic coverage of the expenditure components is England, Wales and Scotland, except where indicated. Where expenditure data is not available for a country, it is assumed that its growth rate in volume terms is equivalent to that of the UK estimate based on the available data.

The geographic coverage for the deflators is either UK-wide or England only. In the case of England only deflators, e.g. sight test deflator, the same rate of price increase is assumed for the other countries of the UK.
Table 5: Expenditure components with matched deflators.

<table>
<thead>
<tr>
<th>Expenditure component</th>
<th>Deflator</th>
<th>Geographic basis of deflator</th>
<th>Data source for deflator</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCHS non-pay</td>
<td>ONS-adjusted Health Service Cost Index (HSCI): see Note 2</td>
<td>England only – assumed to apply to whole of UK</td>
<td>ONS analysis of HSCIC data</td>
</tr>
<tr>
<td>GP intermediate consumption</td>
<td>All items RPI</td>
<td>UK</td>
<td>ONS</td>
</tr>
<tr>
<td>NHS Dental services</td>
<td>Dental deflator based on up-rated NHS dentist practice contract value</td>
<td>England only – assumed to apply to whole of UK</td>
<td>DH</td>
</tr>
<tr>
<td>NHS Ophthalmic services</td>
<td>Sight deflator based on price rise in NHS sight test fees</td>
<td>England only - assumed to apply to whole of UK</td>
<td>DH</td>
</tr>
<tr>
<td>Pharmaceutical services</td>
<td>Expenditure per item dispensed (unit cost)</td>
<td>Separate unit cost increases estimated for each country of the UK</td>
<td>DH, WG, SG, DHSSPSNI</td>
</tr>
<tr>
<td>Central Health and Miscellaneous services (CHMS)</td>
<td>All items RPI</td>
<td>UK</td>
<td>ONS</td>
</tr>
<tr>
<td>Volume of GP prescribed drugs</td>
<td>As for output estimation</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Non-NHS provision</td>
<td>ONS adjusted Health Services Cost Index (HSCI) combined with an adjusted Pay Cost Index (PCI) : see Note 2</td>
<td>HSCI and PCI apply to England only – assumed to apply to whole of UK</td>
<td>ONS analysis of HSCIC data on HSCI and PCI</td>
</tr>
<tr>
<td>Welfare Food (England and Wales expenditure only)</td>
<td>RPI Food</td>
<td>UK</td>
<td>ONS</td>
</tr>
<tr>
<td>EEA (European Economic Area) treatment costs (England only expenditure)</td>
<td>ONS adjusted Health Services Cost Index: ) : see Note 2</td>
<td>England</td>
<td>ONS analysis of HSCIC data</td>
</tr>
<tr>
<td>DH Administration non-pay costs (England only expenditure)</td>
<td>ONS adjusted Health Services Cost Index : see Note 2</td>
<td>England</td>
<td>ONS analysis of HSCIC data</td>
</tr>
</tbody>
</table>

To calculate an overall UK inputs estimate the three components of inputs are aggregated together, using expenditure weights drawn from National Accounts for compensation of employees, net procurement and capital consumption. It should be noted that these weights are adjusted to allow for the fact that GP labour is included in healthcare labour estimates rather than goods and services estimates.

3.2 Education

A detailed explanation of the data sources and methods used to calculate Public Service Productivity Estimates: Education statistics is given in ONS (2012a). The key points are repeated here for completeness.
ONS publishes estimates of publicly-funded education inputs in the UK from 1996 onwards. The inputs index is an aggregate of three elements: Labour, Goods & Services and Capital, broken down by the level of government as follows:

- Local authority Labour
- Central government Labour
- Local authority Goods & Services
- Central government Goods & Services
- Capital services

A direct measure of Local Authority maintained schools' labour input is estimated, based on FTE teacher and support staff numbers. This is combined with indirectly measured components for Central Government labour, Local Authority goods and services, central government goods and services and capital services.

These indirectly measured components also include an estimate for Further Education inputs.

Changes in these elements are added together using their relative shares in total government expenditure on education, to form a chain-linked Laspeyres volume index. This is the same approach used to calculate the output series which is described in Section 2.2 above.

Table 6, which is taken from ONS (2012a) show the sources of education inputs data and geographic coverage.
### 3.3 Adult Social Care

The inputs index for adult social care is derived from weighting and aggregating four series. Those series are:

- Volume of labour
- Volume of other procurement
- Volume of independent care
- Volume of capital consumption
To calculate the labour index, data on labour expenditure (compensation of employees) is obtained from the most recent Classifications of the Functions of Government (COFOG) publication. Local government figures for adult social care are then modified by removing social security salary figures to obtain the true local government labour cost. Central government labour expenditure figures are left unmodified, and aggregated with the local government figures. This is then deflated using the local authority Personal Social Services pay and prices index which is supplied by Department of Health.

The independent care index is calculated with data on local and central government expenditure on goods and services being drawn from the latest COFOG publication. These figures are combined to give general government expenditure on adult social care, which is then deflated.

The Independent Sector Social Care Price Index is used as the deflator and is provided by the Department of Health.

The expenditure for other procurement is assumed to be a fixed ratio of total net procurement spending. This expenditure is deflated using the Consumer Price Index, and the other procurement index is constructed using deflated expenditure growth rates.

To calculate the capital consumption index, capital consumption expenditure data for adult social care is extracted from the same COFOG data. This expenditure data is then deflated using a derived deflator for capital consumption in healthcare.

To calculate the final overall inputs index, growth rates from each of the four indices are weighted by their respective expenditure shares.

### 3.4 Children’s Social Care.

Inputs for Children’s Social Care (CSC) are based on expenditure data collected from England, Scotland and Wales for 2000-01 onwards. This expenditure data can be split into:

- Labour (people employed directly by local authorities)
- Goods and services, of which - Goods and services of local authority-provided children’s social care; and Goods and services of independently-provided care
- Labour of independently-provided care

The volume of labour inputs is calculated by deflating the expenditure on labour by a constructed pay deflator.

To calculate the pay deflator, the numbers of staff working in Children’s Social Care is mapped according to SOC codes, and weighted staff numbers are calculated by dividing the amount of staff under each SOC code by the total size of the workforce.

Salary data for these SOC codes working in Children’s social care is obtained from the Annual Survey of Hours and Earnings (ASHE). The weighted staff numbers are multiplied by ASHE data to
give a deflator value per SOC code; these are then summed to obtain a pay deflator. The volume of labour used is then found by dividing the current price expenditure on labour by the pay deflator.

The volume of Goods and services inputs is calculated by deflating expenditure by a derived deflator. Net procurement expenditure is broken down into local authority-provided care and independently provided care. Within the independently provided care, there is also an element for wages and salaries.

The first two elements are deflated by a composite procurement deflator, based on the spending returns of Local Authorities in England (Subjective Analysis Return). The wages element is deflated by the pay deflator used in the labour inputs estimates.

Finally, the four components of inputs are aggregated together, using their relative expenditure weights to produce a UK estimate of Children’s Social Care inputs.

### 3.5 Social Security Administration

To calculate an estimate for Social Security Administration inputs, input indices are constructed for labour, goods and services and capital consumption. To calculate an index for inputs current price expenditure drawn from the COFOG dataset is deflated to produce a constant price series. The inputs are deflated as follows:

Compensation of employees is deflated using the Index of Labour Costs per Hour (ILCH) which is published by ONS. Expenditure data for goods and services is obtained from net expenditure on intermediate consumption, and then deflated using the Retail Prices Index.

Net expenditure on capital consumption is deflated by an implied capital deflator for public administration.

Changes in the constant price series are weighted according to their expenditure share, and a Laspeyres volume index of inputs is constructed.

### 3.6 Public Order and Safety

Inputs estimates are calculated for:

- Fire
- Courts
- Probation
- Prisons

The Public Order and Safety (POS) volume of inputs series is a weighted combination of these four series (chain-linked using the expenditure weights).
Also, inputs are measured in three components:

- Labour
- Goods and Services
- Capital Consumption

For all the four services within Public Order and Safety, the following calculations apply:

The volume of labour inputs is the current price expenditure on labour deflated by the Index of Labour Costs per Hour (ILCH) for the public sector. The volume of Goods and Services inputs is the current price expenditure on Goods and Services deflated by the Retail Price Index excluding mortgage payments (RPIx). The volume of capital inputs is measured by capital consumption estimates for the wider category Public Administration.

### 3.7 Police, Defence and Other

The inputs estimates for Police, Defence and Other are as described in the Output section, using the convention that inputs equals output.

### 4. Revisions to methodology

Information on a minor methods change introduced in Public Service Productivity Estimates: Total Public Service 2010 (ONS 2013a) can be found in the Methods change in Public Service Productivity Estimates: Total Public Service 2010. (2013c).

### 5. Worked example

To provide a sense of how developments in total public service affect the calculation of inputs, output and productivity, ONS has produced a simplified spreadsheet model of the process, published alongside this document. This spreadsheet includes a stylised worked example for Public Service Productivity - Total Public Services 2010 (ONS 2013a).

The primary objective of the worked example is to illuminate how developments in total public service affect the calculation of productivity. The example allows users to change the growth rates of key series – the growth rates of inputs and outputs – to observe how these alterations affect the evolution of aggregate inputs, output and productivity.

Users are able to see the differences between their customised scenario and the baseline scenario.
6. Users and stakeholders needs

ONS actively seeks feedback from users of its public service productivity statistics in order to inform its future work priorities. We are particularly interested in user views on the value of these statistics to inform policy debates and research projects within the academic and National Accounts fields. The updated Quality and Methodology Information (QMI) (ONS 2013d) for the Total Public Services productivity article includes a section on user needs and perceptions.

The QMI outlines the various methods we have used to gain feedback from users about our statistics, including (a) ONS work programme consultations, (b) functional board meetings, (c) workshops discussing the range of productivity estimates produced by ONS and (d) a user survey (via Survey Monkey) attached to the latest Total Public Services productivity article.

In addition, ONS has produced a document containing a series of frequently asked questions that provides users with a short explanation of the key concepts relating to public service productivity (ONS 2012d), including how they relate to other issues such as ‘efficiency’ and ‘value for money’. This document also provides an overview of methods used to create the statistics and guidance on how they should be used.

7. References


Sources & Methods for Public Service Productivity Estimates: Total Public Services.


