

Public service productivity: total, UK QMI

Quality and Methodology Information (QMI) report for the Public service productivity: total, UK: 2019 release, detailing the strengths and limitations of the data, methods used and data uses and users.

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1 . Methodology background

- National Statistic: Yes
- Survey name: Public Service Productivity: Total, UK: 2019
- Frequency: Annual
- How compiled: Based on third-party data
- Geographic coverage: UK
- Related publications:
 - [Public service productivity: total, UK: 2019](#)
 - [Productivity overview, UK: January to March 2022](#)
 - [Public service productivity, healthcare, England: financial year ending 2020](#)
 - [Public service productivity, adult social care, England: financial year ending 2020](#)

2 . About this Quality and Methodology Information report

This quality and methodology report contains information on the quality characteristics of the data (including the European Statistical System five dimensions of quality) as well as the methods used to create it.

The information in this report will outline:

- the strengths and limitations of the data
- existing uses and users of the data
- the methods used to create the data
- suitable uses for the data

3 . Important points

- The estimate for public service productivity is displayed as an index, showing the change over time of the amount of output provided for each unit of input.
- To remove the effect of price changes over time, public service output and inputs are measured in quantity terms (also referred to as volume terms), instead of expenditure terms.
- Some public service area outputs are also adjusted for changes in the quality of activities and services provided, as recommended by the [Atkinson Review \(PDF, 1.08MB\)](#). A quality adjustment is a statistical estimate of the change in the quality of a public service. This allows for observation of the outcome of a public service being provided, rather than the output alone.
- Productivity estimates included in this article are multi-factor productivity estimates as opposed to labour productivity estimates (a single factor productivity measure), and so are not comparable with our headline measures of whole-economy labour productivity. For more information on how to compare the measures of productivity, see our [Sources and methods for public service productivity estimates methodology article](#).
- These estimates are produced to measure the productivity of total UK public services, but do not measure value for money or the wider performance of public services.

4 . Quality summary

Overview

Total public service productivity is estimated by comparing growth in the total output provided with growth in the total inputs used. If the growth rate of output exceeds the growth rate of inputs, productivity increases, meaning that more output is being produced for each unit of input. Conversely, if the growth rate of inputs exceeds the growth rate of output, then productivity will fall, indicating that less output is being produced for each unit of input.

Output, inputs and productivity for total public services are estimated by combining growth rates for individual services using their relative share of total government expenditure as weights.

The public service productivity measures included in this article are also not directly comparable with our market sector multi-factor productivity estimates owing to differences in the methodology used. For further information, see [How to compare and interpret ONS productivity measures](#) and [A simple guide to multi-factor productivity](#).

These estimates are produced to measure the productivity of total UK public services. They do not measure value for money or the wider performance of public services. They do not indicate, for example, whether the inputs have been purchased at the lowest possible cost, or whether the desired outcomes are achieved through the output provided.

The methodology for calculating these statistics is based on the recommendations of the [Atkinson Review \(PDF, 1.08MB\)](#) on the measurement of government output and productivity for the national accounts. Estimates are published on a calendar year basis to be consistent with the UK National Accounts, and estimates are available both for total and for an individual service area breakdown. These are included in [Public service productivity: Total, UK: 2019](#).

More information on the methodology and sources used can be found in [Sources and methods for public service productivity estimates](#).

Uses and users

Users of our public service productivity measures include:

- departments within UK government such as the Cabinet Office, HM Treasury and regulatory bodies
- the National Audit Office
- Press and general public
- the Office for Budget Responsibility
- Institute of Fiscal Studies (IFS)
- the Nuffield Trust
- academia
- international statistical bodies

These organisations use the productivity estimates in a number of ways. Total public service productivity estimates have been used to inform previous IFS Green Budgets, directly used by the Nuffield Trust and are regular inputs into briefings for Cabinet Office's ministers and permanent secretaries. We have, similarly, given advice to government departments on how to incorporate the general methodology of the estimates into their own work.

Feedback from users is received via user surveys and consultation events. Acting on such feedback, we are undertaking a development program to improve public service productivity statistics across all service areas. Changes and improvements on our statistics are published in [methodology articles](#). As well as the annual estimates that are the focus of this release, we also publish [experimental estimates of quarterly public service productivity](#) - allowing for statistics to be provided on a more timely basis.

Strengths and limitations

Strengths of [Public service productivity: Total, UK: 2019](#)

The majority of data we use is administrative data and as such we are not reliant on surveys. The data in one paragraph can be disaggregated in multiple ways. Estimates for inputs, output and productivity are disaggregated by service area. Inputs estimates are disaggregated by component (labour, goods and services, and consumption of fixed capital). Productivity estimates are calculated with and without adjustments for the quality of output. Therefore, some data can be used to estimate the impact of quality change on public services output. The open revisions policy allows us to continuously improve the dataset, which means that the estimates are not constrained by Blue Book procedures.

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Limitations of [Public service productivity: Total, UK: 2019](#)

There is a two-year time lag in producing the estimates - this year, the dataset time series covers the period 1997 to 2019. This is because of data availability. To account for this, we are now also producing [experimental quarterly estimates of public services productivity](#).

Several different ways of measuring output are used in producing the statistic. Some service areas are quality adjusted, some are directly measured, and the remainder output is assumed to be equal to inputs. For areas where output is assumed equal to inputs, productivity growth is zero. Currently, the data required for direct measurement of output for all service areas are not available. Work will continue to develop the output measurements.

There is no geographical breakdown of the estimate - the numbers given are for the UK as a whole.

Recent improvements

There are several major changes that have been made to the associated statistic as part of [Public Service Productivity: total, UK, 2019](#):

- For education: new quality adjustment measures and inclusion of reception in the cohort split.
- For healthcare: alternative data sources have been introduced to replace [NHS England's National Cost Collection \(NCC\)](#), since the changes to data collection and challenges presented by the coronavirus (COVID-19) pandemic have affected the comparability over time for some services.
- For children's social care: a new approach to output measurement including more comprehensive activities data, a casemix adjustment and a new quality adjustment.

Further information on the changes can be found in [Improved methods for total public service productivity: total, UK, 2019](#) and [Sources and methods for public service productivity estimates](#).

Change to Education quality adjustment

The quality adjustment for education has been developed over a number of years, in line with the recommendations published in the [Atkinson review](#). Attainment data were previously used as a proxy for change in the quality of education, and the GCSE (or equivalent) results for a given year were applied to quality adjust the output of primary and secondary education for that year. Using the "[cohort split](#)" approach, the GCSE attainment data published for each academic year reflected the quality of teaching from Year 1 to Year 11.

We summarise below the most recent methodological changes for the quality adjustment of Education.

Extending the cohort split to Reception (or equivalent) year

The previous cohort split methodology considers 11 years of compulsory schooling. However, Reception year (in England and Wales), P1 (in Scotland) and Year 1 (in Northern Ireland) are currently excluded from the cohort split. Since the 2022 publication, we have extended the cohort split to account for the first year of primary schooling.

To introduce the Reception year, we retain the secondary school cohort splits (from Year 7 to Year 11) and split the remaining 15% contribution from Reception to Year 6.

New quality adjustment for primary education

Key Stage 2 attainment measures are now incorporated in the quality adjustment alongside existing Key Stage 4 attainment measures. These are nationally representative, publicly available measures of attainment of those aged 11 years across the UK, which allow us to consider attainment in literacy and numeracy.

We also apportion primary school attainment equally between the seven years of primary schooling, since the year in which the test is taken is not the only year that contributes to this attainment. We assign 14% of the national curriculum assessment attainment to each year of primary school from Reception (or equivalent) to Year 6, using the [same methods](#) applied in the past.

Disadvantaged pupil attainment gap index

We have incorporated the [disadvantaged attainment gap index](#) within the quality adjustment for education. This measure defines disadvantaged pupils as those who attend primary school and have been eligible for free school meals at any point in the last six years, children looked after by a local authority and children who left local authority care in England and Wales. You can find more information in the [Department for Education's \(DfE\) methodology documents](#).

In incorporating the disadvantaged attainment gap index, we take the inverse of the growth rate, such that a fall in the index (as it gets closer to zero) reflects an improvement in quality, using the DfE pupil premium funding information. To reflect its relative importance, we take the proportion of total school funding assigned to the pupil premium (which is funding specifically targeted at supporting disadvantaged pupils) to inform the weighting choice.

More information can be found in our [Improved methods for total public service productivity: total, UK, 2019](#).

Changes to healthcare output data sources

Our public service healthcare productivity statistics use a wide range of output activities and sources, as described in our [Sources and methods for public service productivity estimates methodology article](#).

In previous years, [NHS England's National Cost Collection \(NCC\)](#) has been used as the main data source to measure hospital and community healthcare services (HCHS) output. However, changes to data collection and challenges presented by the coronavirus (COVID-19) pandemic have affected the comparability of these data between the financial year ending (FYE) 2019 and FYE 2020 for some services. As a result, alternative data sources have been introduced to estimate growth for some services within HCHS.

Where NCC data cannot be used to measure healthcare output growth between FYE 2019 and FYE 2020, two strategies have been followed in choosing an appropriate alternative data source.

In the first instance, we used data sources to produce the more-timely estimates of output within our [Quarterly National Accounts \(QNAs\)](#) and [monthly gross domestic product \(GDP\)](#) estimates. These data are generally less comprehensive and less granular than NCC data.

We then supplement this with additional data sources that capture growth in healthcare components not measured in the timely National Accounts measures.

Growth rates using alternative data sources were applied to expenditure in the FYE 2019 National Cost Collection, to minimise the impact on the weight of different services.

The new data sources are only used to estimate output growth in FYE 2020 and have not resulted in revisions to estimates for healthcare output growth in earlier years.

Elective care, day-cases and non-elective care

A lower number of trusts reporting activity data has contributed to abnormal activity growth rates (that contradicted other more comprehensive sources of activities data) within the NCC. As a result, we have used the growth in the number of finished admission episodes reported in the Monthly Activity Returns (MAR) taken from NHS Digital's hospital episode statistics (HES) dataset instead. We also use this data source in our timely estimates of healthcare output within the QNA. The data are highly aggregated, providing activity for all specialities by elective care, day cases and non-elective care.

Critical care

[Monthly situation reports](#) from NHS England were used to estimate growth in critical care output. The change in the average number of occupied beds for adult, paediatric and neonatal was used as an alternative to the NCC data. This source is also used to inform our QNA estimates.

Accident and emergency

New reporting categories have had an impact on comparability to FYE 2019. NCC data reported a drop in emergency care activity in FYE 2020, whereas data from HES and NHS England monthly situation reports both reported an increase. Data from the [NHS England situation reports](#) on attendances have been used instead. This is consistent with our QNA estimates.

Mental health care

In FYE 2020 most NHS trust mental health care activity was derived from patient-level information costings systems (PLICS). PLICS will ultimately provide more robust estimates of activity and unit costs than the previously reported reference costs, but the data in FYE 2020 are not comparable to data presented for FYE 2019. Consequently, we have used alternative sources to provide information on mental health service activity growth for these services.

We have used a set of indicators from [NHS Digital's monthly mental health statistics](#) release to measure growth in mental health care cluster activity and secure services. We measure the former through the increase in the number of people assigned to a care cluster, and the latter by the increase in the number of people subject to detention at the end of the reporting period.

To measure the growth in services provided under the Improving access to psychological therapies (IAPT) programme, we have used [NHS Digital's IAPT statistics](#) on the number of appointments attended and the number of first assessments completed.

Ambulance services

Recording practices for ambulance calls have changed. Data from [NHS England](#) on calls are therefore used instead of NCC. For the rest of ambulance services NCC data are still used.

Community health services

A larger number of trusts than usual did not submit data for the full set of community health services in FYE 2020. The growth rate in output for this year was therefore calculated for each subset of community health services (groups of services such as community nursing or midwifery) using data from trusts that did submit for that subset of services in both FYE 2019 and FYE 2020. This enabled each subset of community health services and by extension, overall community health services, to be estimated. However, because of missing data, the overall weight of community health services in healthcare output will be reduced in FYE 2020.

High-cost drugs

In FYE 2020, high-cost drugs data were not disaggregated by those administered in admitted, outpatient or other patient settings. Therefore, output growth was determined at a less granular level than usual.

New method for measuring children's social care output and quality adjustment

Output

Children's social care (CSC) includes the provision of social work, personal care, protection or social support services to children in need or at risk.

The previous CSC output measures included looked-after children (LAC), children in need, Sure Start schemes, adoption and other activities. Both direct and indirect measures were adopted for CSC. Approximately one-third of output, covering LAC services, was measured directly under this approach. The remaining two-thirds of CSC output, focusing on non-looked-after children (non-LAC) were measured indirectly using the 'outputs equals inputs' convention.

To improve our measurement, additional measures for direct quantity output, quality adjustment and casemix have been developed for CSC.

Four areas of CSC activity were identified as direct measures of output, as described below.

Adoptions

CSC services are responsible for processes to determine when it is appropriate to place a LAC up for adoption. We capture the output of adoption services as the number of looked-after children adopted over the year. Children who are adopted cease to be reported in the data collection for looked-after children.

Special guardianship orders

Special guardianship orders (SGOs) are a type of care order used in England and Wales to place a child needing looking after with a long-term guardian. Children with SGOs are recorded as having left care. We record the number of SGOs as an output, capturing the services carried out by CSC to place a child with a guardian under an SGO.

Care leavers

These are defined as children who were previously looked after for at least 13 weeks after their 14th birthday in England, and between ages of 16 and 19 years for the other nations. CSC services have statutory responsibilities to provide care and support to care leavers who may have specific needs. We capture the output of care leavers' services as the number of care leavers reported in the year. Where possible, this is limited to the number of care leavers in receipt of services (instead of only those eligible), or those care leavers that are still in touch with the local authority indicating they are more likely to be receiving some level of support.

Safeguarding services

These services cover statutory services provided to children who, for various reasons, need support from children's social care services, and to protect children from harm. In England, these services fall under two main categories: services provided to children in need (CIN) and services provided to children with a child protection plan (CPP). CIN recipients may have a need for services because of family circumstances or for multiple other reasons including if they have a special educational need or disability (SEND). CPP recipients have been assessed as at significant risk of harm and whose cases require more intensive monitoring and engagement.

We identified two appropriate data series to measure the output of safeguarding services: the number of children in need (CIN) and number of children on a CPP. We sum together the number of CIN and CPP to estimate the total number of children receiving safeguarding services. It is not possible to estimate the two service areas separately because expenditure data are not available for services provided for CIN separately from those provided to CPP.

Casemix adjustment

Given an absence of unit cost information, it is possible to approximate a unit cost approach instead of using publicly available data on casemix, as described below.

The casemix adjustment includes:

- safeguarding adjustment: the percentage of CIN with CPPs
- LAC adjustment (for non-secure, secure, adoptions and SGOs): the age of looked after children

Only data for England have been used. A final casemix deflator is applied to each of the directly measured activity categories for each of the devolved administrations. We adopt a regression-based method to create casemix adjustment weights (see [improved methods for total public service productivity: total, UK, 2019](#) for details). This regression estimates the relationship between local authority expenditure and casemix factors such as the age of the child, their [primary need code](#) and child protection status, separately for safeguarding and for the LAC adjustment. No casemix adjustment is made to care leavers owing to a lack of data.

Quality adjustment

For the first time, we introduce quality adjustment to CSC output. Quality adjustment accounts for possible changes in the quality of the service over time, as described in our [guide to quality adjustment in public service productivity measures](#).

The following is a summary of the shortlisted quality adjustment series identified for the service areas of safeguarding, secure and non-secure care services and care leavers' services.

Rereferrals and reregistrations

These occur when a child who has previously been referred to CSC services is referred again within 12 months (applying primarily to children in need). Similarly, for CPP, reregistrations occur when a child who had previously had a child protection plan is reregistered as at risk and starts a new child protection plan. Therefore, they suggest that the initial service was unsuccessful, and thus reflect lower quality. Thus, we treat an increase in rereferrals and reregistrations, as reported by [DfE](#) and [StatsWales](#), as a decrease in quality. Given that it relates to the quality of the initial service, we lag this measure by 12 months.

Placement stability

This is measured as the percentage of children moving between placements two or more times within a year, and widely considered a key measure of CSC effectiveness, for example used by the Children's Commissioner for England to produce a [Stability Index](#) for children in care. Since more placement moves within a short period of time can have negative impacts on children's outcomes, stability is considered a primary objective of CSC services, [as reported by DfE](#). As such, we treat an increase in stability as an increase in quality.

Care leavers

The care leaver outcomes reported in England, Scotland and Wales are a key measure of the effectiveness of care leavers' services at supporting children moving on from placements. The outcomes include percentage of leavers living in suitable accommodation and the percentage that are not in employment, education or training (NEET). Providing suitable accommodation reflects positive quality of CSC service provision since it can be used to monitor whether they [receive adequate support to transition to adulthood successfully](#). NEET outcomes for care leavers have been associated with negative long-term consequences, including higher rates of homelessness, mental health problems and imprisonment. As such, we use data from [DfE](#) and [StatsWales](#), with an increase in the percentage of care leavers who are NEET reflecting a fall in quality.

Quality measures were shortlisted if they were fully attributable to CSC services as opposed to other public service areas or external factors. We excluded other measures (for example, percentage of child protection processes carried out within the recommended timeframes) since they were not necessarily reflective of year-on-year improved outcomes for children and relate to processes rather than our preferred focus on child outcomes.

5 . Quality characteristics of the data

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 to take forward the recommendations of the [Atkinson Review \(PDF, 1.08MB\)](#), with the aim to improve the measurement of government output, inputs and productivity, and to establish a regular reporting schedule. While UKCeMGA no longer exists as a distinct unit, the Office for National Statistics (ONS) continues to regularly report on government output, inputs and productivity. The ONS also continues to improve the measurement of government inputs, output and productivity in line with the recommendations of the Atkinson Review.

In the years since the publication, we have developed estimates of output, inputs and productivity for different service areas. These estimates are updated annually, and any methods changes are explained in prior papers and articles that we have published. Service areas are based on the [Classification of Functions of Government \(COFOG\)](#). These are:

- healthcare
- education
- adult social care
- children's social care
- social security administration
- public order and safety
- police
- defence
- other government services (this includes general government services, economic affairs, environmental protection, housing, recreation, and other public order and safety)

There are three different statistical outputs published in [Public service productivity: Total, UK: 2019](#):

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

Accuracy and reliability

(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 we have 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.

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.

It is difficult to provide a confidence interval around our 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. We collate triangulation evidence from other government departments and independent sources, which provides additional context to inform the interpretation of the public service productivity statistics.

Coherence and comparability

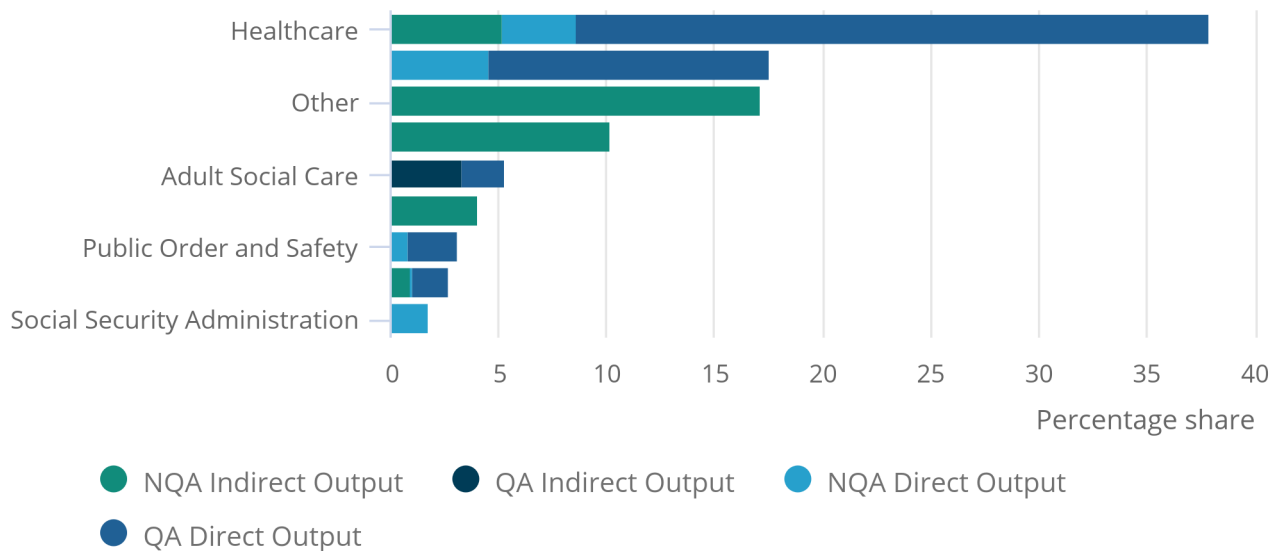
(Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain, for example, geographic level.)

Assessing coherence of the data in [Public service productivity: Total, UK](#) is difficult as there are currently no comparable measures published. We convert some source data from financial year to calendar year and aggregate results to a UK level, which makes it difficult to make comparisons at a country level. Service areas are also defined by [Classification of the Functions of Government \(COFOG\)](#) rather than administrative department or devolved administration. The different methodology developed for healthcare and education and the "output=inputs" treatment of three service areas (police, defence and other), means that direct comparisons between service areas should not be made.

The different three methods by which we measure output and their distribution between service areas can be seen below in Figure 1.

Figure 1: Output-type share by service area: total, UK, 2019

Figure 1: Output-type share by service area: total, UK, 2019



Source: Office for National Statistics – Public Service Productivity – Public service productivity: total, UK, 2019

Notes:

1. Percentage share of components may not sum to 100 because of rounding.
2. QA means quality-adjusted. NQA means non-quality adjusted.
3. "Direct" means output is measured using activity indicators. "Indirect" means output is measured following the "output equals inputs" convention.
4. The service area "Other" includes economic affairs, general public services, recreation, housing and environmental protection.

The estimates cover the UK 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 quality adjustment, output or inputs data.

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 that introduce additional, largely unquantifiable effects on our estimates.

Accessibility and clarity

(Accessibility is the ease with which users can 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.)

Our 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. We also offer users the option to download the narrative in PDF format. In some instances, other software may be used, or may be available on request. The datasets associated with this release have been modified in accordance with the [accessibility legislation](#).

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

- [terms and conditions \(for data on the website\)](#)
- [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 are published in the public service productivity topic specific methodology page as well as historic changes being available in the guidance and methodology area of our archive website.

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. If the reference period were to be moved, for example to (t-1), there would be a significant increase in the use of estimation to fill data gaps in the productivity articles, in advance of the publication of these datasets.

For more details on related releases, the [GOV.UK release calendar](#) provides 12 months' advance notice of release dates. 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 at the same time, as set out in the [Code of Practice for Official Statistics](#).

Concepts and definitions

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

Our analysis of productivity in UK public services represents internationally pioneering work. Measurement of outputs follows the guidance in the System of National Accounts (SNA) 1993 and subsequent SNA 2008, as well as the European System of Accounts (ESA) 1995 and subsequent ESA 2010. Measurement of outputs (including the need to measure the change in quality), inputs and productivity follows the principles in the Atkinson Review. The estimates presented in the article are for service areas classified by the Classification of the Functions of Government (COFOG).

Geography

Estimates are published on a UK geographic basis, with no further geographic breakdown provided. This is unchanged from last year's publication.

Output quality

This statistic is a National Statistic and so meets the quality requirements of this status. It measures total productivity and the productivity of nine different service areas, offering a comprehensive coverage of the data required by the users.

Why you can trust our data

The Public service productivity: Total, UK: 2019, UK statistic is produced in accordance with the best practices set out in the [Statistics Authority's Code of Practice](#) and the [ONS' Data Policies](#).

Any revisions to the data are clearly identified as such and limitations are made known to all users.

6 . Methods used to produce the data

Main data sources

A range of data sources are used to provide a comprehensive picture of UK public services. A summary of these data sources is documented in [Sources and methods for public service productivity estimates](#).

How we process the data

The following section outlines the main statistical methods used to compile estimates of public service inputs, output and productivity. A detailed explanation of the methods used is given in [Sources and methods for public service productivity estimates](#). Significant methods changes are published in advance on the topic specific methodology page to inform users of both the nature and the likely impact of methodological changes.

Measuring output

The methods of measuring output vary between and within service areas. This section provides a breakdown of methods of measuring output, by output measure, including definition, service areas and their coverage percentages.

Quantity output measure

Definition: the number of activities performed and services delivered. Growth values in individual activities are weighted together using the relative cost of delivery.

Percentage of service area with quantity measures only:

- Social security administration: 100%
- Public order and safety: 26%
- Education: 26%
- Healthcare: 9%
- Children's social care: 4%

Quality adjusted output measure

Definition: Quantity output is adjusted for the quality of the services delivered. If the quality adjustment is positive, estimates of output growth will increase.

Percentage of service area that is quality adjusted:

- Adult social care: 100%
- Healthcare: 77%
- Education: 74%
- Public order and safety: 74%
- Children's social care: 63 %

"Output-equals-input" output measure

Definition: For some services, we cannot measure output directly, so we assume the volume of output equals the volume of inputs used to create them, meaning that productivity growth will always be zero.

Percentage of service area that is 'output equals inputs':

- Police: 100%
- Defence: 100%
- Other government services: 100%
- Children's social care: 33 %
- Healthcare: 14%

The output measures used are based on or taken in chained volume from the [Blue Book](#). Given that most public services are supplied free of charge or at cost price they are considered non-market output. The output of most services is measured by the activities and services delivered. These are usually referred to as "direct output" measures. These activities are measured and aggregated into a single volume output according to their relative cost or share of service area expenditure. This is referred to as a Cost-Weighted Activity Index.

For "collective services" — those that are not provided to an individual, such as defence — it is difficult to define and measure the nature of their output. It is assumed for such services that the volume of output is equal to the volume of inputs used to create them. This is referred to as the "output-equals-inputs" convention.

In addition, a quality adjustment factor is applied to the volume of activity index of several service areas. The purpose of these quality adjustment factors is to reflect the extent to which the services succeed in delivering their intended outcomes and the extent to which services are responsive to users' needs. This results in estimates differing from those used in the national accounts.

There are currently five service areas that include such an adjustment:

- healthcare
- education
- public order and safety
- adult social care
- children's social care

Healthcare

The healthcare productivity quality adjustment is a compound measure made up of five components:

- short-term post-operative survival rates
- estimated health gain from procedures
- waiting times
- primary care outcomes achievement under the Quality and Outcomes Framework
- National Patient Surveys scores

This quality adjustment process is applied from 2001 onwards. In the national accounts series, no quality adjustment is applied to healthcare output at present.

Further detail can be found in [Source and Methods Public Service Productivity Estimates: Healthcare](#).

Education

The education productivity is quality adjusted using four component:

- Attainment for primary and secondary school
- Disadvantaged attainment gap index at Key Stage 2
- Bullying
- Qualified teacher status

Further detail can be found in [Sources and methods for public service productivity estimates](#), and in our [Improved methodology articles published in 2021](#) and [2022](#).

Public order and safety

Quality adjustments are applied to the criminal justice system elements of public order and safety output. This includes output associated with Crown Courts, magistrates' courts, legal aid, Crime Prosecution Service, prison and probation services. There are two main sections included. The first adjusts the whole series by a severity-adjusted measure of total reoffences per offender. The second looks more closely at the different service areas. With prisons, this is including escapes from and safety inside the prisons, using number of incidents and their severity. With courts, it uses the timeliness of courts to process cases passed on to them by police.

In [Public service productivity: total, UK, 2019](#), an adjustment has been made for the recidivism indicator, since the data on reoffending for the last quarter of 2018 and all of 2019 have been affected by the coronavirus (COVID-19) pandemic. More information about these aspects can be found in our [methodology article](#). Further detail can be found in [Quality adjustment of public service public order and safety output: current method](#).

Adult social care

A new quality adjustment in ASC was introduced to apply the concept of adjusted social care-related quality of life and data from the Adult Social Care Survey. To assess how well their needs are met, respondents are asked to rank how well their care needs are met in eight domains, such as food & nutrition, accommodation and safety. Then, each level of response is weighted by importance to quality of life, using weights derived from another survey of community care users.

The quality adjustment is produced separately for working age adults with learning disabilities, other working age adults and older adults for each of residential and nursing care, and community care. The final six components are then weighted together using the same measure of public expenditure as used in the inputs and output. The quality adjusted output is obtained from the rate of change in the aggregate quality adjustment for each year and then applied to the corresponding year of the output index. More information on the methodological developments can be found in [Public service productivity: adult social care QMI](#).

Measuring inputs

The input measures used are based on or taken from a mixture of expenditure, deflator and administrative data sources. They consist of compensation of employees, intermediate consumption and consumption of fixed capital of each service by central government and local government.

Central government expenditure data are sourced in current prices from HM Treasury's public spending database - Online System for Central Accounting and Reporting (OSCAR) - that collects financial information from across the public sector. Annual estimates are derived from monthly profiles of spending for the current financial year and modified to meet national accounts requirements.

Most local government expenditure data are sourced from financial year returns by local authorities, apportioned across calendar years.

Expenditure data are subsequently adjusted for price changes (deflated) using a suitable deflator (price index). The purpose of this being to measure input volumes indirectly.

For a number of inputs - in particular most healthcare and education labour inputs - volume series are measured directly using administrative data sources (that is, full-time equivalent staff numbers from NHS staff resources).

Deflator or price indices

A suitable deflator (price index) - or composite deflator - is applied to each current price expenditure to estimate a volume series. The [Atkinson Review \(PDF, 1.08MB\)](#) recommends that deflators are applied separately for each factor and that the price indices should be specific for each service. Price indices for labour and procurements should be sufficiently disaggregated to allow for changes in the compositions of the inputs. Currently, deflators are taken from a range of different sources to best represent changes in prices for each service input. Where suitable data is unavailable the gross domestic product (GDP) implied deflator (acting as a generic price index) is used instead.

These series are aggregated to form an overall estimate of the volume of inputs used to provide each of the public services identified in the total public services.

Further detail can be found in the [Sources and methods for public service productivity estimates](#).

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 (GGFCE) by [Classification of the Functions of Government \(COFOG\)](#).

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 method follows the formula:

$$Q_{LaspeyresVolume}^{t-1,t} = \frac{\sum_{i=1}^n q_i^t \cdot p_i^{t-1}}{\sum_{i=1}^n q_i^{t-1} \cdot p_i^{t-1}} = \sum_{i=1}^n w_i^{t-1} \cdot \tilde{R}_i^{t-1,t}$$

Where w_i^{t-1} is the value share of item i in the base period $t-1$, and $\tilde{R}_i^{t-1,t}$ is the volume relative (the ratio of the quantity of an activity to the quantity of the same activity in the base period).

In the context of public service output the weights (w_i) are indicative of the relative value of different activities (q_i). Unit costs can be used to approximate the "price" of an activity (p_i) given the difficulty of accurately estimating the relative social and economic value of different activities. However, in practice, expenditure shares from public finance data are generally used to approximate relative value (w_i) of activities. The weights for different activities are those taken from the first year of each activity pair (the base year $t-1$).

For example, if we were combining activity series for each of the devolved UK nations for 2010, we would weight each of the activity growths from 2009 to 2010 for England, Scotland, Wales or Northern Ireland by their respective expenditure shares in 2009.

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 method follows the formula:

$$Q_{LaspeyresVolume}^{t-1,t} = \frac{\sum_i^n q_i^t \cdot p_i^{t-1}}{\sum_i^n q_i^{t-1} \cdot p_i^{t-1}} = \sum_{i=1}^n w_i^{t-1} \cdot \tilde{R}_i^{t-1,t}$$

Where w_i^{t-1} is the value share of item i in the base period $t-1$, and $R_i^{t-1,t}$ is the volume relative (the ratio of the quantity of an activity to the quantity of the same activity in the base period).

Measuring productivity

Estimates of total public sector productivity are calculated using the aggregate output and inputs indices produced using the approach just discussed.

Including the police, defence and other government services in the calculation of productivity will limit the growth in total public service productivity, pushing estimates of productivity growth towards zero. The extent to which they affect the growth of total public service productivity is proportional to their share of total expenditure. During periods when productivity in other sectors is positive, the "output-equals-inputs" convention will reduce productivity growth. 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.

How we analyse and interpret the data

The contributions of each service area to total growth in output, inputs and productivity are calculated, as are the levels of revisions. These different findings are shown in a series of charts for stakeholders within the Office for National Statistics (ONS), and the reasons behind changes in the figures are identified as far as possible.

The data are then published for use by various external stakeholders, who are welcomed to provide feedback, show us how they use the statistic and provide guidance on where we should focus future work in public service productivity.

How we quality assure and validate the data

A number of procedures are followed to quality assure the data. These processes are applied at all stages of the production process - at both granular and aggregate levels.

Internal quality assurance is carried out at all key stages of processing. This is followed by a larger scale quality assurance, involving stakeholders and key individuals. A quality assurance follows a parallel run of two aggregation systems (by service area and by component). This made it possible to check the accuracy of the data and the processing system simultaneously.

Visual presentations are created from the processed data. These presentations are used for internal analysis to highlight significant data points or patterns that may warrant further investigation.

How we disseminate the data

The [Public service productivity: Total, UK](#) releases are published free of charge on the ONS website. They are published once a year, within the [Public Services Productivity section of the ONS website](#). Supporting documents are clearly linked and accessible to users. Additional data can be provided on request.

How we review and maintain the data processes

Further revisions to the estimates may be required in accordance with, for example, changes to source data. This follows [ONS' Revisions Policy](#). There is also available a [guide to statistical revisions](#).

7 . Other information

Assessment of user needs and perceptions

(The processes for finding out about uses and users, and their views on the statistical products.)

Our productivity releases have a range of users, as given in the earlier section.

We have developed two main ways of obtaining information on users and uses of our public service productivity estimates:

1. User consultation meetings and regular functional board meetings on healthcare, education and adult social care. These meetings allow the exchange of information on data sources, development issues and methods changes that affect our public service productivity estimates.
2. A user feedback questionnaire is circulated to those who make enquiries about public service productivity.

Useful links

- [Atkinson Review \(PDF, 1.08MB\)](#)
- [Independent review of UK economic statistics: final report](#)
- [How to compare and interpret ONS productivity measures\)](#)
- [Total public service productivity: understanding inputs](#)
- [A guide to quality adjustment in public service productivity measures](#)
- [Sources and methods for public service productivity estimates](#)
- [Improved methods for total public service productivity: total, UK, 2019](#)