

Methodological developments to public service productivity, healthcare: 2021 update

Methodological changes to public service healthcare productivity, including improved measures of primary care output.

Contact:
James Lewis
publicservicesanalysis@ons.gov.
uk
+44 (0)1633 455323

Release date:
18 January 2021

Next release:
To be announced

Table of contents

1. [Introduction](#)
2. [General practice output](#)
3. [Dental services output](#)
4. [Ophthalmic services output](#)
5. [Developments to the NHS Cost Inflation Index](#)
6. [Brief summary of public service healthcare productivity](#)

1 . Introduction

This article details planned methodological changes to [Public service productivity: healthcare](#), which we intend to incorporate in our release for the first time in February 2021.

The main methodological development to be included in the next edition of Public service productivity: healthcare is a set of improvements to the measurement of output for general practice, dental and ophthalmic services. Collectively, along with the far smaller element of NHS web and phone services, these services comprise primary care output – one of the four components of healthcare output used in measuring public service healthcare productivity. Primary care output was referred to as Family Health Services (FHS) in previous editions of Public service productivity: healthcare but is being renamed to reflect the declining use of the term FHS in the NHS.

It should be noted that while the output data in these statistics are predominantly shared with the UK National Accounts, the public service productivity estimates operate an open revisions policy. This means that new data or improved methods can be incorporated more quickly in the public service productivity estimates and can be implemented for the entire time series of data. The new primary care output methodology has not yet been incorporated in the National Accounts but will be considered for inclusion when the availability to make changes allows.

This article also outlines a change to the methodology for deflating agency staff expenditure, which we plan to incorporate in the data for financial year ending 2019 onwards.

We welcome user feedback on the proposed changes, which can be sent to publicservicesanalysis@ons.gov.uk.

2 . General practice output

Why change methods?

Measures of general practice (GP) output used in previous publications have been based on data collected by QResearch between financial year ending (FYE) 1996 and FYE 2008. However, this data source was discontinued after FYE 2008. With no equivalent data available, general practice output for subsequent periods was modelled based on the relationship between the QResearch data and the population of different age groups in England. This model predicted the trend in activity for different population groups, scaled by changes in population size. Without incorporating new data on changes in consultation rates per person, these modelled estimates were unable to reflect changes in GP output caused by events such as the coronavirus (COVID-19) pandemic.

[Appointments in General Practice](#) is a relatively new monthly publication by NHS Digital of general practice activity in England, which can replace our modelled estimates of activity growth from FYE 2018 onwards.

For our England output measure, we use the national level dataset. Appointments data are available from November 2017 onwards. For the earlier months of FYE 2018, the average rate of growth between each month was calculated based on subsequent data for 2018 and 2019¹. Growth rates were calculated based on the amount of activity conducted per working day per month, as the number of working days differs from month to month.

For the period between FYE 2008 (when the previous data source ends) and FYE 2018 (when the new data source begins), we estimate growth based on the methodology developed by the Centre of Health Economics at the University of York in their [Productivity of the English NHS](#) series. This method accounts both for changes in population growth and changes in consultation rates over time, and more details are provided later in this article. These two changes will provide a more accurate means of identifying activity growth in general practice than our previous modelled estimates.

We have also re-evaluated the unit costs used to cost-weight different types of GP activity, to better account for the effects of cost changes between different consultation types.

New measure of cost-weighted activity from FYE 2018 onwards

While the new activity data collection offers insight into the number of appointments made in general practice in England, for the purpose of measuring output we need to know the number of attended appointments, which we refer to as consultations. The “Appointments in General Practice” data gives the shares of appointments that were attended, those that were not attended and those where attendance was unknown. To calculate the number of consultations (attended appointments), the number of overall appointments is multiplied by the ratio of attended to not attended appointments, to pro-rate “unknown” attendances. For months, where there are no data for the share of appointments by attendance status of appointments, the share is estimated based on the average share of the last known and next available months of data.

The NHS Digital data are collected from a sample of general practices (approximately 95% of practices are included in the data collection). As such our consultation numbers, derived from the NHS Digital collection, are upscaled by the estimated patient coverage of the data collection to give a total number of consultations for England. This means that our overall estimate for the number of consultations in England is consistent with the methodology of NHS Digital for estimating England aggregates.

The estimated number of consultations in England is then divided into consultations led by General Practitioners (GPs) and those led by other practice staff. This is based on the ratio of General Practitioner (GP)-led consultations to those led by other practice staff. In some instances, the practitioner type for a consultation is unknown; these are pro-rated by GP and other practitioner types, in the same way as attendance types. Information on practitioner type was only published for months from January 2018 onwards. We estimate the practitioner type for consultations in prior months based on the average share of practitioner types for the equivalent months in 2018 and 2019. This is because the number of GP and other practitioner appointments can vary seasonally.

GP-led appointments are further split by mode (or type) of consultation:

- surgery consultations
- home visits
- telephone consultations
- video or online consultations

The mode is unknown for some consultations. There is no reason to suggest that consultations where the mode is unknown are more likely to be one type over another, therefore they are pro-rated across known consultation types in the same way as unknown attendance status and unknown practitioner type. As with practitioner type, information on the mode of consultation was unavailable before January 2018. The number of consultations in the months from April 2017 to December 2017 are estimated in the same way as for the split by practitioner types. When monthly data have been processed, they are then aggregated into the number of consultations by financial years.

This information is important to distinguish between the cost and complexity of different types of activity. The principle of volume output measurement is that different activities are assigned different weights based on their costs, such that growth in treatments that are common and expensive has a greater effect on overall output than a similar rate of growth in treatments that are uncommon or low cost. In the case of general practice, consultations led by GPs are typically more expensive than those led by other practice staff, while home visits require more time commitment, and so are typically more expensive than other forms of consultation.

We have also reviewed the unit costs used in the cost-weighting of GP activity. Like our previous measure, the unit costs in our new measure of general practice output are based on average consultation cost data compiled by the [Personal Social Services Research Unit \(PSSRU\)](#). However, while the unit costs in the previous measure were fixed from FYE 2014 onwards, the new measure uses unit costs updated annually, to account for cost inflation over this period. This method is used to calculate unit costs for GP surgery consultations, telephone consultations and home visits. Practice nurse consultation unit costs are used as a proxy for consultations led by non-GP staff. The PSSRU do not currently publish unit costs for video or online consultations, so these costs have been estimated as the weighted average between surgery and telephone consultations.

Comparing the trend in cost-weighted activity from our previous measure to the new measure

Table 1 shows that there are three distinct periods in the series for general practice output: an initial period where administrative data were collected from general practices by QResearch, a later period where NHS Digital collect administrative data and an intervening period, where growth in consultations must be estimated by an alternative means.

While the levels of activity reported in each of these periods is not consistent, the growth rates in activity can be chain-linked across these periods to give a consistent time series.

Table 1: Timeline of GP consultation data

Period of our series Data source

1995/96 to 2007/08	QResearch data
2007/08 to 2017/18	Estimated growth in activity
2017/18 onwards	Appointments in General Practice data

Given the limitations with the previous modelling method used to estimate activity growth over the period FYE 2008 to FYE 2018, which was unable to account for variation in consultation rates per person, we have chosen to estimate growth over this period based on the methodology developed by the Centre of Health Economics at the University of York in their [Productivity of the English NHS \(PDF, 4.5MB\)](#) series. The University of York method for this period is based on survey data drawn from the General Lifestyle Survey (GLS) up to FYE 2010 and from the GP Patient Survey (GPPS) from FYE 2011 onwards.

The advantage of this method is that, as well as accounting for population growth (by age group and sex), it also accounts for changes in the consultation rates per person. Analysis by the University of York² suggests that the growth in consultation rates observed in the QResearch data to FYE 2008 did not continue into later periods. This means that models which only account for population growth will likely be overestimating activity growth during the period.

While this method is an improvement relative to our previous population-based model for GP output growth, the GPPS relies on a sample of approximately 1.5 million, considerably smaller than the earlier QResearch administrative data collection, which used approximately 9 million records. Therefore, the GP output measure produced using this method for FYE 2008 and FYE 2018 will be subject to some deviation from the unobservable “true” number of consultations during this period due to sample variation.

While we are principally interested in the rates of activity growth over time, we also need a consistent series of activity levels over time, in order to cost-weight GP activity relative to other elements of output. Therefore, we use activity levels based on data from “Appointments in General Practice” for the most recent period, with activity for earlier years estimated using growth rates.

With the adoption of the NHS Appointments in General Practice data source for FYE 2018 onwards, there are some changes in how consultations are split by type, when compared with our previous estimates, as demonstrated in Table 2. Firstly, consultations undertaken by non-GP staff in the new measure include consultations by all healthcare professionals (including practice nurses, counsellors, health visitors, physiotherapists and other professionals), rather than being limited only to practice nurses, as in our previous measure. Secondly, there are differences in the mode of consultation, with the new data collection separately including online or video consultations, which have become more widely available in the years since the end of the QResearch publication.

Table 2: Differences between types of consultation between previous measure based on QResearch data and new measure based on Appointments in General Practice data

Previous measure based on QResearch data		New measure based on appointments in general practice data	
Practitioner type	Mode of consultation	Practitioner type	Mode of consultation
GP consultations	Surgery	GP consultations	Surgery
	Telephone		Telephone
	Home visits		Home visits
	Other		Online/Video
Practice nurse consultations	Total	Consultations with other practice staff	Total

For consistency throughout the series, “other” GP consultations from QResearch data are pro-rated across surgery and telephone consultations, and home visits, as this type does not exist in the new NHS Digital data collection. The growth rate in practice nurse consultations is used as a proxy to estimate all non-GP consultations in periods before FYE 2018. Online and video consultations have not been estimated before FYE 2018, as the number of these consultation types is currently low, and they are a relatively recent mode.

We have also reviewed our method for estimating general practice unit costs in our back series. These largely remain unchanged, with the exception of GP home visits, which now include expenses relating to travel costs in years before FYE 2009, so they are measured consistently across the whole series.

Notes for: General practice output

1. Despite being available, data for 2020 were not used, as the impact of COVID-19 is likely to have resulted in atypical growth rates for GP services.
2. Also see Appendix B of [Bojke and others \(2017\) Productivity of the English NHS: 2014/15 Update](#) for a review of alternative primary care data.

3 . Dental services output

Our previous method for estimating output growth in dental services cost-weighted overall dental activity. However, the complexity of dental treatments ranges substantially, from simple check-ups to more complex dental procedures. As a result, we have expanded the level of granularity of the activity data used to cost-weight different courses of treatment separately. Data exist to split by courses of treatment from financial year ending (FYE) 2007 onwards, using NHS Digital’s [Dental Statistics for England](#). For earlier years, total dental activity is used.

The dental courses of treatment are:

- Band 1 – check up and simple treatment, for example, examination, x-rays and prevention advice
- Band 2 – mid range treatments, for example, fillings, extractions, and root canal work in addition to Band 1 work
- Band 3 – includes complex treatments, for example, crowns, dentures, and bridges in addition to Band 1 and Band 2 work
- urgent – a specified set of treatments (including up to two extractions and one filling) provided to a patient, such as where oral health is likely to deteriorate significantly, or to prevent significant deterioration or address severe pain
- other – courses of treatment that include the following procedures that do not have a patient charge, for example, arrest of bleeding, bridge repair, denture repair, removal of sutures and prescription issues

Dental activity is weighted by [Units of Dental Activity \(UDAs\)](#), which account for differences in the level of complexity for each type of treatment. These UDAs weight dental treatments in relation to an equivalent number of Band 1 treatments¹, Band 1 typically being the least complex treatment type. We then apply a cost element, by dividing net dental expenditure by total weighted activity to give a cost per Band 1 treatment. The UDA ratios can then be used to estimate a unit cost for each treatment type. In the early years of the series, where activity is not split by band, a single unit cost is imputed by dividing net dental expenditure by total unweighted activity.

Notes for: Dental services output

1. The relative cost of different UDA bands can be found in [Table B of the NHS Digital guidance](#).

4 . Ophthalmic services output

Our previous method for estimating output growth in ophthalmic services was based solely on cost-weighting overall sight test activity. However, the cost of a sight test can differ depending on the location it was performed, with home visits being more expensive than tests performed on an optician's premises. Ophthalmic services also include the provision of optical vouchers for the purchase, repair and replacement of eyewear.

Therefore, we have expanded both the coverage and the level of granularity of the activity data used to determine growth in ophthalmic services, using NHS Digital's [General Ophthalmic Services activity statistics](#). Ophthalmic services output is now calculated by:

1. disaggregating ophthalmic activity by type of activity (sight tests and optical vouchers)
2. disaggregating sight test activity further, by type of sight test (for example, domiciliary visits and standard eye tests)

Due to a lack of available data on the number of optical vouchers issued by type, we can only measure the overall number of vouchers.

In order to cost-weight these services, eye tests performed on site and as home visits are weighted by the NHS sight test fee and NHS domiciliary fee respectively, while an implied unit cost for optical vouchers is calculated by dividing estimated optical voucher expenditure by the number of vouchers issued.

5 . Developments to the NHS Cost Inflation Index

The NHS Cost Inflation Index (NHSCII) was developed by the Department of Health and Social Care (DHSC) working in conjunction with NHS England and NHS Improvement, the Centre for Health Economics at the University of York and the Office for National Statistics (ONS) to provide a measure of inflation specific to the input costs faced by the NHS. The NHSCII was introduced into public service healthcare productivity statistics in 2020 to replace a previous discontinued healthcare cost deflator and was used to deflate input costs to produce a volume measure of inputs. The NHSCII draws on a range of data sources to deflate different elements of inputs and the methodology of the index is detailed in [Methodological developments to public service productivity: healthcare, 2020 update](#).

The NHSCII has been further developed by DHSC over 2020, with the main change being the introduction of a specific deflator for agency staff costs, which were previously deflated using a deflator produced from NHS employee data.

This agency pay cost deflator makes use of mandatory data collections undertaken by NHS England and NHS Improvement on NHS trusts' agency staff spending and the number of shifts worked.

Unlike other data used in calculating labour deflators for healthcare, the number of shifts worked is the best available measure of the amount of agency staff labour input provided. This is less preferable than the full-time-equivalent staff numbers data available for NHS employees, as it requires the assumption that agency staff shift lengths remain consistent over time. However, discussions with experts in the NHS suggest agency staff shift lengths remaining similar over time in recent years is, in general, a reasonable assumption.

A specific deflator for labour costs is considered an improvement relative to using a deflator based on NHS employees due to the distinct nature of trends in agency staff pay. These differences in recent years are in a large part caused by [NHS England policies on agency staff pay](#), which mean that year-on-year growth rates for agency staff costs can differ substantially from NHS provider staff costs, making a deflator specific to agency pay costs valuable.

Table 3 updates Table 3 from our [article introducing the NHSCII](#) to reflect this change and more information on these other deflators can be found in that article.

Table 3: Deflators used in public service healthcare inputs

Element of intermediate consumption	Deflator to be used in Public service productivity: healthcare, England, financial year ending 2019
Intermediate consumption other than that specified below (includes NHS providers), financial year ending 2015 (FYE 2015) to FYE 2019	ONS intermediate consumption-specific version of the NHS Cost Inflation Index (NHSCII) NHS providers non-pay deflator
Intermediate consumption other than that specified below (includes NHS providers), FYE 1996 to FYE 2015	ONS intermediate consumption-specific version of the Health Service Cost Index (HSCI)
Non-NHS provided services, FYE 2015 to FYE 2019	NHSCII NHS providers deflator including both pay and non-pay elements
Non-NHS provided services, FYE 1996 to FYE 2015	Non-NHS deflator combining ONS intermediate consumption-specific version of the HSCI and ONS pay cost index covering Hospital and Community Health Services (HCHS) staff
NHS bank staff costs, FYE 2016 to FYE 2019	NHSCII pay cost deflator for NHS providers
Agency staff costs, FYE 2018 to FYE 2019	NHSCII agency cost deflator
Agency staff costs, FYE 2015 to FYE 2018	NHSCII pay cost deflator for NHS providers
Agency staff costs, FYE 1996 to FYE 2015	ONS pay cost index covering HCHS staff
General practice intermediate consumption, FYE 1996 to FYE 2019	Consumer Price Index including owner occupiers' housing costs (CPIH)
Dental services, FYE 2008 to FYE 2019	NHSCII dental cost deflator and ONS equivalent for earlier years
Dental services, FYE 1996 to FYE 2008	Non-NHS deflator as above for FYE 1996 to FYE 2008
Pharmaceutical services (excluding drug costs), FYE 2015 to FYE 2019	Overall NHSCII
Pharmaceutical services (excluding drug costs), FYE 1996 to FYE 2015	Non-NHS deflator as above for FYE 1996 to FYE 2015
General ophthalmic services, FYE 2015 to FYE 2019	Overall NHSCII
General ophthalmic services, FYE 1996 to FYE 2015	Non-NHS deflator as above for FYE 1996 to FYE 2015

Notes

1. The inputs for hospital and community health service employees (other than bank staff) staff working in general practice and GP-prescribed drugs are not deflated as these inputs are directly measured using a cost-weighted labour index or cost-weighted drug index.
2. Capital consumption inputs are obtained from the national accounts in volume terms and so need no further deflation.

Further detail on the NHSCII is available from [the Unit Costs of Health and Social Care](#) published by the Personal Social Services Research Unit.

6 . Brief summary of public service healthcare productivity

The high-level methodology for the production of public service healthcare productivity statistics was set up in the [Atkinson Review \(PDF, 1.1MB\)](#). These statistics involve the calculation of inputs and output in volume terms:

$$\text{Productivity} = \frac{\text{Output}}{\text{Inputs}}$$

Volume output in public service sectors such as healthcare is mainly measured using a cost-weighted activity index (CWA). This calculates the change in the number of activities undertaken, weighting each activity by its cost such that an increase of one unit of activity for a high-cost activity has a greater effect on the output than an increase of one unit of activity for a low-cost activity.

The volume output measure is produced using the Laspeyres approach:

$$I^t = I^{t-1} \times \frac{\sum_i (a_i^t \times u_i^{t-1})}{\sum_i (a_i^{t-1} \times u_i^{t-1})}$$

where:

I = index value

a = activity count

u = unit cost

t = year

i = activity type

Volume output is divided into four broad components:

- hospital and community health services (HCHS)
- primary care services, formerly known as Family Health Services (FHS)
- GP prescribing, otherwise known as community dispensed prescriptions
- Non-NHS provision

Inputs are also calculated on a volume basis and consist of three main components:

- labour, which is mainly measured through a Laspeyres cost-weighted labour index (CWL), which uses the growth in full-time equivalent staff numbers weighted by their cost, in a similar manner to quantity output
- intermediate consumption of goods and services used in the provision of healthcare, such as gloves and syringes (this category includes agency staff), which is calculated using expenditure deflated by relevant deflators
- consumption of fixed capital, covering the cost of depreciation of capital goods (items that are anticipated to be in use for a year or more, such as buildings and vehicles) over time

More information on the methodology of the existing statistics can be found in the related [Quality and Methodology Information](#).

