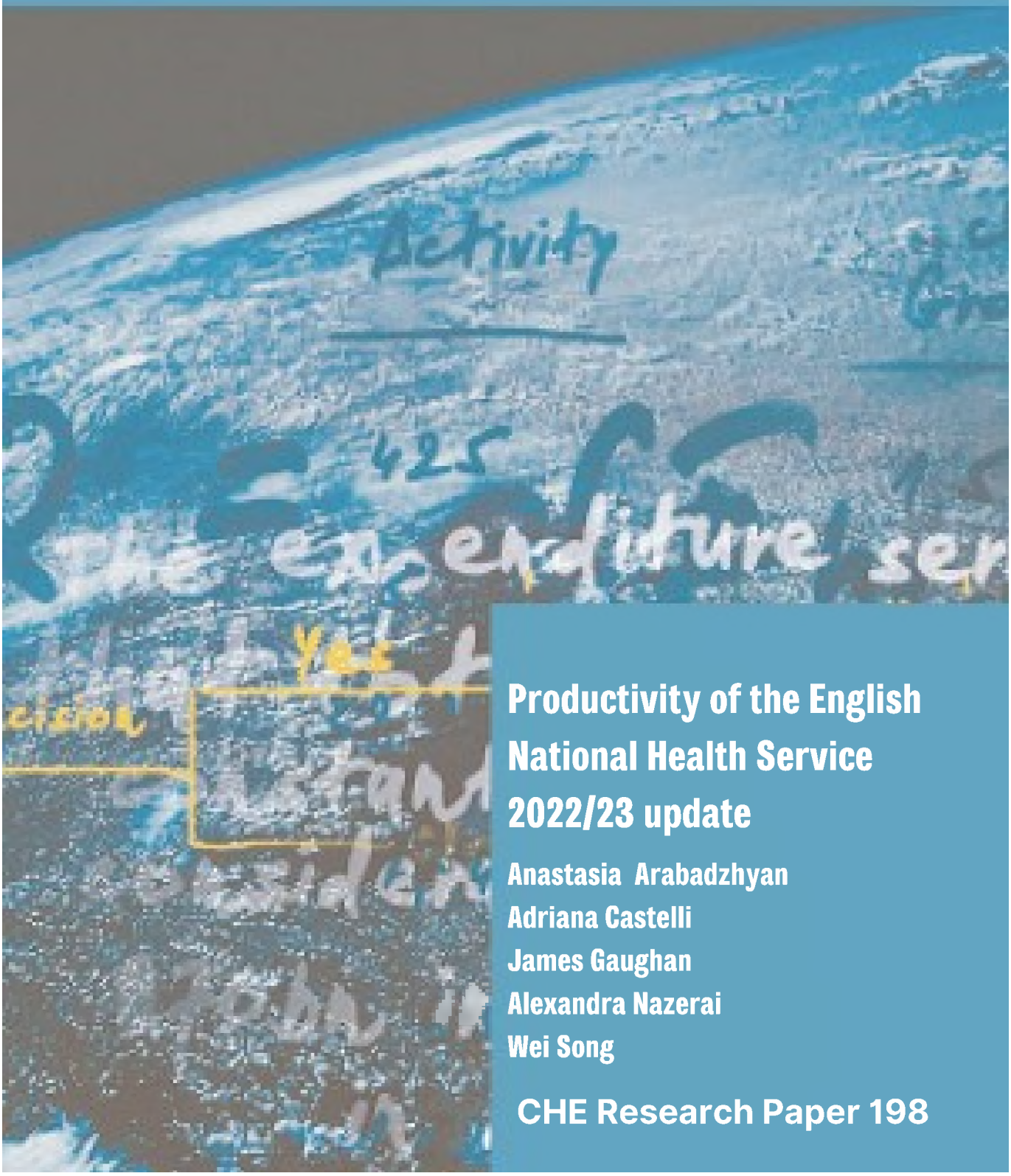
Part of

UNIVERSITY of York

CHE
Centre For Health Economics



Productivity of the English National Health Service 2022/23 update

Anastasia Arabadzhyan
Adriana Castelli
James Gaughan
Alexandra Nazerai
Wei Song

CHE Research Paper 198

Productivity of the English National Health Service 2022/23

[a] Anastasia Arabadzhyan
Adriana Castelli
James Gaughan
Alexandra Nazerai
Wei Song

[a] Centre for Health Economics, University of York, UK

May 2025

Background to series
CHE Discussion Papers (DPs) began publication in 1983 as a means of making current research material more widely available to health economists and other potential users.

The CHE Research Paper series takes over that function and provides access to current research output via web-based publication. The RPs can take various forms and results and ideas do not necessarily represent the final position and may include work in progress not subject to peer review at the time of publication.

CHE RP 198 is part of the time series of the English National Health Service (NHS) productivity growth calculated at the Centre for Health Economics, University of York, and commissioned and funded by the NIHR Policy Research Programme (NIHR200687). Part of the work is as an early version of a paper for later submission to an academic journal.

Corresponding author
The corresponding author is Adriana Castelli, who can be contacted by email at adriana.castelli@york.ac.uk

Acknowledgements
The authors thank Alastair Brodlie, Emma Griffiths, Eleanor Wilson and Venus Ahmed from the Department of Health and Social Care for useful discussions and comments on an early draft of this report. The report is based on independent research commissioned and funded by the NIHR Policy Research Programme (NIHR200687). The views expressed in the publication are those of the authors and not necessarily those of the Department of Health and Social Care. This work uses data provided by patients and collected by the NHS as part of their care and support. The Hospital Episode Statistics are copyright © 2004/05 – 2022/23, NHS England. Re-used with the permission of NHS England. All rights reserved.
Funder

Ethics approval
No ethical approval was required.

Conflicts of interest
The authors do not have conflicts of interest to disclose

Further copies
Only the latest electronic copy of our reports should be cited. Copies of this paper are freely available to download from the CHE website www.york.ac.uk/che/outputs/. CHE Research Papers can be reused and distributed for non-commercial purposes provided the source is properly cited.

Centre for Health Economics
Alcuin College
University of York
York,
YO10 5DD, UK

www.york.ac.uk/che

Summary

Healthcare expenditure is one of the largest elements, and a growing proportion, of public spending. In the context of limited resources, it is essential for patients and policymakers to understand the return on investment in health care. Productivity, the ratio of output produced to input used, is therefore a key performance metric for the English NHS. In addition, measuring NHS productivity growth is an important tool for assessing future funding needs. Finally, in the aftermath of the COVID-19 pandemic, evaluating the extent to which the NHS has recovered to pre-pandemic levels of productivity is of great policy relevance.

In this report we extend previous investigations into NHS productivity growth carried out at the University of York. Embedded in National Accounting Systems, we use an index number approach, to calculate growth in both NHS inputs, outputs and productivity. Outputs are also adjusted for the quality of care provided. This report has two objectives, (1) to provide an update on NHS productivity between 2021/22 and 2022/23, and (2) similarly to last year's report (Arabadzhyan et al., 2024) to evaluate whether the NHS system has recovered from the effect of the COVID-19 pandemic by determining the productivity growth between 2019/20 and 2022/23.

We find NHS productivity continued to grow between 2021/22 and 2022/23 (between 0.88% and 1.05% depending on the method used). However, when compared to 2019/20, productivity in 2022/23 remains lower (between -10.73% and -10.16% depending on the method used). Although this is a considerable improvement of between 1.72% to 3.14% percentage points compared to 2021/22, a significant gap still remains between NHS productivity before the pandemic and in 2022/23.

Executive Summary

This report forms part of the time series of the English National Health Service (NHS) productivity growth calculated at the Centre for Health Economics, University of York. In this update, we focus on growth from 2021/22 to 2022/23. These two financial years are no longer directly affected by the COVID-19 pandemic, which had previously disrupted the normal provision of healthcare in England. From 2021/22, all NHS organisations, including primary care providers, were asked to return to the 'business as usual' provision of healthcare services. However, safety protocols and measures were still heightened compared to provision before the pandemic.

In February 2022, NHS England published the 'Delivery plan for tackling the COVID-19 backlog of elective care' which emphasised a focus on maximising NHS capacity to support the delivery of about 30% more elective activity by 2024/25. The plan calls for significant investments in capacity and skills of NHS Staff and highlights the necessity of supporting other sectors affected by the pandemic, like mental health and primary care, to achieve a comprehensive, system-wide recovery. Further, the plan adds renewed emphasis to improving patients' outcomes and their experience of NHS services. In particular, it focuses on reducing long waits, including waits of over 2 years, for therapeutic procedures and diagnostic tests; delivering the "faster diagnosis standard" for cancer by March 2024; improving both waiting times and patients' experience of waiting for first outpatient appointments over the next three years. Supporting guidance for NHS organisations was published in April 2022 by NHS England, outlining similar ambitions. The core focus is on recovering services, increasing capacity and transforming outpatient care.

As NHS England's focus is still on recovery, in this report we also investigate how NHS outputs, inputs and productivity compared to pre-pandemic levels, i.e. 2019/20.

Between 2021/22 and 2022/23, overall NHS output, when adjusted for quality (survival rate, changes in health status before and after treatment, life expectancy and waiting times), increased by 2.39%. This is a second year of positive output growth, and it is in line with the objectives set out by NHS England. The quality of care, as included in our measure, has also marginally improved. The simple cost-weighted NHS output growth rate before quality adjustment is 2.32%. Our analyses of the contribution of quality indicators to the overall quality-adjusted NHS output growth measure show that this was mainly driven by life expectancy, and to a smaller extent by improvements in waiting times. Adjusting for survival and PROMS had a negative impact on the output growth index for 2021/22 – 2022/23.

After expanding the quality indicators to include avoidable emergency readmissions and hospital acquired infections (HAIs), the NHS output growth increases to 2.42%. These two further quality indicators are included as deadweight-losses (see section 3 for further details on methods). Therefore, the fact that the NHS output growth rate increased even further after we corrected for them is an indication that changes in these measures of quality improved between 2021/22 and 2022/23.

NHS inputs grew by 1.49%, when measured using a mixed (direct and indirect) approach, and by 1.33%, when measured using an entirely indirect approach, between 2021/22 and 2022/23.

This leads to a growth in NHS productivity between 1.05% (mixed approach) and 0.88% (indirect approach). A higher productivity growth rate is yielded when we also include avoidable emergency readmissions and HAIs, respectively equal to 1.08% for the mixed approach and 0.91% for the indirect approach.

Comparing growth in NHS outputs, inputs and productivity with the pre-pandemic year, 2019/20, productivity in 2022/23 remains lower, between -10.16% and -10.73% respectively for the mixed and indirect productivity measures. Although this is a considerable improvement of between 3.14 to 1.72 percentage points respectively compared to 2021/22, a significant gap remains between NHS productivity before the pandemic and in 2022/23.

Taking a longer-term view from 2004/05 to 2022/23, growth in NHS quality adjusted outputs averaged 3.30% per annum, and that for inputs averaged 3.01% per annum for the mixed NHS input measure, resulting in annual NHS productivity growth average of 0.31% per annum.
If we consider the period from 2004/05 to 2018/19, i.e. leaving out all financial years affected by the pandemic (2019/20, 2020/21 and 2021/22), average NHS output growth per annum would be higher at 3.75% per annum. Average NHS input growth would be lower at 2.63% for the mixed measure. The resulting NHS productivity (mixed measure) would be, on average, 1.11% per annum.

Finally, when comparing total factor productivity in the NHS to the broader UK economy, as measured by the Gross Value Added per Hour (labour productivity, LP), we find that NHS productivity has substantially recovered from 2020/21. However, it remains below the productivity levels of the UK economy as a whole (see section 4).

* * *

As well as the headline figures described above, we provide an in-depth analysis of each NHS setting, highlighting where appropriate, the specific challenges faced in constructing the output growth measure. For example, around data quality. The impact of the COVID-19 pandemic is multifaceted and may have differed across parts of the healthcare system. We therefore also consider how NHS outputs and inputs in 2022/23 compared to the pre-pandemic year, 2019/20, in individual NHS healthcare settings and in terms of specific inputs used by the NHS.

Further highlights of this report:

- Avoidable emergency readmissions and hospital acquired infections, Clostridium Difficile (C-Diff) and Methicillin Resistant Staphylococcus Aureus (MRSA) quality indicators are included as part of a wider set of quality indicators. Details can be found in sections 3 and 6.2.6.

- Primary Care: Our measure of primary care output includes COVID-19 vaccinations carried out by GPs and/or PCNs. To account for the shift to remote consultations (telephone and video/online) during the pandemic, we continue to assign the same cost weight to GP face-to-face appointments, telephone and video/online appointments. Results with alternative weights are reported as a sensitivity check (section 6.6.5). Primary care activity is adjusted for the time patients wait to see a healthcare professional. We are still not able to incorporate the Quality and Outcomes Framework quality adjustment due to payment protection of these indicators in 2021/22. However, we include a sensitivity check, which reintroduces the QOF adjustment to understand how it impacts our baseline results (see section 6.6.5).
- The National Cost Collection (NCC) data are still affected by quality issues, albeit at a much smaller scale, previously summarised in Arabadzhyan et al. (2022). We therefore continue to calculate the output growth in settings covered by the NCC dataset by limiting our analysis to NHS Trusts reporting data in both years, therefore ensuring a like-for-like comparison. This year, it was also necessary to make some further *ad-hoc* exclusions across all providers for specific sub-settings or lower levels of aggregation. This correction is applied for both the 2021/22 – 2022/23 and the 2019/20 – 2022/23 links. Full details in section 6.4.

Glossary of acronyms

A&E	Accident & Emergency
AD	Admitted
CCG	Clinical Commissioning Group
CHD	Coronary Heart Disease
CIPS	Continuous Inpatient Spell
CSU	Commissioning Support Unit
DHSC	Department of Health and Social Care
ESR	Electronic Staff Record
EQ-5D	EuroQol five dimensions standardised instrument for measuring generic health status
FCE	Finished Consultant Episode
FOI	Freedom of Information
FTE	Full-time Equivalent
GPPS	GP Patient Survey
HCHS	Hospital and Community Health Services
HES	Hospital Episode Statistics
HRG(4/4+)	Healthcare Resource Group (version 4/4+)
ISHP	Independent Sector Health Care Provider
IAPT	Improving Access to Psychological Therapies
MH	Mental Health
NAD	Not admitted
NCC	National Cost Collection
NHS	National Health Service
ONS	Office for National Statistics
PCA	Prescription Cost Analysis
PCN	Primary Care Network
PCT	Primary Care Trust
PROMs	Patient Reported Outcome Measures
PSSRU	Personal & Social Services Research Unit
QOF	Quality and Outcomes Framework
RDNA	Regular Day and Night Attendance
TAC	Trust Accounts Consolidation

Table of Contents

1. Introduction

This report forms part of the time series of the English National Health Service (NHS) productivity growth calculated at the Centre for Health Economics, University of York. This report focuses on growth from 2021/22 to 2022/23. These two financial years are no longer directly affected by the COVID-19 pandemic, which had previously disrupted the normal provision of healthcare. From 2021/22, all NHS organisations, including primary care providers, were asked to return to a 'business as usual' provision of healthcare services. However, safety protocols and measures were still heightened compared to provision before the pandemic.

In February 2022, NHS England published the 'Delivery plan for tackling the COVID-19 backlog of elective care' which emphasised a focus on maximising NHS capacity to support the delivery of about 30% more elective activity by 2024/25. The plan calls for significant investments in capacity and skills of NHS Staff and highlights the necessity of supporting other sectors affected by the pandemic, like mental health and primary care, to achieve a comprehensive, system-wide recovery. Further, the plan adds renewed emphasis to improving patients' outcomes and their experience of NHS services. In particular, the plan focuses on: waiting times reductions for long waits, including waits of over 2 years, and for diagnostic tests; delivering the "faster diagnosis standard" for cancer by March 2024; improving both waiting times and patients' experience of waiting for first outpatient appointments over the next three years. Supporting guidance for NHS organisations was published in April 2022 by NHS England, outlining similar ambitions. The core focus is on recovering services, increasing capacity and transforming outpatient care.

As NHS England's focus is still on recovery, in this report we investigate how NHS outputs, inputs and productivity compare to pre-pandemic levels, i.e. 2019/20, as well as comparing 2021/22 with 2022/23.

The York NHS outputs, inputs and productivity growth measures follow national and international accounts' recommendations (Eurostat, 2001). These recommend, for public sector services, to measure changes (growth) in either inputs used or outputs produced through the direct approach. That is by using physical units, at as granular a level as possible, weighted by their respective unit costs. If information (data) on physical units are not available, an indirect approach is advised using expenditure data and appropriate deflators.

Our measures of NHS output, input and productivity growth are calculated by means of a Laspeyres volume chain index, where different NHS inputs and outputs are valued in terms of their cost in the first (base) year, in order to identify volume changes in the next year. As our method employs a chain index, the base year changes with each new update. We measure growth in NHS outputs and NHS staff (direct labour measure) using the direct approach. We also use the indirect approach to measure growth in labour (NHS Staff, bank, and agency), materials, and capital using expenditure data. When using expenditure data we need to use appropriate deflators for each type of input in order to disentangle changes due to volumes from those due to prices. Finally, we calculate a mixed NHS input growth measure using the direct NHS labour growth measure, where available, alongside an indirect measure for all other inputs.

For the NHS output growth measure, we also employ available measures of quality, in recognition that the value of outputs may not be entirely reflected by the cost of their provision, especially outside of a competitive market context. Specifically, we use short-term survival rates for both elective and non-elective hospital care, changes in health status, and waiting times for elective hospital care only. We also adjust for waiting time for first outpatient appointments. Finally, activity delivered in the primary care setting is adjusted based on the changes in the time patients wait to see a primary care professional, and historically also on changes in blood pressure monitoring.

This report includes the two new quality indicators - emergency readmissions and hospital acquired infections (HAIs), namely Methicillin Resistant Staphylococcus Aureus (MRSA) and Clostridium Difficile (C-Diff), first introduced in Arabadzhyan et al. (2023). These new quality adjustments are still to be considered experimental, and NHS output and productivity growth measures are reported both with and without them. See section 3 for further details.

Similarly to Arabadzhyan et al. (2023) and Arabadzhyan et al. (2024), test and trace services were not included as an output, as we did not have access to this information. So far as these services were delivered by NHS staff as part of their NHS role, the costs of these services would be included in our measure of NHS inputs, but they are not in our measure of NHS outputs.

The remainder of the report is organised as follows: in section 2, we summarise the methods used in calculating the productivity of the English health care system. In section 3, we present the impact of the new experimental quality indicators on the NHS output and productivity growth measures. Our findings for NHS productivity growth are presented in section 4; we then consider increasingly small constituent parts of this overall result, beginning with NHS outputs and NHS inputs in section 5. Individual items of NHS outputs and inputs are investigated in sections 6 and 7, respectively. Historical results are largely presented as graphs in the main text, with tables of figures limited to the Online Appendix.

In section 9.1 in the Appendix, we include further investigations made into community prescribing. Section 9.2 provides a description of input deflators used in our analysis. In section 9.3, we present the results on NHS output, input and productivity growth for NHS Trusts only. Section 9.4 provides a table with working days and total days for the most recent years, used to adjust NHS output growth measures.

2. Methods

The growth in Total Factor Productivity of the healthcare system, ΔTFP,[1] is measured as the ratio of an output growth index (X) and an input growth index (Z), such that:

$$\Delta TFP = X/Z \quad \text{(E1)}$$

To estimate Total Factor Productivity, it is necessary to correctly define and measure both output and input indices.

2.1. Output growth

Quantification of health care output is a challenge because patients have varied health care requirements and receive very different packages of care. To address this, it is necessary to classify patients into reasonably homogenous output groupings, such as Healthcare Resource Groups (HRGs) or other healthcare categories as reported in the National Cost Collection (formerly National Schedule of Reference Cost) data. Furthermore, to aggregate these diverse outputs into a single index, some means of assessing their relative value is required. Usually, prices are used to assess value, but prices are not available for the vast majority of NHS services, which are provided free at the point of use. In common with the treatment of other non-market sectors of the economy in the national accounts, costs are used to indicate the value of health services. Costs reflect producer rather than consumer valuations of outputs but have the advantage of being readily available Eurostat (2001).

As costs are not expected to fully reflect consumers' valuations, Atkinson suggests supplementing costs with information about the quality of non-market goods and services (Atkinson, 2010, Atkinson, 2005). One way of doing this is by adding a scalar to the output index that captures changes over time in different dimensions of quality. Thus, following Castelli et al. (2007), the output growth index (in its Laspeyres form) can be calculated across two time periods as:

$$X^{cq}_{(0,t)} = \frac{\sum_{j=1}^{J} x_{jt} c_{j0} \left[\frac{v_{j0} q_{jt}}{q_{j0}}\right]}{\sum_{j=1}^{J} x_{j0} c_{j0}} \quad \text{(E2)}$$

We define x_j as the number of patients who have output type j, where $j=1...J$; c_j indicates the cost of output j; q_j represents a unit of quality for output j, and v_j is the value of this unit of quality; and t indicates the time with 0 indicating the first period of the time series. Our measures of quality include inpatient and outpatient waiting times, health improvements, survival rates following hospitalisation, and for primary care the time patients wait to see a primary care professional, and historically also on changes in blood pressure monitoring.

[1] Both X and Z are indices with values around one, for example, 1.05 indicates a 5% increase and 0.98 indicates a 2% decrease. Therefore, the productivity growth calculated using them will also be an index, which can be transformed into a percentage by subtracting 1 and multiplying by 100.

2.2. Input growth

Turning to the input growth index (Z), inputs into the health care system consist of labour, material goods, and capital. Growth in the use of these factors of production can be calculated directly or indirectly (OECD, 2001). A direct measure of input growth can be calculated when data on the volume and price of inputs are available. In its Laspeyres form, the direct input growth index can be calculated as:

$$Z^{D}_{(0,t)} = \frac{\sum_{n=1}^{N} z_{nt}\omega_{n0}}{\sum_{n=1}^{N} z_{n0}\omega_{n0}} \tag{E3}$$

where z_n is the volume of input of type n and ω_{n0} is the price of input type n; and t indicates the time with 0 indicating the first period of the time series.

However, data about the volume of inputs are rarely available. It is, therefore, common practice to calculate input growth using expenditure data. Changes in expenditure are driven by both changes in the volume of resource use and in prices. Hence, to isolate the volume effect, it is necessary to wash out price changes by converting 'current' monetary values into 'constant' expenditure using an appropriate deflator π_{nt}. This deflator reflects the underlying trend in prices for the input in question, such that $\omega_{nt+1} = \pi_{nt}\omega_{nt}$.

If expenditure data and deflators are available, the input growth index can be specified as:

$$Z^{Ind}_{(0,t)} = \frac{\sum_{n=1}^{N} E_{nt}/\pi_{n0}}{\sum_{n=1}^{N} E_{n0}} = \frac{\sum_{n=1}^{N} z_{nt}\omega_{nt}/\pi_{n0}}{\sum_{n=1}^{N} z_{n0}\omega_{n0}} = \frac{\sum_{n=1}^{N} z_{nt}\omega_{n0}}{\sum_{n=1}^{N} z_{n0}\omega_{n0}} = Z^{D}_{(0,t)} \tag{E4}$$

This is equivalent to using volume data, provided that deflators correctly capture the trend in prices for each input.

2.3. Productivity growth

The above equations show output or input growth over two consecutive periods from a base (0) to a current period (t). Usually, there is interest in assessing productivity growth over longer periods. We do this by means of a chained index that involves updating weights in every period, thereby making it possible to account for ongoing changes in the composition of the outputs and inputs being measured (Diewert et al., 2010).

Using the Laspeyres output index as defined in eq. (E2), a chained output index takes the following form:

$$X^{cq}_{(0,T)} = \frac{\sum_{j=1}^{J} x_{jt}c_{j0}\left[\frac{v_{j0}q_{jt}}{q_{j0}}\right]}{\sum_{j=1}^{J} x_{j0}c_{j0}} \times \frac{\sum_{j=1}^{J} x_{jt+1}c_{jt}\left[\frac{v_{jt}q_{jt+1}}{q_{jt}}\right]}{\sum_{j=1}^{J} x_{jt}c_{jt}} \times \cdots \times \frac{\sum_{j=1}^{J} x_{jT}c_{jT-1}\left[\frac{v_{jT}q_{jT}}{q_{jT-1}}\right]}{\sum_{j=1}^{J} x_{jT-1}c_{jT-1}} \tag{E5}$$

This can be simplified to:

$$X^{cq}_{(0,T)} = X^{cq}_{(0,t)} \times X^{cq}_{(t,t+1)} \times \cdots \times X^{cq}_{(T-1,T)} \tag{E6}$$

where each link is represented by eq. (E2) for the relevant two consecutive years. An analogous construction applies to the chained input index.

2.4. Working days adjustment

Our measure of productivity growth captures the growth in outputs over growth in inputs between two financial years. However, financial years do not always have the same number of working days, with this number being affected by the number of public holidays in each financial year (e.g. financial years may include between zero and four Easter public holidays) and the position of weekends during the year. The total number of days will also vary due to leap years.

It is expected that changes in the number of working days in a given year will impact the level of output produced in the NHS and hence impact the productivity of the system. Therefore, we adjust the Laspeyres output growth measure to capture the effect of changes in the number of working and total days between pairs of years. Expressions (E7) and (E8) present the Laspeyres output growth formulae (for the cost-weighted measure) with working days (WD) and total days (TD) adjustment respectively. For example, if the number of working days in year *t=0* is smaller than the number of working days in year *t=1,* then the working days adjustment should indicate both lower output and productivity growth estimates, with respect to the same measures with no working days adjustment. The same logic applies to the total days adjustment.

$$X_{(0,t)}^{wd} = \frac{\sum_{j=1}^{J} \frac{x_{jt} c_{j0}}{\frac{wd_t}{wd_0}}}{\sum_{j=1}^{J} x_{j0} c_{j0}} \quad \text{(E7)}$$

$$X_{(0,t)}^{td} = \frac{\sum_{j=1}^{J} \frac{x_{jt} c_{j0}}{\frac{td_t}{td_0}}}{\sum_{j=1}^{J} x_{j0} c_{j0}} \quad \text{(E8)}$$

Whilst the productivity of all NHS care settings will be affected by the total number of days in a given year, we conjecture that not all the settings will be affected by the total number of working days. Some settings, such as A&E services or non-elective inpatient care, should not be affected by variation in weekends and public holidays, as it is expected that these operate on a 24/7 basis. Finally, the great majority of NHS inputs, for example, salaried staff and capital costs, are not affected by the number of working days. Therefore, no adjustment is applied to them. Some materials, e.g. bandages, may be affected. However, their contribution to overall NHS input growth is small, and the effect of not adjusting these inputs for the number of working days is negligible.

Table 1 contains the list of NHS settings, as developed for our NHS output growth measure, and indicates whether the working days or total days adjustment is applied. It is important to note that adjusting for working days, by definition, recognises a change in total days.[2]

[2] A table reporting working and total days for the financial years 2018/19 onwards is presented in section 9.4 in the Appendix.

Table 1: NHS settings and their working days/total days adjustment

Setting	WD Adjustment	TD Adjustment
Inpatient Elective and Day-cases	x	
Inpatient Non-elective		x
Outpatient	x	
Primary care	x	
Community Prescribing		x
Community Mental Health		x
Community care	x	
A&E		x
Chemo- /Radiotherapy/High Cost Drugs	x	
Specialist Services	x	
Ophthalmology & Dentistry	x	
Radiology	x	
Diagnostic Tests	x	
Rehabilitation	x	
Renal Dialysis		x
Other	x	

2.5. Alternative approaches to deal with missing NHS Trusts in the National Cost Collection data

The measurement of NHS output in 2019/20 was affected by data quality issues and missing data in the National Cost Collection (NCC) data series (previously known as the National Reference Costs data), which led to non-comparability with previous years of data. The NCC data are still affected, albeit to a lesser extent, by quality issues, previously summarised in Arabadzhyan et al. (2022). We refer to Arabadzhyan et al. (2022) for in-depth details of the four approaches developed to deal with missing Trusts data. Here it suffices to say that all approaches made use of the organisational (Trust) level NCC data. However, these data had their own issues because of missing activity (and therefore, unit cost) information, as small numbers (any activity information smaller than eight units) are suppressed by NHS England.

Our preferred approach (approach 3 in Arabadzhyan et al. (2022)) is (methodologically) the closest to our traditional measure. That is to directly measure growth in NHS outputs, and it also requires only a minimum set of additional assumptions. Its only shortcoming is that we need to impute missing values for some output categories. Further, our preferred approach makes maximum use of comparable, and high-quality data from Trusts with published NCC data, having met the rigorous data quality standard set by NHS England and NHS Improvement. In fact, NHS Trusts submitting data of insufficient quality do not have their data published in the National Cost Collection data. Limiting our analysis to Trusts reporting data in both years also means we have a like-for-like comparison, which is not the case if Trusts reporting data in only one year are included. For the growth rate estimates to be applicable to the NHS as a whole, we assume that observed data are representative of the NHS as a whole.

In this report, we continue to calculate the output growth in settings covered by the NCC dataset by limiting our analysis to NHS Trusts reporting data in both years, therefore ensuring a like-for-like comparison. This correction is applied for both the 2021/22 – 2022/23 and the 2019/20 – 2022/23 links.

3. Experimental quality adjustment for hospital inpatient activity

The English National Health Service (NHS) is under perpetual pressure to minimise cost and thus improve levels of productivity (outputs/inputs). This may create a race to the bottom in terms of costly quality (Chalkley and Malcomson, 1998), thereby negatively affecting patients.

Although national plans such as the NHS Five Year Forward View, the Next Steps on the NHS Five Year Forward View[3] and the NHS Long Term Plan[4] prioritise investing in the quality of care and closing quality gaps, unwarranted variation may still exist across England. Initiatives such as the Right Care Programme[5] and Getting it Right the First Time[6] aim to improve outcomes, but measuring quality remains complex, particularly as NHS services lack market prices.

Current practice in accounting for the quality of healthcare services makes use of routinely available information in order to capture the Quality Adjusted Life Years (QALYs) associated with treating patients, by combining information on survival rates, life expectancy and a measure of change in health status before and after treatment. The process of care delivery is also captured by measures of treatment waiting times. This approach may overlook other important characteristics of the quality of healthcare.

To address this, Bojke et al. (2018) proposed a refined framework to incorporate broader quality characteristics into NHS output measures. After reviewing indicators from the NHS Outcomes Framework indicators and NHS Safety Thermometer,[7] they identified 17 potential quality adjusters, focusing particularly on emergency readmissions and two hospital-acquired infections—C-Diff and MRSA—as negative outcomes with significant cost and patient impact. Both types of events lead to additional treatment, which the current productivity measure evaluates as additional output, but which de facto do not yield additional benefits to patient care. Our work refines the present NHS output and productivity measure by explicitly recognising activity induced by emergency readmissions and C-Diff and MRSA, which does not represent additional value from the perspective of the patient. For further detail on the methodology see Arabadzhyan et al. (2023) and Arabadzhyan et al. (2024).

3.1. Impact of incorporating new quality indicators on NHS output and productivity growth measures

In this section we present a summary of the volume and costs associated with these two quality indicators – emergency readmissions and hospital acquired MRSA and C-Difficile (C-Diff) infections, and the impact of including them in the NHS output and productivity growth measure.

[3] NHS Five Year Forward View (last accessed 11/04/2025).
[4] NHS Long Term Plan (last accessed 11/04/2025).
[5] Right Care Programme (last accessed 11/04/2025).
[6] Getting it Right the First Time (last accessed 11/04/2025).
[7] NHS Safety Thermometers have been discontinued in 2019.

3.1.1. Emergency readmissions

Table 2 presents the volume and unit cost of avoidable emergency readmissions between 2019/20 and 2022/23. In our previous report, we discussed and presented results for a range of definitions of avoidable emergency readmissions. For this report we present our preferred, blended, method alone. This definition incorporates characteristics of the potentially avoidable readmission presented in Blunt et al. (2015) and the definition most often used in readmission figures published by the NHS.[8] The volume of avoidable emergency readmissions decreased by around 3.50% between 2021/22 and 2022/23, while the unit cost of readmissions increased by around 6.33%. Interestingly, the volume of avoidable emergency readmissions has not reached the level observed in 2019/20, a potential indication of increased quality of hospital care provided during a patient's initial (index) admission.

Table 2: Volume and unit cost of avoidable emergency readmissions

Year	Volume	Average cost (£)
2019/20	323,294	2,031
2019/20*, §	319,184	2,044
2020/21	249,199	2,889
2020/21*	252,637	2,957
2021/22	295,401	2,533
2021/22§	289,855	2,536
2022/23§	279,753	2,697

* Figures updated with corrected sorting of FCEs within CIPS. § Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

[8] See Indicator specification for more detail (last accessed 11/04/2025).

3.1.2. Hospital Acquired Infections: MRSA and C-Diff

Table 3 presents volumes and unit costs of the hospital acquired infections MRSA and C-Diff. Cases of MRSA have remained low and relatively stable over the years presented (2019/20-2022/23). However, their unit cost is substantial relative to the average for inpatient care.

Table 3: Volume and unit cost of hospital acquired infections

Year	MRSA		C-Difficile	
	Volume	Average cost (£)	Volume	Average cost (£)
2019/20	260	4,000	4,712	1,531
2019/20*, §	260	3,994	4,712	1,535
2020/21	279	5,760	4,251	2,109
2020/21*	279	5,760	4,251	2,104
2021/22	233	4,632	5,355	1,865
2021/22§	233	4,681	5,356	1,860
2022/23§	295	5,326	6,485	2,076

* Figures updated with corrected sorting of FCEs within CIPS.
§ Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

The high unit cost of MRSA cases arises partially from patients staying an average of 13 additional days in hospital if they contract this infection, based on external literature (see Arabadzhyan et al. (2023)). The volume of C-Diff infections rose sharply between 2021/22 and 2022/23 (by around 21.10%). After the fall in the unit cost of C-Diff recorded in 2021/22, in 2022/23 this increased by around 11.61% compared to the previous year. The unit cost of C-Diff from additional days in hospital is more similar to the unit cost for inpatient care overall. However, the total costs of C-Diff infections are over five times larger than that of MRSA due to the higher volumes of C-Diff cases.

3.1.3. Impact on NHS output and productivity growth

In comparing 2022/23 with 2021/22, including avoidable emergency readmissions as a quality adjustment increased the NHS inpatient output growth to 6.05%. This indicates that both the volume and the overall value (deadweight loss) of avoidable emergency readmissions decreased between these two years. The impact of hospital acquired infections is negative but too small to be observed at three decimal points of a percentage point of growth. This is due to the small overall total cost of the two HAIs considered, despite substantive volatility in volumes and unit costs observed. The impact of including avoidable emergency readmissions and HAIs on NHS productivity is small but positive, leading to an increase of 0.034%.

In comparing 2022/23 with 2019/20, including avoidable emergency readmissions and hospital acquired infections as quality adjustment leads to a very small decrease in inpatient growth detectable at the fifth decimal point. The observed difference is entirely driven by changes in emergency readmissions. The impact of including avoidable emergency readmissions and HAIs on NHS productivity is in this instance negative and very small, detectable only at the third decimal point.

4. NHS Productivity growth

Overall NHS productivity growth between 2021/22 and 2022/23 was 1.05% when using the mixed measure and 0.88% using the indirect measure. Our preferred measure for the 2022/23 NHS productivity update uses the mixed measure.

In Table 4 we present productivity growth measures, both mixed and indirect, for the financial years 2020/21 – 2021/22, and 2021/22 – 2022/23. We also include measures of productivity recovery from the pre-pandemic year 2019/20.

To calculate a measure of productivity recovery, NHS outputs and NHS inputs growth measures between 2019/20 and 2022/23 are calculated by comparing NHS outputs produced and NHS inputs used in 2019/20 with the respective NHS outputs produced and inputs used in 2022/23, for each NHS care setting, and each type of NHS input. An alternative would be to use a chain-link method, but this relies on the assumption that the basket of goods (outputs and inputs) is similar across years, which we know not to be the case.[9]

All the growth measures are adjusted for the number of working and total days in all financial years. Productivity growth figures for previous years, beginning with growth from 2004/05 to 2005/06, can be found in the Online Appendix.

After the stark negative 2019/20 – 2020/21 productivity growth due to the COVID-19 pandemic, the NHS has been on a trajectory of recovery as elective and face-to-face activity were gradually re-introduced in 2021/22. The substantial increase in productivity, in both the mixed and indirect measures, recorded in 2021/22, was not continued in 2022/23. This is not surprising as the big increases recorded between 2020/21 and 2021/22 can be ascribed to the fact that all elective activity was cancelled in the NHS for the greater part of 2020/21, whilst in 2021/22 the NHS hospitals had a return to more normal working conditions. Nonetheless, we find that NHS output has continued to grow in 2022/23, as has NHS input (see section 5).

Table 4: NHS Productivity Growth[10]

Years	Mixed	Indirect
2019-20 – 2020/21	-22.95%	-24.02%
2020/21 – 2021/22	14.14%	15.18%
2021/22 – 2022/23	1.05%	0.88%

Recovery

Years	Mixed	Indirect
2019/20 – 2021/22	-13.30%	-12.45%
2019/20 – 2022/23*	-10.16%	-10.73%

* Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders

[9] The chain-link method produces similar results: NHS productivity calculated with the mixed approach is -12.06% and -11.14%, respectively for 2019/20 – 2021/22 and 2019/20 – 2022/23. NHS productivity calculated with the indirect approach is -12.49% and -11.72%, respectively for 2019/20 – 2021/22 and 2019/20 – 2022/23.

[10] Working and total days adjusted figures.

When comparing the pre-pandemic financial year, 2019/20, with 2022/23, the resulting productivity growth rates amount to -10.16% and -10.73% when mixed and indirect input growth measures are used respectively.

The details of changes in both NHS outputs and inputs are shown in Figure 1.

Figure 1: NHS Output and Input changes (growth rates) 2004/05-2005/06 to 2019/20-2022/23[11]

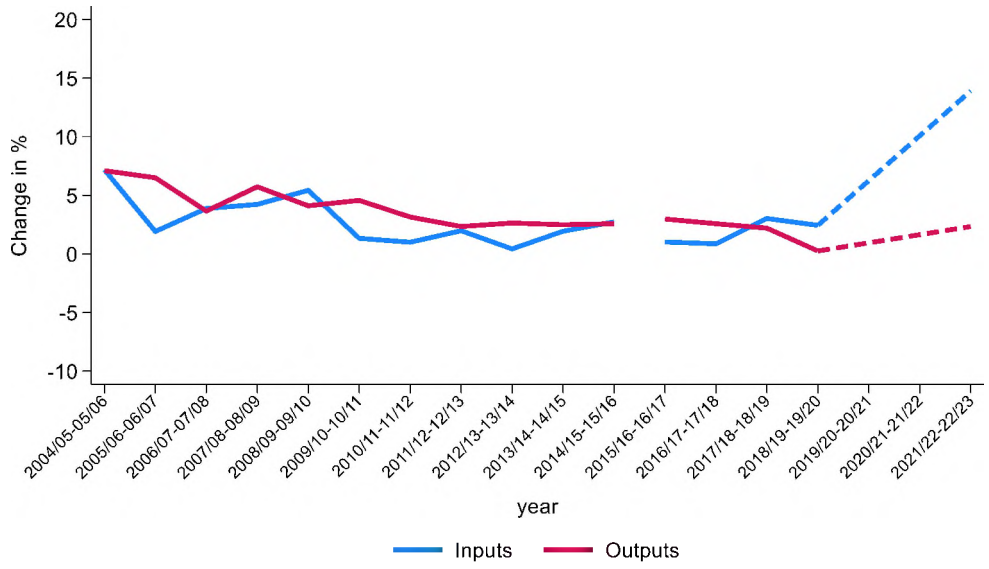
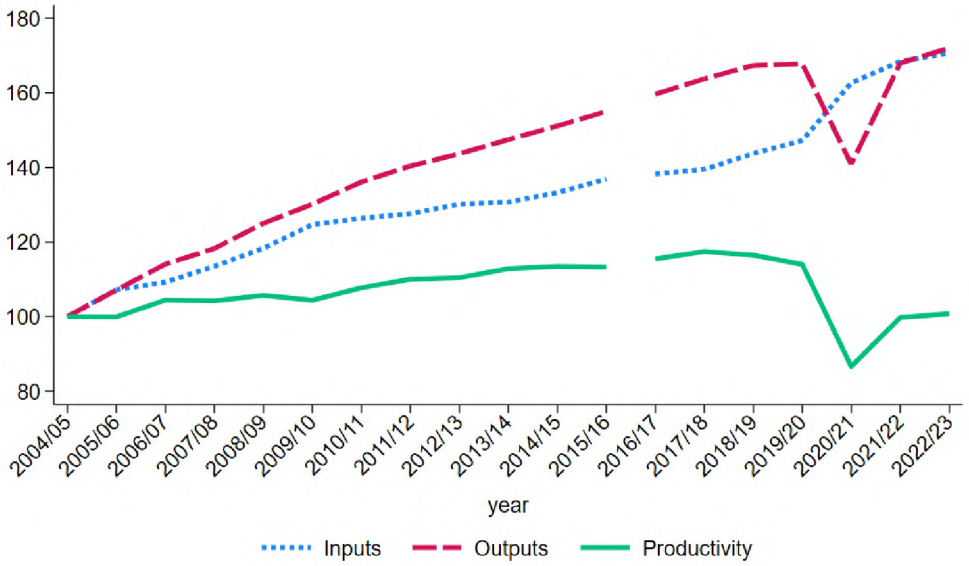


Figure 2 presents the cumulative NHS outputs, inputs, and productivity indices over time, using 2004/05 as the base index year. It is evident from the figure that the large decrease in productivity during the pandemic was due to both a massive drop in output growth and a concurrent substantial positive input growth. The NHS has since shown improvements in both output and productivity growth, whilst growth in inputs continues to slow down. Between 2021/22 and 2022/23, output growth appears to have reached and surpassed pre-pandemic growth; however, inputs have continued to grow beyond pre-pandemic levels. As a result, productivity growth is still below the 2019/20 levels.

[11] The mixed input growth is used as the baseline and depicted in this graph. The 2019/20-20/21 and 2020/21-21/22 growth rates are omitted, and the 2019/20-21/22 growth rates are presented instead (dashed lines). The interruption of the series reflects re-calculation of the figures due to a coding error corrected (first noted in Arabadzhyan et al., 2021).

Figure 2: Cumulative NHS Output, Input and Productivity Indices (2004/05 = 100)[12]

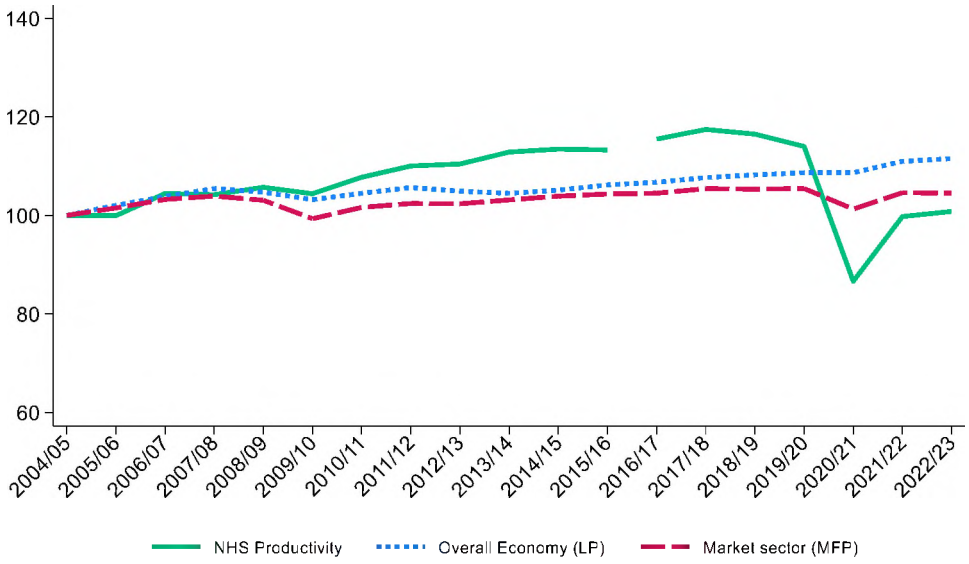


Finally, we compare the productivity growth of the NHS to the growth of the UK economy as a whole. Productivity growth in the wider economy can be measured both using the Gross Value Added per Hour (LP) measure, a measure of Labour Productivity of the whole economy, and the Multi-Factor Productivity (MFP) series, both produced by the Office of National Statistics (ONS). The latter is a measure of productivity comprising all inputs (labour, capital, and materials), but is limited to the market sector. Both measures are important productivity statistics, and while the methodology differs across sectors, the overall objectives are the same as our NHS specific measure.[13,14,15]

Figure 3 presents the Overall Economy (LP) and the market sector Multi-Factor Productivity indices dynamics along with the NHS productivity index. Unsurprisingly, the healthcare sector was deeply affected by the pandemic, hence the substantial reduction in productivity observed since 2020/21. Neither the Overall Economy LP nor the MFP measure has changed significantly since 2020/21.

[12] Up to 2018/19-2019/20 the mixed input index is used as the baseline and depicted in this graph, whilst the indirect input index is used for 2019/20-2020/21 link. The interruption of the series reflects re-calculation of the figures due to a coding error corrected (first noted in Arabadzhyan et al., 2021).
[13] See ONS note on GVA and GDP (last accessed 11/04/2025).
[14] See ONS labour productivity data (last accessed 11/04/2025).
[15] See ONS multifactor productivity estimates (last accessed 11/04/2025).

Figure 3: Cumulative NHS productivity, Overall Economy (LP) and Multi-Factor Productivity (MFP) indices



In the post-pandemic period, all measures except for MFP have shown a rising trend. The LP index surpassed its pre-pandemic level. NHS productivity, while still substantively lower than its pre-pandemic level, shows a significant growth, indicating the system is on the path of recovery.

5. Overall NHS output and NHS input growth

5.1. Output growth

Output growth is measured by combining activities of different types into a single index, using costs to reflect their values. We report in Table 5, the cost-weighted and quality-adjusted output growth measures, both also adjusted for the number of total and working days. The quality adjusted output growth rate includes changes in survival, in health outcomes following hospital treatment, life expectancy, and waiting times.

Between 2021/22 and 2022/23, the cost-weighted and cost and quality adjusted NHS output growth rates amount to 2.32% and 2.39% respectively (see Table 5). This is a second year of positive post-pandemic output growth.

If we expand the quality indicators to include avoidable emergency readmissions and hospital acquired infections, the NHS output growth increases to 2.42%. These two further quality indicators are included as deadweight-losses (see section 3 for further details on methods). Therefore, the fact that the NHS output growth rate increased even further after we corrected for them is an indication that changes in these measures of quality improved between 2021/22 and 2022/23. This overall improvement is entirely due, however, to avoidable emergency readmissions, which decreased in 2022/23. Further details are provided in section 6.2.6.

When comparing 2022/23 with the pre-pandemic 2019/20, the resulting output growth rates were 1.89% (cost-weighted) and 2.34% when adjusted for quality, respectively.

Quality adjusting NHS output had a positive albeit small impact on the overall NHS output growth. Our analyses of the contribution of quality indicators to the overall quality-adjusted NHS output growth measure show that this was mainly driven by life expectancy, and to a smaller extent by improvements in waiting times, while adjusting for survival and PROMS had a negative impact on the output growth index for 2021/22 – 2022/23. When comparing 2019/20 with 2022/23, the main positive drivers of quality adjustment were life expectancy and survival, while other quality adjustments negatively impact the NHS output growth measure.

Table 5: NHS output growth

Years	Cost-weighted growth (CW)	Quality-adjusted CW growth
2020/21 – 2021/22	19.45%	19.26%
2021/22 – 2022/23	2.32%	2.39%

Recovery		
Years	**Cost-weighted growth (CW)**	**Quality-adjusted CW growth**
2019/20 – 2021/22	-1.45%	-1.53%
2019/20 – 2022/23	1.89%	2.34%

* Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders

5.1.1. Contribution by settings

Different settings contribute differently to the output growth index. Figure 4 shows the share of overall spend for each of the settings as well as their contribution to growth, calculated as a share of overall spend multiplied by the output growth of the setting, using growth rates obtained when estimating missing Trust activity for 2022/23.

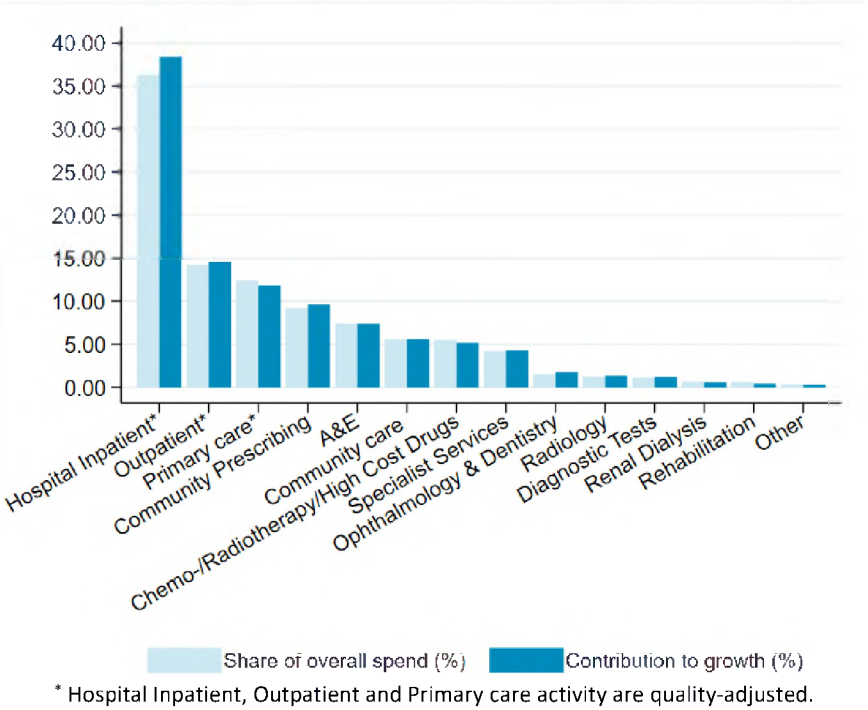
Table 6 and Table 7 include more information on the contribution to overall NHS output growth by setting, for 2021/22 – 2022/23 and 2019/20 – 2022/23 respectively.[16] Similarly to our previous two updates, the growth rates for the NHS settings covered by the National Cost Collection data, were obtained following our preferred approach in accounting for missing Trust activity (see section 2.5 of this report or Arabadzhyan et al. (2022) for the full details). The output growth rates for the Hospital Inpatient, Outpatient, Primary Care, Community Prescribing, and Ophthalmology & Dentistry settings are not affected by missing NHS Trusts activity data. Not correcting for missing Trust NCC data may result, on average, in the uncorrected growth rates being biased.

Overall, the largest contributor to the output index was Hospital Inpatient activity, with a share of about 38.39% of overall output growth (36% of total spend) in 2022/23 and 35.85%

[16] Community mental health setting has been excluded from our analysis (see section 6.4.2 for further detail).

(36.31% of total spend) for the 2019/20 – 2022/23 link. In 2022/23, other sizable contributors (in order of overall contribution to output growth) were Outpatient, Primary Care and Community Prescribing. All other settings each contributed less than 8% to the total value of output growth. For the 2019/20 – 2022/23 link, the picture is very similar, except that Primary Care makes a larger contribution than Outpatient care.

Figure 4: Contribution to output growth by setting, 2022/23



* Hospital Inpatient, Outpatient and Primary care activity are quality-adjusted.

A detailed breakdown of output growth for each NHS setting is presented in section 6.

Table 6: Contribution to overall NHS output growth by NHS setting, 2022/23

Setting	Growth	Setting specific growth index	Value of Activity (21/22 prices)	Share of overall spend	Contribution to overall growth rate**
Hospital Inpatient*	5.85%	105.85%	38,038,328,470	36.26%	38.38%
Outpatient*	2.51%	102.51%	14,859,930,000	14.16%	14.52%
Primary care*	-4.84%	95.16%	12,983,641,211	12.37%	11.78%
Community Prescribing	5.57%	105.57%	9,657,053,184	9.20%	9.72%
A&E	-0.49%	99.51%	7,742,941,760	7.38%	7.34%
Community care	0.74%	100.74%	5,814,850,335	5.54%	5.58%
Chemo-/Radiotherapy/High Cost Drugs	-5.08%	94.92%	5,724,938,960	5.46%	5.18%
Specialist Services	2.00%	102.00%	4,391,017,866	4.19%	4.27%
Ophthalmology & Dentistry	17.66%	117.66%	1,567,477,480	1.49%	1.76%
Radiology	7.84%	107.84%	1,307,446,029	1.25%	1.34%
Diagnostic Tests	9.84%	109.84%	1,151,770,416	1.10%	1.21%
Renal Dialysis	-11.23%	88.77%	684,139,422	0.65%	0.58%
Rehabilitation	-27.54%	72.46%	631,829,524	0.60%	0.44%
Other	12.56%	87.44%	38,038,328,470	0.35%	0.30%
Total/NHS output growth rate			**104,918,333,128**		**2.39%**

* Hospital Inpatient, Outpatient and Primary care activity are quality-adjusted.

** The contribution of each setting to growth in 2022/23 is expressed as a percentage of the total output in 2021/22. Where numbers in this column are lower than numbers in the preceding column, this represents negative growth in outputs for that setting.

Table 7: Contribution to overall NHS output growth by NHS setting, 2019/20-2022/23

Setting	Growth	Setting specific growth index	Value of Activity (19/20 prices)	Share of overall spend	Contribution to overall growth rate**
Hospital Inpatient*	1.27%	101.27%	33,622,316,580	35.85%	36.31%
Primary care*	11.81%	111.81%	12,352,090,000	13.17%	12.91%
Outpatient*	-1.97%	98.03%	12,983,641,211	13.85%	15.48%
Community Prescribing	12.20%	112.20%	9,019,679,744	9.62%	10.79%
A&E	-4.99%	95.01%	5,816,515,053	6.20%	5.89%
Chemo-/Radiotherapy/High Cost Drugs	14.80%	114.80%	4,649,665,792	4.96%	5.69%
Community care	-2.88%	97.12%	5,814,827,520	6.20%	6.02%
Specialist Services	-1.75%	98.25%	3,543,659,896	3.78%	3.71%
Ophthalmology & Dentistry	-11.07%	88.93%	1,993,128,218	2.13%	1.89%
Diagnostic Tests	15.78%	115.78%	1,060,746,905	1.13%	1.31%
Radiology	-7.11%	92.89%	1,039,175,433	1.11%	1.03%
Renal Dialysis	-6.17%	93.83%	612,417,454	0.65%	0.61%
Rehabilitation	-58.50%	41.50%	906,494,088	0.97%	0.40%
Other	-27.93%	72.07%	359,504,636	0.38%	0.28%
Total/NHS output growth rate			**93,773,862,531**		**2.34%**

* Hospital Inpatient, Outpatient and Primary care activity are quality-adjusted.

** The contribution of each setting to growth in 2022/23 is expressed as a percentage of the total output in 2019/20. Where numbers in this column are lower than numbers in the preceding column, this represents negative growth in outputs for that setting.

5.2. Input growth

Table 8 presents the growth in inputs for the last two links, 2020/21 – 2021/22 and 2021/22 – 2022/23, as well as for the 2019/20 – 2021/22 and the 2019/20 – 2022/23 links, using the mixed and indirect methods.

The indirect method uses expenditure data for all types of inputs, derived from Hospital Trusts' and other NHS organisations' financial accounts. The mixed method uses Electronic Staff Record (ESR) data to calculate growth in NHS labour inputs and combines this information with expenditure data from published accounts for the remaining inputs used in the production of healthcare goods and services.

Table 8: Indirect and Mixed NHS input growth

Years	All NHS	
	Mixed	**Indirect**
2020/21 – 2021/22	4.49%	3.55%
2021/22 – 2022/23	1.33%	1.49%

Recovery

Years	All NHS	
	Mixed	**Indirect**
2019/20 – 2021/22	13.58%	12.48%
2019/20 – 2022/23	13.91%	14.63%

The difference between the mixed and indirect input indices is due to the data sources used to measure NHS Staff inputs, and so growth rates in NHS labour inputs differ. Considering the change between 2021/22 and 2022/23, ESR data (direct method) suggest that NHS staff increased by 3.33%, whilst the equivalent growth rate calculated using expenditure data (indirect method) is 3.70%.

In past NHS productivity updates, Arabadzhyan et al. (2023) and Arabadzhyan et al. (2024), we reported that the direct labour measure might have been affected by delays in updating the staff and pay-roll system of NHS Trusts, during the height of the COVID-19 pandemic. We therefore used the indirect NHS input growth measure as our preferred measure to calculate NHS productivity growth between 2019/20 and 2020/21 and between 2020/21 and 2021/22, i.e. the two NHS productivity updates directly affected by this data recording issue.

The above issue does not affect the staff and pay-roll system of NHS Trusts in 2021/22 and 2022/23. We therefore revert back to using the mixed NHS input growth measure as our preferred measure to calculate NHS productivity growth between 2021/22 and 2022/23.

Finally, when comparing 2019/20 to 2022/23, we note that NHS inputs are still growing compared to 2019/20, which is in line with expectations as NHS England has injected further resources to support the elective recovery programme.

In terms of the major contributors to overall input growth, these were, in order, labour, materials and primary care.

6. Growth in output categories

6.1. Measuring output

Our NHS output index is designed to capture all activities provided to NHS patients, whether by NHS or private sector organisations.[17] Table 9 summarises the data sources used to measure activity, quality and costs. It should be noted that we have two alternative sources of volume of activity for outpatient output: the Hospital Episode Statistics (HES) outpatient dataset, and the National Costs Collection (NCC) database. In this report, we compare outpatient activity derived from both datasets, but use the HES outpatient figures in our NHS output growth measure. Summaries for each output type and any data issues are detailed in sections 6.2 to 6.7.

6.2. Hospital physical and mental health inpatient

- **Overall cost-weighted and working days adjusted Laspeyres output growth for hospital inpatient activity was 5.19% between 2021/22 and 2022/23.**
- **Measures of quality improved over this period, leading to a growth rate of 5.85% after quality-adjustment.**

Day-case, elective and non-elective hospital inpatient care is calculated from the HES Admitted Patient Care (APC) dataset. Information in this dataset is recorded at the Finished Consultant Episode (FCE) level. An FCE represents a period of treatment under the same hospital consultant. The dataset includes both physical and mental health inpatient care.[18] In 2022/23, just under 20 million inpatient FCEs were recorded, an increase of 3% compared to 2021/22. This is similar to the increase reported by NHS England.[19]

Table 10 presents activity in terms of FCEs across different provider types. Note that we exclude from our analysis Frimley Health NHS Foundation Trust (RDU) due to technical issues that prevented it from submitting data for most of the months of the financial year 2022/23.[20] Additionally, data on regular day and night attenders (RDNA) was not provided in the HES Admitted Patient Care (APC) dataset for the year 2022/23 received from NHS England. As these admissions were included in the respective elective and day-case and emergency activity in the year 2021/22, we exclude them from our study sample to avoid double counting. This activity is in any case already captured through the NCC data (see section 6.4.2).

In 2022/23, NHS Trusts covered 96% of total FCEs hospital inpatient activity provided in the NHS with a decrease in coverage by one percentage point compared to 2021/22. The number of FCEs delivered by private providers in 2022/23 increased by around 21% from 2021/22, whilst the number of FCEs delivered by Other providers remained a very small proportion of

[17] NHS activity provided by non-NHS providers was included in the output growth series up to 2010/11. Hospital inpatient (elective and non-elective) and outpatient activity paid for by NHS Trusts and provided by non-NHS providers is still included in our measure of NHS output.

[18] Consistently with previous publications of this series, we continue to exclude patients categorised to HRGs which are not included in the National Cost Collection ('Zero Cost HRGs').

[19] See "Hospital Admitted Patient Care Activity, 2022-23" publication (last accessed 26/03/2025).

[20] For more information see "Hospital Activity publications supporting information, NHS England Digital" (last accessed 26/03/2025).

the total, at less than 0.5% in 2022/23. However, the increasing trend of FCEs provided by Other providers continued in 2022/23, with an increase of just under 175% compared to 2021/22. Details of a longer time trend can be found in the Online Appendix.

Table 9: Summary of NHS output data sources

Output type	Activity source	Cost source	Quality
Elective	HES	NCC	In-hospital survival; health outcomes & waiting times
Non-elective	HES	NCC	In-hospital survival & health outcomes
Outpatient	HES (or NCC)	NCC	Waiting times
Mental health	HES & NCC	NCC*	In-hospital survival; health outcomes & waiting times
Community care	NCC	NCC	N/A
A&E	NCC	NCC	N/A
Other**	NCC	NCC	N/A
Primary care	QResearch (up to 2008/09); General Lifestyle Survey (2008/09-09/10); GP patient survey (from 2009/10) NHS Digital Appointments in General Practice data (from Nov 2017)	PSSRU Unit Costs of Health and Social Care + other sources	QOF data (up to 2018/19; 2019/20 had a change in the way indicators were recorded; no QOF data collected in 2020/21) Waiting times
Prescribing	Until 2017/18, Prescription cost analysis system (PCA) From 2018/19, NHS Business Service Authority (BSA)	PCA system & BSA	N/A
Ophthalmic & de services	NHS England	NHS England	N/A

* Unit costs for Mental Health taken from the NCC but uprated using the NHS Cost Inflation Index. This is due to changes in past NCC cost collection guidance which has resulted in increases in unit costs of Mental Health care activity, which we have not been able to reconcile. **Chemo-/Radiotherapy & High Cost Drugs and Devices, Diagnostic Tests, Radiology, Rehabilitation, Renal Dialysis, Specialist Services, 'Other' NHS activity.

Table 10: Organisational coverage of HES activity, FCEs

Year	NHS Trusts	Private providers	Other*	Total
2019/20	21,736,268	633,558	404	22,370,228
2019/20**	19,968,018	633,558	404	20,601,980
2020/21***	16,993,469	359,880	3,518	17,356,867
2021/22	20,309,952	584,590	32,801	20,927,343
2021/22**	18,721,096	581,548	32,801	19,335,444
2022/23**	19,125,360	704,289	90,100	19,919,748

* Some new providers in 2022/23 are reclassified from 'Other' to 'Private providers'. ** Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders. *** Correction made to counts in 2020/21. 'Other' category previously reported as 2,715 as 803 observations contributed to total observations but were not attributed to any specific category.

6.2.1. Methodology

The differing types of NHS activity performed in an inpatient setting are identified through HRGs. Output within a HRG is the count of Continuous Inpatient Spells (CIPS) allocated to that HRG. A CIPS can contain multiple FCEs. This occurs if a patient is transferred to the care of a different hospital consultant within the same Trust or a different Trust as part of their care. We construct CIPS following our own algorithm, which is similar to the official algorithm published by NHS England.[21, 22]

The cost of each CIPS is the highest cost reported for an individual FCE within the CIPS (Bojke et al., 2017). Costs are reported in the National Cost Collection (NCC) dataset. The NCC dataset reports a separate unit cost for day-case, elective care, and non-elective care activity for each HRG. As we use unit costs as a proxy for the relative health value of different activities, we acknowledge the significance of appropriate day-case care by assigning it equal value as elective care (Bojke et al., 2016).[23] Having assigned a cost to each CIPS, we then calculate the national average cost per CIPS in each HRG.

It can be that some HRGs do not have associated costs in consecutive years, due to new HRGs being introduced (old HRGs being retired). This can also arise if there was no activity in a given HRG for a specific year. Additionally, the unit costs for some HRGs have a negative cost. In such cases we deflate (inflate) costs from the year where a cost observed, using the imputation method as described in Castelli et al. (2011).

6.2.2. Physical elective, day-case, and non-elective activity

- **Cost-weighted and working days adjusted Laspeyres output growth for elective and day-case physical care was 9.44% between 2021/22 and 2022/23. Non-elective physical care Laspeyres output growth was 0.53% over the same period, leading to overall NHS cost-weighted and working days adjusted activity output growth of 5.28%.**

[21] NHS Digital CIPS and Spells methodology (last accessed 27/03/2025).
[22] A note detailing the differences between the CHE and the NHS Digital algorithms to construct CIPS is available as supplementary material published alongside the NHS productivity update for 2018/19 (Arabadzhyan et al., 2021).
[23] This equal weighting ensures that the output index is not biased downwards if delivery of treatment moves from overnight to day-case settings over time.

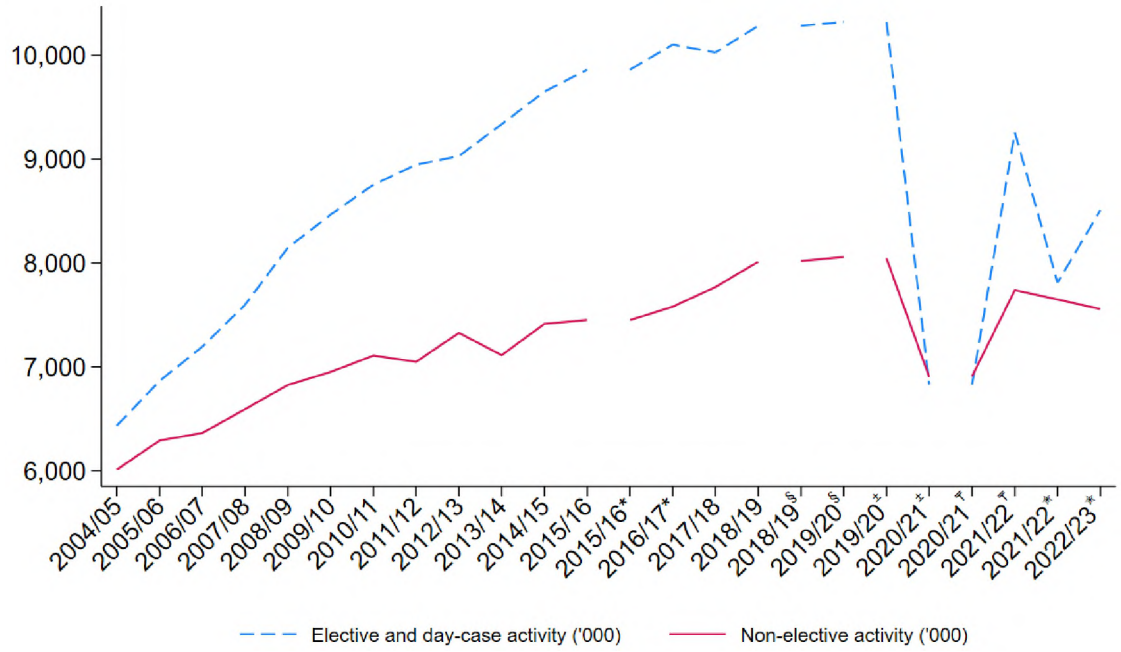
- **Measures of quality indicated an increase of nearly 1 percentage point between 2021/22 and 2022/23 for elective and day-case care in physical health, resulting in growth of 10.30%. For non-elective physical care activity the effect of adding quality indicators was positive, but this increase was smaller and less than 0.5 of a percentage point, leading to 0.97%. The quality adjusted Laspeyres output growth for physical health care overall was equal to 5.95%.**

Between 2021/22 and 2022/23, the combined volume of day-case, elective and non-elective physical healthcare rose by around 3.9%. This increase was concentrated within elective and day-case care (just under 9%) while the volume of emergency activity decreased by 1.2%. However, levels of activity in 2022/23 were still lower than those seen shortly before the COVID-19 pandemic. Figure 5 highlights this point, showing activity from 2004/05. Against a background of gradually increasing activity from 2004/05 to 2019/20, the volume of elective and day-case activity in 2022/23 was similar to that in 2009/10 and 2010/11. Activity in non-elective care in 2022/23 was similar to that of 2016/17. However, it should be noted that this count does not recognise any changes in the value of patient care through case-mix complexity or the quality of care.

Activity information is also presented in Table 11 along with mean unit costs. It can be seen from this table that the mean cost of elective and non-elective care increased between 2021/22 and 2022/23: from £2,584 to £2,765 (equivalent to a 7.04% increase) for elective care and from £2,307 to £2,523 (equivalent to a 9.38% increase) for non-elective care. Unit costs in 2022/23 were well above those observed in 2019/20, especially for emergency health care activity. Part of the increase in unit costs between 2021/22 and 2022/23 is expected to be related to increased activity in more complex care, especially for the non-elective physical health care activity. The residual difference in costs may in part reflect higher inflation rates. In fact, mean Consumer Price Inflation including housing costs (CPIH) from 2021/22 with 2022/23 was 6.8% (ONS 2023).[24]

[24] See CPIH annual rate (last accessed 28/03/2025).

Figure 5: Changes in elective and day-case and non-elective activity



Notes: * The HES variable 'admission method' underwent changes in the coding; thus from 2015/16 we implemented those changes in the methodology used to group FCEs into CIPS. § Calculation of activity was translated from SAS 9.2 to STATA 17 and minor refinements made, making figures for 2018/19 not comparable with those from 2019/20. See Arabadzhyan et al. (2022), section 6.2.1, for details. ± Activity calculated with updated patient identifier provided by NHS Digital. ᵀ Activity calculated with corrected ordering of FCEs within CIPS. * Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

Table 11: Number of CIPS and average cost for electives and non-electives

Year	Elective and day-case activity		Non-elective activity	
	# CIPS	Average cost (£)	# CIPS	Average cost (£)
2019/20	10,322,560	1,900	8,044,921	1,852
2019/20*, §	8,712,001	2,142	7,947,453	1,853
2020/21	6,830,556	2,542	6,901,554	2,627
2020/21*	6,828,395	2,601	6,907,709	2,641
2021/22*	9,258,555	2,275	7,739,036	2,307
2021/22§	7,811,654	2,584	7,649,308	2,307
2022/23§	8,509,067	2,765	7,557,654	2,523

Notes: The average cost for the year 2021/22 is corrected for the most updated inflator of the year. * Measures calculated using corrected ordering of FCEs within CIPS. § Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

Cost-weighted and working days adjusted Laspeyres output growth for elective and day-case physical care was 9.44% between 2021/22 and 2022/23. Non-elective output grew by 0.53% over the same period, leading to an overall NHS cost-weighted and working days adjusted

activity output growth of 5.28% for inpatient physical care.[25] Volume of elective physical care increased between 2021/22 and 2022/23 whilst that of emergency physical care decreased during the same period.

6.2.3. Physical elective, day-case, and non-elective activity: quality adjustment

For our main measure, we use four metrics to adjust for changes in the quality of care provided in the inpatient setting, which is calculated at the HRG level, and separately for elective and non-elective care. Specifically, we account for:

1. **In-hospital survival rates and mean life expectancy.** We use information on in-hospital survival rate, which is obtained directly from the HES APC dataset, and mean life expectancy, taken from mid-year life tables published annually by ONS,[26] and combine it with estimate changes in health outcomes following treatment (see subsequent bullet point) to capture changes in the expected discounted sum of lifetime Quality Adjusted Life Years (QALYs) conditional on treatment survival.
2. **Estimated change in health outcomes following hospital treatment** to assess the impact that treatments have on patients' health status over time. We use changes in the ratio of health status before and after care. Smaller ratios represent a larger health improvement associated with the treatment. We use two separate data sources:
    i. Patient Reported Outcome Measures (PROMs) for all patients undergoing unilateral hip or knee replacement.[27] This survey is offered to all patients shortly before surgery and six months following treatment. It includes the generic EQ-5D measure, which can be converted to QALYs through an official valuation from the general population of health states. Change in the ratio of before divided by after procedure EQ-5D QALY scores are used for related HRGs.
    ii. For treatments (HRGs) where no such information is available, or the proportion of activity with PROMs information for a given HRG is small and unlikely to be representative in either year considered (< 100 observations) we assume that the ratio is constant over time and equal to 0.8 for elective care/day-cases and 0.4 for non-elective care (Dawson et al., 2005). We also assign the above constant ratios to CIPS with error code UZ01Z (Castelli et al., 2019).
3. **Waiting times** to account for adverse health implications of delayed treatment along with direct patient dissatisfaction from waiting for care. We use the 80th percentile of waiting time, also calculated from HES APC, and apply this as a scaling factor, multiplying the health effect (Castelli et al., 2007). This adjustment applies only to elective and day-case activity.

Table 12 and Table 13 present average values of the measures for the quality elements for the years 2019/20, 2021/22, and 2022/23. Table 12 highlights that life expectancy did not change for patients undergoing either an elective or day care procedure/treatment, but increased for non-elective patients, on average, between 2021/22 and 2022/23. Compared to 2019/20, life expectancy for non-elective care fell in 2022/23, whilst that for elective/day-

[25] The total number of working days was 253 and 251 in 2021/22 and 2022/23, respectively.
[26] ONS life tables can be found here (last accessed 27/03/2025).
[27] From 2018/19, PROMs for varicose vein surgery and groin hernia repair were discontinued.

cases did not change. Waiting time at the 80th percentile increased between 2021/22 and 2022/23 by four days, on average, and by 20 days compared to 2019/20. Survival rate remained the same in 2022/23 as in 2021/22 for elective care activity while it decreased for non-elective cases during the same period. Compared to 2019/20, survival rate declined for both activity groups in 2022/23. It is important to stress that these values are averages and mask considerable variation in the value observed for single HRGs and for each HRG across years. We, therefore, report in Table 16 details of the impact of individual and combinations of quality measures and discuss their implications in section 6.2.6.

Table 12: Quality adjustment for elective and day-case and for non-elective activity

Year	Elective and day-case activity			Non-elective activity	
	In-hospital survival rate	Mean life expectancy	80th percentile waiting times	In-hospital survival rate	Mean life expectancy
2019/20	99.96%	22.1	85	98.36%	31.8
2019/20*, §	99.94%	22.5	88	97.45%	31.5
2020/21*	99.93%	21.7	104	96.63%	30.7
2021/22*	99.95%	21.5	104	97.38%	31.5
2021/22§	99.94%	22.1	104	97.38%	31.5
2022/23§	99.94%	22.1	108	97.17%	31.7

* Measures calculated using corrected ordering of FCEs within CIPS and updated life tables used for 2020/21 and 2021/22. § Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

Table 13 presents descriptive statistics for patient reported outcome measures (PROMs) for hip and knee replacement. In 2022/23, the ratio of pre- to post-treatment EQ-5D QALY scores for patients undergoing hip replacement was higher compared to 2021/22, indicating a lower health improvement associated with treatment in patients undergoing hip replacement in 2022/23. Of note is also the large decrease in the ratio of pre- to post-treatment health status for patients undergoing a knee replacement in 2022/23 compared to 2021/22. This is also confirmed when we compare the mean of the pre-treatment EQ-5D score to the mean of post-treatment ED-5D score. However, the overall effect of changes in the ratio of pre- to post-treatment health status is averaged out (partly absorbed) when we move from the patient procedure level to the CIPS HRG level where both knee and hip replacement effects are aggregated, where appropriate, into the same HRGs.

Table 13: Ratio of pre to post health status, based on EQ-5D

Year	Hip replacement	Knee replacement
2019/20	0.39	0.44
2020/21	0.31	0.50
2021/22	0.32	0.39
2022/23	0.41	0.07

Including adjustments for quality leads to an increase in elective and day-case as well as non-elective output growth. More specifically, between 2021/22 and 2022/23, the quality adjusted Laspeyres output growth rate, (when adjusted for in-hospital survival rates, life expectancy, PROMS, and waiting times) was 10.30% and 0.97% for elective and day-case and non-elective physical care respectively. Overall, changes in quality indicate an improvement in Laspeyres growth by less than one percentage point to 5.95% for physical health.

6.2.4. Mental elective, day-case, and non-elective activity

- **The cost-weighted and working days adjusted Laspeyres mental health inpatient output growth measure was -11.07% between 2021/22 and 2022/23.**
- **After accounting for changes in quality, the total Laspeyres output growth of NHS mental health activity fell only by 0.02 of a percentage point to -11.09%.**

Table 14 shows the number of CIPS and average costs for mental health care activity in the years 2019/20 to 2022/23. The volume changes in mental health care in the inpatient setting were both negative. Therefore, contrary to the physical health, we saw a decrease in the elective mental health activity volume from 2021/22 to 2022/23 by 5.86%. Also, non-elective mental health activity decreased by almost 12% between 2021/22 and 2022/23 which is a much larger drop compared to that observed in the case of the physical care emergency activity. Part of this decrease can be explained by the fact that Mental Health Trusts are longer mandated to report their activity in the HES APC dataset, with all of the care provided by them being included in the Mental Health Services Dataset and in the NHS Talking Therapies dataset (previously Improving Access to Psychological Therapy). Finally, the level of overall mental health activity in 2022/23 was around 20% lower compared to the year shortly before the COVID-19 pandemic (2019/20).

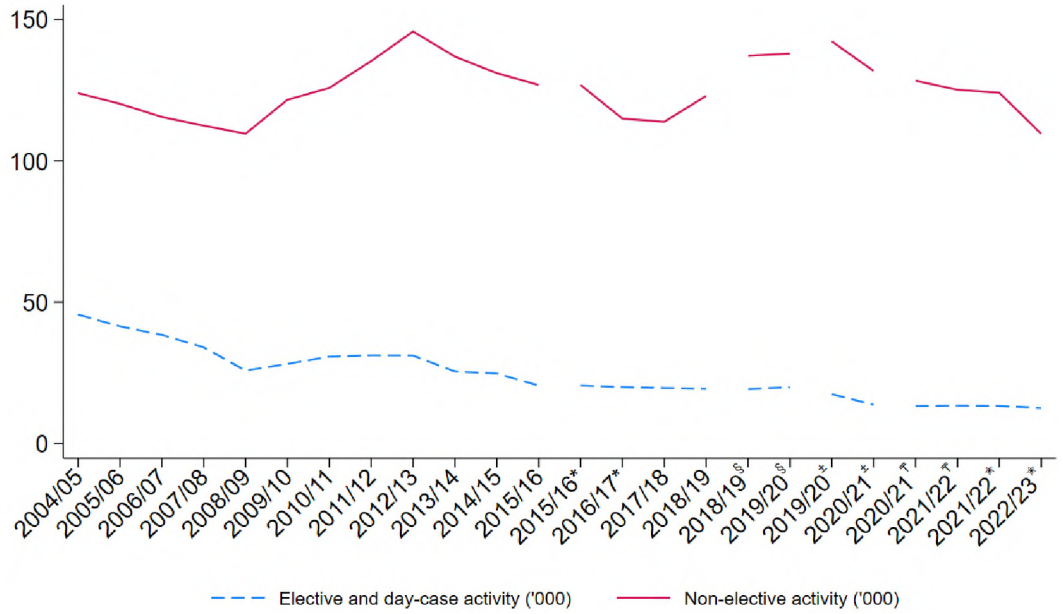
Table 14: CIPS and average cost for inpatient mental health patients

Year	Elective and day-case activity		Non-elective activity	
	# CIPS	Average cost (£)	# CIPS	Average cost (£)
2019/20	17,360	1,494	142,321	1,516
2019/20[*, §]	16,640	1,494	136,877	1,516
2020/21[*]	13,258	1,506	128,382	1,528
2021/22	13,351	1,538	125,165	1,561
2021/22[§]	13,275	1,532	124,107	1,554
2022/23[§]	12,497	1,641	109,584	1,665

[*] Measures calculated using corrected ordering of FCEs within CIPS and updated life tables used for 2020/21 and 2021/22. [**] Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

Figure 6 reinforces the point that compared to physical health (presented in Figure 5), changes in the volume of mental health care exhibit a negative trend for both types of activity. Also, the negative growth in the activity volume between 2021/22 and 2022/23 further increases the difference against the pre-pandemic year.

Figure 6: Number of CIPS for elective, day-case, and non-elective mental health patients over time



Notes: * The HES variable 'admission method' underwent changes in the coding; thus from 2015/16 we implemented those changes in the methodology used to group FCEs into CIPS. § Calculation of activity was translated from SAS 9.2 to STATA 17 and minor refinements made, making figures for 2018/19 not comparable with those from 2019/20. See Arabadzhyan et al. (2022), section 6.2.1, for details. ± Activity calculated with updated patient identifier provided by NHS Digital. ∓ Activity calculated with corrected ordering of FCEs within CIPS. * Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

The cost-weighted and working days adjusted Laspeyres mental health inpatient output growth measure between 2021/22 and 2022/23 was -11.07%. Compared to physical health care, this is a substantial decrease. Both elective and day-cases and non-elective activity recorded negative growth, equal to -5.11% and -11.70% respectively. However, this does not mean that less mental health care is provided in the NHS. An important contributor to the negative growth rates is the fact that Mental Health Trusts are no longer mandated to report their activity in the HES APC dataset, with all of the care provided by them being included in the Mental Health Services Dataset and in the NHS Talking Therapies dataset (previously Improving Access to Psychological Therapy).

6.2.5. Mental elective, day-case, and non-elective activity: quality adjustment

Table 15 presents quality adjustment measures for mental health inpatient care. We use the same set of quality adjustment measures as for inpatient physical care. Compared to 2021/22, survival rate for patients receiving elective mental health care was slightly higher in 2022/23. On the other hand, patients receiving non-elective mental health care experienced, on average, a decrease in survival rate by more than 0.5 of a percentage point. Mean life expectancy decreased for patients in both groups of activities. Although this decline was small for the recipients of elective mental health care (0.32%), the average decrease in the life expectancy for the recipients of non-elective mental health care was around 3%. The 80th percentile waiting time increased from 49 to 73. As noted in section 6.2.3, these mean values are made up of highly variable values at the HRG level within the year, which also change over time.

Table 15: Quality adjustments for mental health activity

Year	Elective and day-case activity			Non-elective activity	
	In-hospital survival rate	Mean life expectancy	80th percentile waiting times	In-hospital survival rate	Mean life expectancy
2019/20	99.63%	30.8	43	99.10%	24.4
2019/20*	99.44%	30.6	41	98.22%	24.3
2020/21	99.25%	30.8	52	97.97%	23.8
2021/22	99.48%	31.1	50	97.90%	23.1
2021/22*	99.48%	31.2	49	97.90%	23.1
2022/23	99.49%	31.1	73	97.35%	22.4

* Excludes Frimley Health NHS Foundation Trust (RDU). Provider excluded due to data submission issues during the financial year 2022/23. Also excluded are regular day and night attenders.

After accounting for changes in quality, the total Laspeyres output growth of NHS mental health activity was -11.09%. This represents a very small reduction in quality with an impact of only 0.02 of a percentage point.

6.2.6. Breakdown of quality measures for inpatient care

In sections 6.2.3 and 6.2.5 we presented descriptive statistics for quality adjustment measures for inpatient physical and mental health respectively, along with the overall impact of these quality adjustments on Laspeyres growth. Table 16 presents growth rates when adjusting solely for cost (cost-adjusted column) and for different combinations of these quality measures.

Adjusting for survival alone leads to a lower overall inpatient output growth by 0.09 of a percentage point. The most impacted activities were non-elective physical health care and mental health overall activity. In particular, for non-elective physical health care output growth decreases by 0.18 of a percentage point, whilst for mental health activity (elective and day-cases, and non-elective) it fell by 0.30 of a percentage point. A reduction in output growth was also observed when including PROMs adjustment (representing health gain). Comparing the survival and PROMs adjusted output growth to the measure when it was only adjusted for the survival rate, we found that, overall, the growth decreased by a further 0.28 of a percentage point. The highest negative impact was identified for non-elective physical health care for which growth decreased even further by 0.31 of a percentage point.

The impact of life expectancy as a quality adjustment was generally large and positive, it increased the overall inpatient output growth by more than one percentage point. The impact was of a similar level for all the types of activities of physical health care with the greatest improvement identified for elective cases (almost 1.1 percentage points). The improvement of the output measure due to life expectancy was smaller for the overall mental health care and it corresponded to 0.5 of a percentage point. Adjusting for waiting times and life expectancy together, the overall output growth measure increases by about 0.03 of a percentage point. The positive impact was identified in the case of physical elective and day-case activity, with an increase of 0.05 of a percentage point. We found no impact on the

output growth of emergency activity. In the case of mental health this quality indicator led to a reduction of the output growth close to 0.03 of a percentage point.

Overall, Table 16 indicates a general improvement in the quality of care provided by the NHS in the hospital inpatient care setting. The overall impact of changes in survival, pre- and post-treatment health status, life expectancy and waiting time was substantial adding around 0.7 of a percentage point to the Laspeyres cost-weighted output growth rate. The largest improvement was for physical elective and day-case activity, where the quality of care as measured here added almost a 1 percentage point to the cost-weighted output growth measure.

Table 16: Quality adjustment breakdown with working day/total day adjustment 2021/22 – 2022/23

	Cost-adjusted	Quality-adjusted (Survival, PROMs, LE & WT)	QA only Survival	QA only Survival & PROMS	QA only survival & PROMS & LE	QA only LE	QA only WT & LE
Physical + Mental Health Inpatient (all)	5.19%	5.85%	5.10%	4.82%	5.83%	6.23%	6.25%
Physical Inpatient (all)	5.28%	5.95%	5.19%	4.91%	5.92%	6.32%	6.35%
Physical Inpatient (Elective)	9.44%	10.30%	9.42%	9.16%	10.26%	10.53%	10.58%
Physical Inpatient (Non-Elective)	0.53%	0.97%	0.35%	0.04%	0.97%	1.51%	1.51%
Mental Health Inpatient (all)	-11.07%	-11.09%	-11.38%	-11.57%	-11.06%	-10.56%	-10.59%

Further, we added to the quality adjusted Laspeyres output growth measure the additional quality indicators, avoidable emergency readmissions and Hospital Acquired Infections (HAIs), MRSA and C-Diff.

Adjusting only for avoidable emergency readmissions, we found that the overall NHS output growth measure improved to just under 6.05%. The impact of this quality indicator on the output growth measure of physical elective and day-case activity was small 0.2 of a percentage point; however, the impact on the output growth measure for physical non-elective activity was more pronounced bringing it to 1.21% – an increase by 0.24 of a percentage point. When we included the additional quality indicator in the calculations of the output growth measure for mental health activity, we found that it slightly improved it to -10.40%. The effect was 0.68 of a percentage point improvement for mental health elective and day-case activity and non-elective activity.

Finally, we accounted for the deadweight-loss associated with HAIs. The impact of this quality indicator cannot be disentangled between elective and day-case and non-elective activity, for both physical and mental health care, therefore we provide only the overall effect on the Laspeyres inpatient output growth measure, which became 6.02% – 0.03 of a percentage point lower than when only avoidable emergency readmissions are accounted for.

6.2.7. Comparison of 2019/20 with 2022/23

When comparing NHS inpatient output reported in 2022/23 to the pre-pandemic year, 2019/20, we found that the cost and working day adjusted inpatient activity fell by 0.2%. Compared to the previous year, this showed a continued improvement in the provision of hospital inpatient care, which is almost at its pre-pandemic levels.

After adjusting for changes in quality, inpatient growth increased by almost 1.5 percentage points amounting to 1.27%. The positive impact of quality adjustment was driven mainly by life expectancy. In particular, for physical health care activity, adjusting the measure of output growth for changes in life expectancy increased it, compared to the cost-adjusted output growth, by 1.7 percentage points leading to a growth of 1.61%. A positive effect was also recorded for mental health care activity, whose output growth rose by almost 0.5 of a percentage point.

The survival rate adjustment has a positive impact on the output growth of elective physical health care, increasing it by 0.03. However, it had a negative impact for both emergency physical activity (although it is small) and mental health care activity which declined by almost 0.4 of a percentage point.

The impact of PROMs and waiting times on the output growth of inpatient health care activity was overall negative. More specifically, accounting for PROMs led to lower output growth, compared to the measure when it is adjusted for the survival rate only, by 0.06 of a percentage point. The negative impact was larger in the case of mental health activity, equal to almost 0.3 of a percentage point. Also, adjusting for changes in waiting times worsened the output growth of both physical health and mental health activity, with the impact being more pronounced for the former. In particular, while this quality indicator has no effect on emergency physical health care, it reduced the output growth of elective physical health activity by 0.3 of a percentage point (compared to the measure adjusted for life expectancy only).

These results are presented in Table 17.

Table 17: Quality adjustment breakdown with working day/total day adjustment 2019/20 – 2022/23

	Cost-adjusted	Quality-adjusted (Survival, PROMs, LE & WT)	QA only Survival	QA only Survival + PROMS	QA only survival + PROMS + LE	QA only LE	QA only WT & LE
Physical + Mental Health Inpatient (all)	-0.20%	1.27%	-0.19%	-0.25%	1.44%	1.46%	1.29%
Physical Inpatient (all)	-0.06%	1.42%	-0.05%	-0.11%	1.59%	1.61%	1.44%
Physical Inpatient (Elective)	-1.46%	-0.94%	-1.43%	-1.50%	-0.65%	-0.62%	-0.93%
Physical Inpatient (Non-Elective)	1.72%	4.42%	1.70%	1.66%	4.42%	4.44%	4.44%
Mental Health Inpatient (all)	-20.18%	-20.37%	-20.54%	-20.81%	-20.33%	-19.69%	-19.72%

Further, when we added the quality indicator avoidable emergency readmissions to the quality adjusted Laspeyres output growth measure we found that overall output growth improved by 0.24 of a percentage point bringing it to 1.51%. The impact of this quality indicator was more pronounced for physical non-elective activity than for elective physical care. Similarly, the growth of mental health activity improved when including avoidable readmissions, with the improvement driven by its impact on non-elective activity. More specifically, the overall mental health growth improved to -19.80%, equivalent to a 0.57 of a percentage point increase. Finally, accounting also for the deadweight-loss associated with HAIs the overall Laspeyres inpatient output growth decreases to 1.48%.

Overall, findings for inpatient care suggest that inpatient output substantially improved between 2021/22 and 2022/23, in large part due to a continuously progressed return to a more standard form of care following the COVID-19 pandemic. However, by all measures used, recovery was not complete by 2022/23, with a substantial residual gap in mental health inpatient activity growth and elective physical health care growth.

6.3. Hospital outpatient setting

- **The cost-weighted and working days adjusted Laspeyres output growth measure for outpatient activity was 2.57% between 2021/22 and 2022/23.**
- **After adjusting for waiting times, the Laspeyres output growth measure was 2.51%.**

As in previous productivity reports, we use two data sources to measure growth in the outpatient setting. In this section we describe our preferred approach of these two. That is to use the HES Outpatient (OP) dataset to calculate activity and the National Cost Collection (NCC) to assign unit costs as weights.

Table 18 presents volume and unit cost of outpatient activity. The table shows outpatient activity increased by 1.04% between 2021/22 and 2022/23. Total activity was also higher, for

the first time, than the level reported in 2019/20 by 0.50%. The mean cost of care increased by 2.20% (from £166.24 to £169.90) between 2021/22 and 2022/23.

Table 18: HES outpatient volume and average cost over time

Year	HES Outpatient Activity	
	Volume	Average cost (£)
2019/20	91,004,047	137.11
2019/20*	89,862,430	137.46
2020/21	74,941,740	184.61
2021/22	90,596,980	165.87
2021/22*	89,390,090	166.24
2022/23*	90,315,310	169.90

* Volume and Average Cost figures exclude Frimley Health NHS Foundation Trust because of technical issues with data submission from June 2022 – March 2023.[28]

The cost-weighted Laspeyres growth in outpatient activity amounted to 2.57% after working-day adjustment, between 2021/22 and 2022/23. The higher rate of increase in this metric compared to raw volume, suggests a shift towards more complex and costly care in 2022/23 compared to 2021/22. A similar shift was also seen between 2020/21 and 2021/22. The working-day adjustment also played an important role in comparing raw and adjusted growth. Without working-day adjustment, the cost-weighted Laspeyres growth in outpatient activity was 1.76%.

6.3.1. HES outpatient: quality adjustment

As in the hospital inpatient setting, we adjusted outpatient activity for the 80th percentile of waiting times. We treat the 80th percentile of all (both face-to-face and non-face-to-face) first appointment waiting times as our primary quality adjustment measure for outpatient care. This reflects a move towards more non-face-to-face first appointments in response to both the COVID-19 pandemic and attempts to digitise more care (see Arabadzhyan et al. (2024)). We also include results using the 80th percentile of first appointments that are face-to-face only. This was the approach originally used to quality adjust outpatient activity.

Mean and 80th percentile waiting times are presented in Table 19. Between 2021/22 and 2022/23, mean and 80th percentile waiting times increased substantially. Mean waiting times increased by 7 days both when considering all first appointments or face-to-face first appointments only. The increase for the 80th percentile was even larger, at 15 days for all first appointments and 17 days for face-to-face first appointments. Some potential reasons for these increases are a continued backlog of care following the COVID-19 pandemic and a greater focus on patients who have already waited an unusually long period for care.

[28] The technical issue is reported by NHS England on the Data Quality section of their supporting information for HES Outpatient activity (last accessed 5/03/2025).

After adjusting for waiting times of first appointments and for working days, growth in outpatient activity decreased by 0.06 percentage points to 2.51%. When using the change in 80th percentile of face-to-face first appointments only, quality and working day adjusted growth fell by 0.07 percentage point to 2.50%.[29] The impact of adjusting for waiting time as a quality measure was limited, despite a substantial change in 80th percentile of waiting time. This is because the negative impact of waiting time is discounted and waiting times were already at a relatively high level in 2021/22.

Table 19: Mean and 80th percentile outpatient waiting times

Year	Face-to-face first appointments		All face-to-face appointments	
	Mean	80th Percentile	Mean	80th Percentile
2019/20	48	68	48	67
2020/21	55	67	57	76
2021/22	57	71	58	74
2021/22*	58	71	58	74
2022/23*	65	88	65	89

* Volume and Average Cost figures exclude Frimley Health NHS Foundation Trust because of technical issues with data submission from June 2022 – March 2023.[30]

6.3.2. Comparison of 2019/20 with 2022/23

The COVID-19 pandemic had large and multifaceted impacts on activity, especially in the year 2020/21. In this sub-section, we compare activity in the year 2019/20 with that in 2022/23, to ascertain the extent to which NHS outpatient activity has already and might continue to recover.

Table 18 shows that activity in 2022/23 was 0.50% higher than in 2019/20. Also, that the unit cost of activity in 2022/23 was 24% higher than in 2019/20. Cost weighted and working day adjusted Laspeyres volume growth between 2019/20 and 2022/23 was -1.88%. The negative value contrasting with the increase in raw volume suggests the complexity of care remains below that reported in 2019/20. However, it also reflects a reduction in the gap of outpatient activity compared to the -4.63% cost and working day adjusted growth between 2019/20 and 2021/22 reported in Arabadzhyan et al. (2024).

Table 19 indicates that between 2019/20 and 2022/23 all measures of waiting time used as quality adjusters worsened. Cost weighted, quality and working day adjusted output growth was -1.97% when using all first appointments and -1.96% when using face-to-face first appointments only.[31] These reductions when using quality adjustment of 0.09 and 0.08

[29] Without working day adjustment, cost-weighted and quality adjusted outpatient growth was 1.70 using all first appointments and 1.69 using face-to-face first appointments as quality adjustment.
[30] The technical issue is reported by NHS England on the Data Quality section of their supporting information for HES Outpatient activity (last accessed 5/03/2025).
[31] Growth using cost weights and quality adjustment without working-day adjustment was -3.12% both when using all first appointments or face-to-face first appointments only for the quality adjustment.

respectively, were similar in magnitude to the use of quality adjustment in comparing 2021/22 with 2022/23. The impact of the waiting time adjustment on the output growth measure is limited for the same reasons provided above, i.e. in the 2021/22 to 2022/23 comparison.

6.4. National Cost Collection data

The National Cost Collection[32] (NCC) data are used in the NHS output and productivity series to capture health care activity delivered but not included in our definitions of primary care, including community prescribing, hospital inpatient and outpatient settings, and ophthalmology and dentistry. In particular, it captures activity conducted in accident and emergency (A&E) departments, including ambulance services, mental health, and community care settings, and diagnostic facilities. Activities are reported in various ways: attendances, bed days, contacts, number of tests, etc.

NCC data also provide information on average unit costs for all recorded activities, including activity performed in hospitals in both inpatient and outpatient settings. NCC data were checked for both accuracy and activity coverage.

The 2022/23 NCC publication was not accompanied by any supporting documentation, which typically includes information on settings or sub-settings of healthcare activity which are not comparable with previous years due to changes in data collection, grouping or any other data quality related issues. We therefore relied on the Integrated National Cost Collection guidance, discussions with the NHS England costing team and our internal data quality checks to determine data comparability across years.

As in previous reports (Arabadzhyan et al., 2022, Arabadzhyan et al., 2023, Arabadzhyan et al., 2024) we used both the national-level and the Trust (organisational)-level NCC data to inform and calculate the output growth rates for healthcare services delivered outside of primary care and of hospital inpatient care. Further, when using the organisational-level NCC data, we removed Trusts that were not included in the NCC data collection in either 2021/22 or 2022/23 when calculating the output growth rate between these two financial years. We also compared the number of Trusts present in 2019/20 and 2022/23 and kept only those that appeared in both financial years when calculating the 2019/20-2022/23 growth rates. In 2019/20, 209 out of 223 providers were included in the dataset. In 2020/21 this number went up to 215 out of 216 organisations. In 2021/22 208 out of 213 Trusts were included in the cost collection, while in 2022/23 206 out of 212 providers were included.[33] Failing to account for the different number of providers submitting data in different years may result in an underestimation of the growth rates for the 2021/22-2022/23 link, and, generally, an overestimation for the 2019/20-2022/23 link. After removing Trusts that did not submit data in one of the two years of interest, we were left with 201 Trusts for the 2021/22-2022/23 link and 195 Trusts for the 2019/20-2022/23 link.

[32] Previously known as the National Reference Cost data.

[33] The difference in the total number of NHS Trusts between financial years is due to several mergers and acquisitions.

This year it was necessary to also make some further *ad-hoc* exclusions across all providers for specific sub-settings or lower levels of aggregation, which we will be detailed in the remainder of this section.

The 2022/23 NCC underwent substantial changes in how activity has been recorded. First, activity was moved across different worksheets within the NCC dataset, e.g. from the Renal Dialysis worksheet to the Admitted Patient Care (APC) worksheet.[34] Second, several healthcare activities (which we group in specific NHS settings) had an overhaul of their service codes,[35] which became more granular. Third, NHS England mandated the Patient Level Information and Costing System (PLICS) for the following healthcare services: chemotherapy, radiotherapy, rehabilitation, renal dialysis, specialist palliative care. In addition, NHS England introduced a soft move to PLICS for wheelchair services and community maternity services, with some providers continuing to report their activity and unit costs as Korner returns,[36] and others as PLICS. Consequently, the main NCC data collection only included activity and unit costs calculated using the patient-level costing, whilst activity and unit costs calculated following the previous system were published in the Alternative Consolidated Contingency Options (ACCO) sheet. The data reported in the ACCO sheet cannot be combined with that in the main collection, as they were not comparable. However, not including it would artificially drive down the growth rates for community care services. Therefore, we removed the activity of entire Trust-setting combinations, when Trusts submitted their activity and unit cost information in the ACCO sheet, from the calculation of the output growth rates using the Trust-level data.

Healthcare activity and unit costs were excluded from 2019/20, 2021/22 and 2022/23 for the 2021/22 – 2022/23 and 2019/20 – 2022/23 output growth calculations for the following Trust-settings combinations:

- Bradford Teaching Hospitals NHS Foundation Trust (RAE) from the Outpatient, Renal Dialysis, and Community Care settings;
- East Suffolk and North Essex NHS Foundation Trust (RDE) from the Community Care settings and from Day Care Facilities, which is part of the 'Other' NHS setting;
- Coventry And Warwickshire Partnership NHS Trust (RYG) from the Community Care setting;
- Birmingham Community Healthcare NHS Foundation Trust (RYW) from the Outpatient, Rehabilitation, A&E Services, Community Care settings and Day Care Facilities, which is part of the 'Other' NHS setting.

[34] The Admitted Patient Care worksheet includes information on activity and unit costs for the following settings: daycases, elective inpatient, non-elective inpatient - short stay, non-elective inpatient - long stay, regular day or night admissions.
[35] A service code identifies a specific area of healthcare service provision (e.g. for acute care, service codes, also known as treatment function codes, are specialties – general surgery, urology, trauma and orthopaedics, etc.).
[36] The 'Korner returns' refer to a set of data collection principles for the NHS developed by Dame Phyllis Korner. Their principles have underpinned the development of the National Reference Cost data, and National Cost Collection data, amongst others. In 2016, NHS England (formerly NHS Digital) piloted the first Patient Level Information and Costing System in a selection of NHS Acute Trusts, with these becoming the standard for the collection of unit cost information across the NHS for different types of NHS Trusts, i.e., Ambulance, Mental Health. However, the move to PLICS was introduced in a staggered way over time and across NHS care settings, either through hard or soft mandation.

Below we outline the approaches to make the NCC data comparable across 2021/22 (2019/20) and 2022/23 years for all the NHS settings that were affected by changes in the costing guidance. This should be considered when interpreting the 2021/22-2022/23 and 2019/20-2022/23 output growth rates for the NHS settings covered by the NCC.

Community Care

Community care activity is now recorded across a more granular set of service areas. Since our unit of observation is the combination of a service code and a currency code, this made comparison across years difficult. However, we noted that in previous years, each of the community care currency codes (with the exception of wheelchair services) had only one service code. Therefore, we can aggregate the 2022/23 NCC community care data up to the currency code level, which in this case was sufficient to obtain comparable units across years. 2022/23 unit costs at the higher (aggregated) currency code level were calculated as activity weighted average unit costs of the more disaggregated data.

Given the soft transition to PLICS introduced by NHS England for wheelchair services (WC*) and community maternity services (NZ*, N01* N03*), we removed their respective currency codes from the output growth rate calculation. We also noted that the 'NZ*' currency codes were no longer recorded under community care, but only within the outpatient activity. Previously, they were recorded in both the community care and outpatient settings. Since we were not able to know with certainty whether activity previously reported as community care was now reported within the Outpatient setting or in any other setting, we removed these currencies from both the community care and the outpatient settings when calculating the output growth rates of these settings.

Finally, the costing team at NHS England informed us that the currency code for intermediate care bed based services (IC02) was retired, and that their activity was now included in the APC worksheet. We therefore excluded the IC02 currency from the community care setting for both 2021/22 (2019/20) and 2022/23.

Chemo-/Radiotherapy, High Cost Drugs and Devices

For the 2022/23 NCC, NHS England mandated chemo- and radiotherapy services to be collected using PLICS. Both types of activity are now reported in the Admitted Patient Care (APC) and the Outpatient Procedures (OPROC) NCC worksheets. Further, and for radiotherapy services only, the service codes in which activity was previously collected and reported changed from inpatient (IP), day-case and regular day or night admissions (DCRDN), outpatient (OP), and other (Other) to respectively elective (EL), non-elective – long-stay (NEL), non-elective – short-stay (NES), day-cases (DC), and regular day or night admissions (RP). To allow for comparability across the two financial years, we reconstructed previously recorded service codes whenever possible: activity in the OPROC worksheet was aggregated up to the currency level and assigned the OP service code, DC and RP activity constitutes the former DCRDN, for radiotherapy EL, NEL and NES were treated as the former IP. For all remaining chemo- and radiotherapy services that could not be matched, we relied on the imputation method (Castelli et al., 2011).

The guidance for submitting activity under the SB97Z currency (Same Day Chemotherapy Admission or Attendance) changed in the 2022/23 cost collection, stating that where no

unbundled chemotherapy currencies are created by the HRG grouper the cost should be submitted against the SB97Z core HRG.[37] This change implied that any activity reported as SB97Z code was no longer comparable across years, since previously the cost of chemotherapy activity was reported against unbundled currencies only, and the unit cost of SB97Z was set to zero. We therefore included activity recorded under SB97Z HRG in the growth rate calculation but treated it as not directly comparable between 2019/20, 2021/22, and 2022/23, and relied on the imputation method.

Further, the currencies for procurement chemotherapy were no longer recorded within the Chemotherapy worksheet. Instead, their respective activity and unit costs were reported in the High Cost Drugs setting, and new currency codes, patient level chemotherapy drugs (PCTD), appeared in this setting. Finally, we learnt from discussions with the NHS England costing team that the high cost drugs codes HICD0542 - HICD0554 were declassified, as these drugs were no longer reported. However, the actual currency codes were inadvertently reused for a different set of drugs. We therefore treated the drugs with currency codes HICD0542 - HICD0554 in the 2022/23 NCC data as new drugs, and relied on the imputation method to include them in the output growth calculations.

Diagnostic Tests and Radiology

Direct Access Diagnostic and Pathology Services were previously presented at the currency code level, while in the 2022/23 NCC there was an additional split by service code. We therefore aggregated the 2022/23 data up to the currency level to enable us to use them in our output growth calculations.

Radiological services also saw a change in department codes from 'Direct Access' (DA), 'Outpatient' (OP), 'Other', and 'Supplementary information' to 'Supplementary information' and 'Community Diagnostic Centre' (CDC). Some of the healthcare activity, previously reported in the Nuclear Medicine (NM) and Diagnostic Imaging (IMAG) (Radiology) worksheets, was moved to the Directly Accessed Diagnostic Services (DADS) worksheet. For the purpose of calculating the output growth rate between 2021/22 (2019/20) and 2022/23, we decided to move this activity back to the Diagnostic Imaging (Radiology) setting and assign it the 'Direct Access' (DA) service code to make it comparable to previous years. We analysed whether activity in 'OP' and/or 'Other' departments were clearly linked to 'CDC' activity (and therefore could be mapped), but this was not the case. We therefore concluded that activity reported as 'OP' and 'Other' departments in the 2021/22 (2019/20) NCC data and the activity reported as 'CDC' in the 2022/23 NCC data were not directly comparable and applied the imputation method when calculating growth rates.

Specialist Services (Cancer Multidisciplinary Teams Meetings, Critical Care, Specialist Palliative Care)

In the 2022/23 NCC, Cancer Multidisciplinary Teams Meetings (CMDT) healthcare services were reported with a split by service code. To compare them with previous years, we aggregated them up to the currency code level. Additionally, on advice from the NHS England costing team, we removed three Trusts (Gloucestershire Hospitals NHS Foundation Trust

[37] For more detail on cost attribution for chemotherapy across core and unbundled HRGs see previously published DHSC guidance, pp. 39-41 (last accessed 11/03/2025).

(RTE), Northern Lincolnshire and Goole NHS Foundation Trust (RJL), and Gateshead Health NHS Foundation Trust (RR7)) from the Trust-level data in this setting because of their known data quality issue. The CMDT activity of these Trusts was, therefore, not included in the calculation of the sub-setting and the specialist services setting output growth measure.

The 2022/23 NCC critical care transport currencies, for both paediatric critical care transportation (XB08Z) and neonatal critical care transportation (XA06Z) were recorded in a separate worksheet and without the split by service code, differently from the previous years. Therefore, we aggregated up to the currency code level the same activity in 2021/22 (2019/20) to make it comparable with 2022/23.

Finally, in the 2022/23 NCC specialist palliative care services were mandated for collection at the PLICS level, and reported against admitted patient care, outpatient care and community care currencies, i.e., there are no longer separate currencies for specialist palliative medicine. We were therefore unable to include this sub-setting in the specialist services setting like we did in previous years.

Renal Dialysis

In the 2022/23 NCC data, renal dialysis activity was no longer reported as 'RD at base' and 'RD away from base', but was submitted at the patient level, as NHS England mandated the move to PLICS for this activity. New renal dialysis currencies can be found in the APC worksheet under service codes EL, NEL, NES, DC, and RP. We therefore reconstructed the overall activity and unit cost from these settings in 2022/23 and aggregated the activity up to the currency level for 2021/22 (2019/20).

Rehabilitation

Similarly to a few other services, specialist rehabilitation was mandated for PLICS-level collection in 2022/23, whereas before it was recorded only via unbundled HRGs (VC* codes). Starting from 2022/23, rehabilitation was recorded in both unbundled HRGs and against the core HRGs for admitted patient care rehabilitation. Additionally, service codes have changed from 'Admitted Patient Care' (APC), 'Outpatient' (OP), and 'Other' to treatment function and department codes. Finally, the level of specialist rehabilitation service (level 1, level 2, and level 3), was removed. When calculating growth rates for the 2021/22-2022/23 and 2019/20-2022/23 links, we aggregated activity up to the currency level.

Furthermore, for the currencies not previously recorded in the Rehabilitation setting, it was important to understand whether they are completely new activity, or whether they were activity that used to be delivered in a different setting and captured elsewhere in the national cost collection. In this case, we know that the new currencies were previously recorded as inpatient activity, but were not fully transferred to the rehabilitation worksheet because they are not rehabilitation specific. There is some evidence that these currencies were previously recorded solely as admitted patient care activity, whilst in the current NCC data and following specific guidance, these are also in part reported in the rehabilitation worksheet. The majority of these new currencies in the rehabilitation sheet, representing about 80% of total rehabilitation activity volume and 86% of value of all new currencies, were recorded as rehabilitation medicine service (service code 314). This service code used to be present in the APC worksheet, but this was no longer the case for 2022/23. This implied that the activity

recorded as service code 314 in the inpatient setting, was now reported in the rehabilitation setting in the NCC publication. However, we used the HES Admitted Patient Care dataset to calculate the hospital inpatient care output growth rates. We, therefore, checked whether the 2022/23 HES APC dataset included activity for the specialty 314, and we found this to be the case. We also checked whether the volumes in 2022/23 were similar to those in 2021/22 and found this to be the case too. This led us to conclude that some of the rehabilitation activity was already included as hospital inpatient care in the HES APC dataset in 2022/23 and in previous years. To avoid double-counting this part of rehabilitation services, we need to exclude them either from the Rehabilitation setting as measured by the NCC data, or from the Inpatient setting, which is measured by the HES APC data. We opted for dropping these currencies from the NCC-measured rehabilitation activity because in HES APC we were unable to distinguish between activity delivered as inpatient care from the rehabilitation-specific activity for a few other relevant specialties of the Rehabilitation setting (323, 344, and 345).[38] Therefore, we derived the Rehabilitation output growth rate, which then feeds into the total NHS output growth rate, including only VC* codes. However, when discussing growth rates for each setting, we also included a growth rate measure calculated using all the currencies in the Rehabilitation sheet, which was a fairer representation of the actual growth of the setting.

Other NHS activity

Unlike previous NCC data, the currency codes for both day care facilities and audiological services became more granular, with a split respectively by service code and by department code ('Admitted Patient Care' (APC), 'Community Health Services' (CHS), and 'Outpatient' (OP)). To compare them with the same data for the previous financial year, we aggregated these activities up to the currency level.

Community Mental Health and Cystic Fibrosis

Community mental health activity continues to be omitted from our analyses. In 2022/23 Community mental health activity and unit costs were again overhauled. Mental health care clusters ceased to exist, and new currencies were introduced, which cannot be matched to the old currencies.

Cystic Fibrosis activity[39] was not provided in the 2022/23 main collection publication, but was provided in the 'Organisation level source data part 3' supplement, possibly due to data quality issues. We therefore excluded Cystic Fibrosis services from the growth rate calculation, but provide the figures of total volume and average unit cost in the relevant table.

In the remainder of this section, we present the results of our internal data quality checks (section 6.4.1), and report detailed overviews of activity and unit costs trends, and output growth for each NHS setting (section 6.4.2). Activity and unit costs trends are calculated using the national-level NCC data, i.e. they are not corrected for the number of Trusts.

[38] The reason we are able to easily make this distinction in the National Cost Collection data is that these currencies are recorded in separate worksheets (APC and REHAB).

[39] Please note that Cystic Fibrosis activity was also not reported in the 2019/20 NCC data, while it was reported in the 2020/21 NCC data.

6.4.1. Quality checks

Following our own validation process (Bojke et al., 2014), we identify large changes in either volume or unit costs of activity for all non-acute services. In particular, our quality assurance process consists of four steps:

- **Step 1:** We check whether a large change in either the total volume (>500,000 units) or the total value (>£25,000,000) of NHS activity/HRG codes, as reported in the NCC data, is observed. The check compares volumes of activity, unit costs, and total costs of the last two financial years in the national productivity series.
- **Step 2:** We check whether cases of NHS activity/HRG codes, meeting at least one of the criteria in Step 1, do not appear to be genuine. This step may lead to the identification of a subset of HRG/service codes related to NHS activity requiring further investigation. Limited to the HRG/service codes flagged up as requiring further investigation, we implement two further steps.
- **Step 3:** This step normally included a cross-check of flagged up HRC codes against the codes listed in the HRG4+ Reference Costs Grouper Roots file. However, since 2019/20 NHS England has has not been publishing an updated HRG4+ Reference Costs Grouper Roots file, and therefore, all checks were carried out via web searches and careful reading of the NCC costing guidance publication.[40]
- **Step 4:** If flagged HRG/service codes have not changed in terms of labelling, definition, or categorisation, we analyse the data in greater detail to identify the possible source of any potential large changes in either volume or value of activity.

We followed this validation process for the financial years 2021/22 and 2022/23, and also for the 2019/20-2022/23 link.

We found that the 2022/23 data were characterised by a substantial number of categories flagged up as large changes in either value (total cost) and/or volume (units) of activity. Some of these changes may be explained by the mandated move to PLICS, and in others, by the fact that we had to aggregate up the units of activity to compare 2021/22 (2019/20) and 2022/23, thereby making them more likely to exhibit large absolute changes in volume and/or value.

Below we describe which settings and individual service categories within these settings were flagged up as having a large value and/or volume change, and the likely reasons behind them.

A&E and Ambulance

A&E and Ambulance was one of the settings for which we found the largest value and volume changes for a single service. For A&E services, this was mostly driven by increases in unit costs. The 'Other' category in the Ambulance sub-setting, in contrast, recorded a drop in average cost and a resulting large negative total value change. Given that currencies in the A&E services setting were frequently flagged as having large value changes, and that we did not find any changes in the costing guidance which could explain such shifts, we kept the flagged currencies in the analysis as given.

[40] NCC 2021 costing guidance (last accessed 11/11/2023).

Chemotherapy, Radiotherapy, High cost Drugs and Devices

Large value changes were detected for some high cost drugs currencies. We believe this is expected given the constantly evolving NICE guidance and drugs being approved for more uses. We also observed a few new large value drugs, which happen to be chemotherapy drugs with currencies created as a result of the move of chemotherapy procurement to the high cost drugs sub-setting. We therefore kept all the currencies for the growth rates calculation.

Community Care

A substantial number of currencies within this setting were flagged as exhibiting large volume/value changes. Those were mostly currencies that were softly mandated for PLICS collection in 2022/23. As discussed above, we removed these currencies when calculating the setting's growth rate, but included them when reporting total activity volumes and value as captured by the NCC data.

Outpatient

We observed a substantial increase in both the volume and value of appointments for midwifery (TFC 560), which was concurrent to large negative changes in the volume and value observed in community maternity care activity. This might indicate a shift of the point of delivery from community to outpatient, and a consequent shift of its records. We also observed a substantial number of categories with large value changes for non-face-to-face outpatient activity between 2019/20 and 2022/23, possibly indicating that remote appointments became a much more common mode of delivering outpatient care in the aftermath of the COVID-19 pandemic.

Specialist Services

Large value changes between 2021/22 and 2022/23 were mainly detected in the Critical Care sub-setting, driven by concurrent increases in both volumes and unit costs. In addition, Cancer Multidisciplinary Teams Meetings currencies were flagged due to both large volume and value changes. This was due to several Trusts submitting implausibly high activity volumes. Note we can only correct for this when deriving growth rates based on Trust-level data. Activity volumes and unit costs for the Cancer Multidisciplinary Teams Meetings sub-setting were reported using national level data, without exclusions.

Diagnostic tests

Similar to the previous update (Arabadzhyan et al., 2024), large changes in diagnostic services were detected for volume only, while their unit costs remained stable. We believe this may be explained by rolling out Community Diagnostic Centres, where diagnostic services were also provided.[41]

Rehabilitation

A few VC* codes in the Rehabilitation setting saw large negative value changes. This is in line with the general trend for the VC* currencies we have been observing for the last few years. We believe the drop in those currencies does not reflect a decline in service provision, but rather a change in recording practice, as described in the beginning of this section.

[41] For more information on Community Diagnostic Centres see here (last accessed 13/03/2025).

Finally, similarly to the previous NHS productivity updates, we provide the estimates of the growth rates corrected for the number of Trusts included in the core NCC schedule. Both uncorrected and corrected growth rates are reported in Table 21.

6.4.2. Growth in NHS activity captured in the National Cost Collection data

In this section, we present the results for the three most recent financial years of NHS activity captured by the NCC data. Tables reporting the full time series for both activity and average costs can be found in the Online Appendix.

Table 20 provides an overview of the activity volumes and average unit costs for the last three years, as measured by the original NCC data. Note that the Community Mental Health setting was excluded from the analysis, similarly to the previous year.[42] Table 21 presents raw volume growth rates, Laspeyres volume growth rates derived from the NCC data as is, and Laspeyres volume growth rates adjusted for the number of Trusts present in the two financial years, for both the links 2021/22-2022/23 and 2019/20-2022/23.

As appears from Table 20, activity volumes between 2021/22 and 2022/23 were fairly stable, with some settings seeing an increase (Chemo-/Radiotherapy and High Cost Drugs and Devices, Diagnostic Tests, Radiology, A&E and Ambulance, Specialist Services) and others declining (Community Care, Renal Dialysis, Other NHS activity). A similar picture arises when comparing activity volumes as measured by the national level NCC data between 2019/20 and 2022/23. This may reflect that some trends in service provision induced by the pandemic remained until 2022/23.

[42] For historic trends in community mental health activity see Table A14 in the Online Appendix.

Table 20: Activity volumes and average unit costs for the settings measured by NCC

NHS setting		2020/21		2021/22		2022/23	
		Volume of activity	Average cost (£)	Volume of activity	Average cost (£)	Volume of activity	Average cost (£)
Outpatient		72,213,955	187	84,986,789	170	84,419,299	176
Community Care*		72,359,084	86	73,310,146	79	64,695,923	80
Directly Accessed Diagnostic Services		4,588,685	52	6,318,767	41	7,284,013	44
Directly Accessed Pathology Services		306,866,304	3	385,602,765	2	410,137,641	2
Radiology		7,829,191	149	10,020,705	131	10,617,762	143
Rehabilitation*		1,630,522	574	1,223,867	516	1,225,179	511
Renal dialysis*		4,411,120	155	4,506,408	152	4,017,010	185
A&E and Ambulance							
Emergency Departments	AD	13,417	333	-	-	-	-
	NAD	41,134	187	-	-	-	-
	Unknown	12,163,403	340	-	-	-	-
	Total	12,217,954		15,601,148	281	15,989,113	312
Other A&E services	AD	23,869	174	-	-	-	-
	NAD	1,032,662	111	-	-	-	-
	Unknown	2,113,039	141	-	-	-	-
	Total	3,169,570		4,490,255	108	5,022,481	104
Ambulance Services	Hear and treat/refer	793,116	85	1,238,673	63	1,014,301	78
	See and treat/refer	2,919,214	268	2,652,954	268	2,597,637	308
	See and treat & convey	4,881,719	357	4,929,780	390	4,547,244	462
	Other	1,590,487	90	3,341,620	50	4,448,734	22
Chemotherapy, Radiotherapy, High Cost Drugs and Devices							
Chemotherapy*		2,547,729	805	2,932,618	657	1,500,077	426
Radiotherapy*		1,562,053	353	1,623,628	339	1,578,416	360
High Cost Drugs		2,627,691	766	3,492,206	774	6,813,360	606
High Cost Devices		273,129	1,261	365,412	1,503	310,160	1,954
Specialist Services							
Critical Care		2,218,159	1,864	2,362,589	1,753	2,404,161	1831
Specialist Palliative Care*		761,030	259	823,770	219	-	-
Cystic Fibrosis		51,770	1,352	50,103	1,212	44,759	1,409
Cancer Multi-Disciplinary Team Meetings		1,775,556	146	2,034,490	139	6,411,493	48
Other NHS activity							
Regular Day & Night Attenders		240,476	483	267,445	403	305,967	409
Audiological Services		2,175,264	100	2,615,431	90	1,797,966	100
Day Care Facilities		45,078	346	70,000	276	46,537	167

Notes: * Fully or partially mandated for PLICS collection in 2022/23. Cystic Fibrosis activity for 2021/22 and 2022/23 was excluded from the main collection, but included in the Organisation level source data part 3 supplement. The data provided is on the national level. A huge drop in Chemotherapy activity volumes and concurrent jump in High Cost Drugs activity volumes is due to embedding procurement currencies into High Cost Drugs currencies in 2022/23. A large increase in the Cancer Multidisciplinary Teams Meetings activity volume is due to a data quality issue in three Trusts, which are excluded from this sub-setting when calculating growth rates.

Table 21 suggests that between 2021/22 and 2022/23 NHS settings exhibited significant variation in growth rates. The working/total days adjusted Laspeyres output growth for NHS activity corrected for the number of providers was -0.01% if the outpatient setting is included, and -0.79% otherwise. The largest increases were recorded for Diagnostic Tests and Radiology (9.84% and 7.84% respectively, when corrected for the number of providers), similar to the previous link. Implausibly large positive Cancer Multidisciplinary Teams Meetings sub-setting growth rate using national level data was due to a data quality issue in three Trusts (see p. 43). We were able to identify and exclude these providers in the analysis corrected for the number of Trusts.

Of note are the substantial negative growth rates for the settings which were mandated for PLICS in 2022/23: Rehabilitation (VC* currencies only), Renal Dialysis, Radiotherapy, and Community Care, when using raw NCC data, dropped by 16.15%, 8.58%, 10.89%, and 2.19% respectively. Chemotherapy was also moved to PLICS, but its large negative Laspeyres growth rate is mostly explained by the move of procurement currencies to the High Cost Drugs sub-setting. Altogether the Chemo-/Radiotherapy and High Cost Drugs and Devices setting saw a negative growth, of -5.08% when corrected for the number of providers, for the first time since the pandemic.

Between 2019/20 and 2022/23, the Laspeyres growth rates showed a negative growth for all settings except for Diagnostic Tests and Chemo-/Radiotherapy and High Cost Drugs and Devices. The working/total days adjusted Laspeyres growth rate of activity corrected for the number of Trusts was -3.60%, and -1.27% when the outpatient setting was excluded. This suggests that while the NHS is on a path of recovery from the pandemic downturn, pre-pandemic levels of activity have not been reached yet.

We also conducted a sensitivity check excluding all settings which fully moved to PLICS and/or had other significant changes in recording in 2022/23: Rehabilitation, Renal Dialysis, and Chemo-/ Radiotherapy, High Cost Drugs and Devices. We kept community care services in this check as we managed to remove specific currencies affected by the (soft) PLICS mandation from this setting. Taken together, the settings omitted from this sensitivity check constitute 25.32% and 25.92% of the total healthcare expenditure in 2021/22 and 2019/20 respectively. The resulting working/total days adjusted Laspeyres output growth rate for non-acute healthcare activity (excluding outpatient activity), as reported in the NCC data, and corrected for the number of Trusts, yields a higher growth rate of 1.30% between 2021/22 and 2022/23. This may indicate that recording activity in PLICS format could be the reason for lower growth rates in non-acute care. However, for the 2019/20-2022/23 link, the Laspeyres growth rate decreases to -3.00%. This is due to the exclusion of Chemo-/Radiotherapy, High Cost Drugs and Devices setting, which demonstrated substantial growth since the pandemic, with a large positive Laspeyres growth rate.

In the remainder of this section we describe in more detail the setting-specific activity and unit costs, providing, where appropriate, further information.

Table 21: Raw volume and Laspeyres growth rates for the settings measured by NCC

NHS setting	2021/22-2022/23			2019/20-2022/23		
	Raw volume growth rate	Laspeyres growth rate	Laspeyres growth rate corrected for # of Trusts	Raw volume growth rate	Laspeyres growth rate	Laspeyres growth rate corrected for # of Trusts
Outpatient	-0.67%	2.19%	1.42%	-0.51%	-3.09%	-7.89%
Community Care*	-11.75%	-2.19%	0.74%	-14.99%	-1.93%	-2.88%
Diagnostic Tests	6.51%	12.24%	9.84%	4.41%	19.04%	15.78%
Directly Accessed Diagnostic Services	15.28%	18.26%	13.60%	3.26%	4.95%	0.47%
Directly Accessed Pathology Services	6.36%	10.49%	8.73%	4.43%	23.43%	20.57%
Radiology	5.96%	9.35%	7.84%	-7.87%	-3.54%	-7.11%
Rehabilitation*	-18.41%	-16.15%	-27.54%	-55.63%	-52.41%	-58.50%
Renal dialysis*	-10.86%	-8.58%	-11.23%	-5.26%	-3.57%	-6.17%
A&E and Ambulance	5.27%	0.07%	-0.49%	10.25%	-2.31%	-4.99%
Emergency Departments	2.49%	-3.50%	-3.50%	3.37%	2.35%	-1.60%
Other A&E services	11.85%	2.52%	1.82%	10.81%	11.22%	4.39%
Ambulance Services	3.66%	11.97%	9.65%	16.77%	-11.59%	-11.59%
Chemotherapy, Radiotherapy, High Cost Drugs and Devices	21.25%	-5.21%	-5.08%	32.44%	21.64%	14.80%
*Chemotherapy**	-48.85%	-71.95%	-70.84%	-42.44%	-70.82%	-72.78%
*Radiotherapy**	-2.78%	-12.37%	-10.89%	-14.94%	-13.86%	-19.23%
High Cost Drugs	95.10%	42.93%	41.67%	145.57%	110.31%	99.16%
High Cost Devices	-15.12%	-0.48%	-2.70%	-33.60%	1.32%	-4.02%
Specialist Services	68.10%	13.82%	2.00%	101.53%	12.28%	-2.14%
Critical Care	1.76%	3.88%	1.87%	-3.21%	0.92%	-2.75%
Cancer Multi-Disciplinary Team Meetings	215.14%	178.72%	3.88%	239.13%	204.45%	6.97%
Other NHS activity	-27.17%	-15.16%	-12.56%	-38.34%	-28.01%	-27.93%
Regular Day & Night Attenders	14.40%	19.56%	21.92%	-7.61%	-5.11%	0.59%
Audiological Services	-31.26%	-29.43%	-27.94%	-41.29%	-38.73%	-41.08%
Day Care Facilities	-33.52%	-33.80%	-12.58%	-50.33%	-51.87%	-51.87%
Total NHS output measured by NCC		**1.33%**	**-0.01%**		**1.32%**	**-3.60%**
excluding Outpatient		**0.87%**	**-0.79%**		**3.62%**	**-1.27%**
excluding Outpatient, Rehabilitation, Renal Dialysis, and Chemo-/ Radiotherapy, High Cost Drugs and Devices		**3.58%**	**1.30%**		**1.91%**	**-3.00%**

* Fully or partially mandated for PLICS collection in 2022/23. Laspeyres growth rates are adjusted for working/total days. Large negative Chemotherapy growth rates are due to moving part of its activity to the High Cost Drugs sub-setting in 2022/23. Large positive Cancer Multidisciplinary Teams Meetings growth rate using national level data is due to a data quality issue in three Trusts, which are excluded in the growth rates corrected for the number of Trusts. Growth for the Rehabilitation setting is based on VC* currencies only. Growth rates for the 2019/20-2022/23 link exclude 'Other' (2022/23) and 'Calls' (2019/20) ambulance activity due to a change in recording, and Onasemnogene Abeparvovec (2022/23) from High Cost Drugs as this drug did not exist in 2019/20.

Outpatient activity

Outpatient activity, as measured in the NCC database, is classified into three major groups: consultant-led activity, non-consultant-led activity, and procedures. Consultant- and non-consultant-led activity represent broadly the same set of outpatient specific HRG-style codes (currency codes beginning with WF). Outpatient procedure codes represent procedure-related HRGs which may appear in other hospital settings. The shares of outpatient activity by the three major groups described above changed in 2022/23 compared to previous years, with activity moving from consultant-led to non-consultant-led. While in 2021/22 consultant-led activity represented 66% of overall outpatient activity (63% and 60% in 2020/21 and 2019/20 respectively), in 2022/23 its share went down to 57%. This was accompanied by a

contemporaneous increase in the share of non-consultant-led activity from 18% in 2021/22 to 25% in 2022/23. The outpatient procedures' share was 17% of overall outpatient activity, similar to the 16% observed in 2021/22.

For the 2021/22-2022/23 link, the adjusted Laspeyres growth rate corrected for the number of providers was 1.42%, which is similar to the cost-weighted growth rate obtained using HES Outpatient data. When comparing outpatient activity to its pre-pandemic levels, i.e. with financial year 2019/20, despite very similar activity volumes, the adjusted Laspeyres growth rate was negative at -7.89%. This may reflect a change in activity composition across face-to-face and non-face-to-face activity. In particular, more costly face-to-face services may have decreased in volume while less costly remote service provision increased in 2022/23 compared to 2019/20.

A&E and ambulance services

A&E services are provided in both Emergency Departments (EDs) and 'Other A&E' departments.[43] In 2019/20 and 2020/21 attendances at A&E departments were classified into three groups: those where patients are subsequently admitted (AD) to an inpatient ward, those where patients are not admitted (NAD), and those with an unknown outcome (Unknown). However, in 2021/22 this classification was removed, and only the total number of activities within each department type was recorded. When comparing 2022/23 with 2019/20, we therefore aggregated activity to department type level.

Between 2021/22 and 2022/23, emergency department attendances (raw volume) increased by 2.49%. However, the Laspeyres volume growth corrected for the number of Trusts was negative (-3.50%) over the same period.

We noted a substantial increase in the raw volume growth of 'Other A&E services' (11.85%) between 2021/22 and 2022/23, with a resulting 1.82% Laspeyres growth rate when corrected for the number of Trusts. Furthermore, when we compared 'Other A&E services' activity in 2022/23 to that of 2019/20, both the raw volume growth rate and the Laspeyres volume growth corrected for the number of Trusts remain positive, at 10.81% and 4.39% respectively, thereby indicating post-pandemic recovery for this category.

As regards ambulance services, a substantial increase in activity volume was captured for the 'Other' category between 2021/22 and 2022/23, while for the remaining activity categories volumes slightly decreased. For this period, overall ambulance services grew by 6.41% in raw volumes and 11.97% when cost-adjusted growth is considered. Note that the 'Other' ambulance activity was excluded from the Laspeyres growth rates calculation for the 2019/20-2022/23 link due to a change in recording guidance in 2021/22. The effect of this

[43] Emergency departments offer a consultant-led 24 hour service with full resuscitation facilities and designated accommodation for the reception of A&E patients, whilst other A&E departments can be either of the following: 'Consultant-led mono specialty accident and emergency services (e.g. ophthalmology, dental) with designated accommodation for the reception of patients'; 'Other type of A&E/minor injury activity with designated accommodation for the reception of accident and emergency patients' and 'NHS Walk-in Centres'. For a definition see the spreadsheet "10. Attendance Location" of the file "ECDS Enhanced Technical Output Specification (ETOS) v3.1.1." available at NHS Digital website "ECDS guidance and documents" (last accessed 27/02/2025).

exclusion is quite substantial, resulting in a negative (-11.59%) Laspeyres growth for Ambulance services between 2019/20 and 2022/23.

Chemotherapy, Radiotherapy, High Cost Drugs and Devices

The Chemo-/Radiotherapy, High Cost Drugs and Devices setting saw a substantial overhaul in the ways activity was recorded in 2022/23. Discontinuation of procurement currencies in Chemotherapy and corresponding creation of a new set of currencies in the High Cost Drugs sub-setting resulted in very large negative growth of the former and very large positive growth of the latter, making year-on-year comparisons less meaningful. Looking at the setting as a whole, we observed an increase in (raw) activity volumes by 21.3% between 2021/22 and 2022/23, but a negative Laspeyres growth rate of -5.08% when corrected for the number of Trusts. This is the first time this setting has a negative growth since the pandemic, and may suggest that substantial volume growth was driven by activity with lower cost. Another reason for the negative growth could be the mandation of PLICS for chemotherapy and radiotherapy activity. We therefore should treat year-on-year comparisons with caution.

We found a substantial positive growth in this NHS setting when comparing activity in 2022/23 with 2019/20, equal to 32.44% when considering raw volumes. This decreases to 21.64% when we calculate the Laspeyres growth rate, without adjusting for the number of providers. When adjusted for the number of Trusts, the Laspeyres growth index for the setting becomes 14.80% – about 7 percentage points lower than the uncorrected one, suggesting that Trusts not included in the 2019/20 NCC data were contributing a large share of this setting's output growth. The Chemotherapy, Radiotherapy, High Cost Drugs and Devices setting was one of the two settings with a positive growth rate between 2019/20 and 2022/23.

Community care

Community care includes a very diverse array of activities carried out in the community by Allied Health Professionals, Community Rehabilitation Teams, and by Health Visiting and Midwifery personnel, as well as Intermediate Care (incl. crisis responses, care home based services, etc), Medical and Dental care (e.g. community, emergency, and general dental services), Nursing (ranging from school-based children's healthcare service to specialist nursing for various diseases) and wheelchair services for both adults and children.

Between 2021/22 and 2022/23, community care activity as captured by the core NCC saw a negative raw volume growth of -11.75%. This is likely explained by two factors: first, the soft move to PLICS for community maternity, health visiting, and wheelchair services; and second, the existence of a contingency option for some Trusts to continue reporting their community care activity by submitting Korner returns instead of PLICS. After making adjustments to account for these cases, detailed in the beginning of this section, the Laspeyres output growth rate, when corrected for the number of Trusts, was 0.74%.

A similar picture emerged when comparing 2022/23 with 2019/20. Compared to 2019/20, community care activity in 2022/23 decreased by 14.99% in terms of raw volume, and by 1.93% when the Laspeyres cost-weighted growth was computed. When correcting for the number of Trusts, the Laspeyres growth rate became even more negative at -2.88%. Taken together, the results suggest that community care activity has been recovering since the

pandemic, but has not yet reached pre-pandemic levels. At the same time, we advise to interpret these results with caution due to changes in the cost reporting guidance.

Diagnostic tests, pathology, and radiology

Continuing the post-pandemic recovery trend, diagnostic and screening activities increased significantly in raw volumes in 2022/23, with a Laspeyres volume growth rate corrected for the number of Trusts of 9.84% for diagnostic and pathology services and 7.84% for radiological services. We believe this may be explained by rolling out Community Diagnostic Centres, where diagnostic services were also provided.[44]

When comparing the output in 2022/23 with that for 2019/20, the volume of activity of Diagnostic Tests (including pathology services) exceeded its pre-pandemic levels, having recorded a 4.41% growth in raw volumes. The Laspeyres growth was even higher, at 15.78% when correcting for the number of Trusts, due to higher volumes of more expensive activity types in 2022/23 compared to 2019/20. Only for the Radiology setting, post-pandemic recovery was still lagging behind, with a raw volume growth of -7.87% and a Laspeyres growth rate of -7.11%, when correcting for the number of providers.

Rehabilitation and Renal Dialysis

Renal dialysis and rehabilitation services were also among the settings which were mandated for PLICS collection in 2022/23. This might explain why, differently from the previous years, Renal Dialysis recorded a negative growth equal to -10.86% in raw volume, and a Laspeyres growth rate of -11.23%, when corrected for the number of Trusts. Similarly, for the 2019/20-2022/23 link, both the raw and the cost-adjusted growth rates were also negative, at -5.26% and -6.17% respectively (corrected for the number of providers). This is quite a substantial change, given that this is life-saving care. We therefore suggest that these results should be interpreted with caution.

Rehabilitation services, as measured by the VC* currencies, continued exhibiting negative year-on-year growth. The Laspeyres volume growth rate, adjusted for the number of Trusts, was -27.54% between 2021/22 and 2022/23, and -58.5% between 2019/20 and2022/23. This rapidly falling trend in VC* currencies was likely due to some of the rehabilitation services being delivered, and therefore recorded, in other ways/point of delivery, and it was not an indication of less rehabilitation care being provided by the NHS. More specifically, in 2022/23 other currencies were also reported in the rehabilitation activity worksheet. We excluded them to avoid double counting and to preserve consistency across years, as explained in the beginning of this section. However, analysing all the currencies would yield a better understanding of the actual growth of rehabilitation activity. Table 22 presents the growth rates for the Rehabilitation setting when other currencies, not reported in the NCC data in the previous years, are included. This resulted in 0.11% raw volume growth rate for the 2021/22-2022/23 link, and 3.38% cost-weighted growth rate. When correcting for the number of Trusts, the Laspeyres growth rate became negative at -7.09%. This was substantially higher than the -27.54% growth obtained when only VC* codes are included.

[44] For more information on Community Diagnostic Centres see here (last accessed 13/03/2025).

Table 22: Growth rates for the whole Rehabilitation setting

	Raw volume growth rate	Laspeyres growth rate	Laspeyres growth rate corrected for # of Trusts
2021/22-2022/23	0.11%	3.38%	-7.09%
2019/20-2022/23	-45.56%	-39.08%	-43.85%

Notes: Laspeyres growth rates are adjusted for working days.

The difference between 2019/20 and 2022/23, however, remains quite large and negative, for all the growth rate measures constructed. This may be explained by the move to PLICS in 2022/23, and so the 2022/23 rehabilitation activity may not be directly comparable to previous years.

Specialist services

The setting Specialist Services, as defined in this report, comprises the following services: critical care[45] and cancer multi-disciplinary team meetings. Up to 2018/19, cystic fibrosis services were reported in the NCC data as a separate activity and included in the Specialist Services setting. In the 2019/20 NCC schedule, this activity was recorded under different NHS settings and the volumes were no longer comparable. In the 2020/21 NCC dataset cystic fibrosis activity was reported in a further new format, in a separate schedule. In the 2021/22 and 2022/23 collections it was reported in the supplementary materials, rather than in the core schedule, indicating potential data issues. We therefore excluded this sub-setting from the calculations of the Laspeyres output growth rate for the Specialist Services setting. In addition, up to 2021/22, we also included specialist palliative care activity in the Specialist Services setting, but we are no longer able to do so due to the move of this activity to the inpatient setting in the PLICS reporting format and the disappearance of the previously existing currencies.

Critical care services saw a modest positive growth between 2021/22 and 2022/23 equal to 1.87% Laspeyres growth when corrected for the number of Trusts, and a very similar raw volume growth. We still found a negative Laspeyres growth rate (adjusted for the number of providers) of -2.75% for the 2019/20-2022/23 link, suggesting that critical care activity has not yet reached pre-pandemic levels.

Very large fluctuations in raw activity volumes were observed for cancer multi-disciplinary team meetings, resulting in implausibly high growth rates. As those were driven by three care providers, we excluded them from the estimates of Laspeyres growth adjusted for the number of Trusts from both years. The resulting growth rates were 3.88% and 6.97% for the 2021/22-2022/23 and 2019/20-2022/23 links respectively, suggesting that this activity type was one of the few that not only recovered from the pandemic, but also exceeded pre-pandemic levels.

Other NHS activity

Between 2021/22 and 2022/23, the 'Other NHS activity' setting saw declines in most sub-settings. The total raw volume decreased by -27.17%, and the Laspeyres growth rate was -12.56% when adjusted for the number of Trusts. The negative growth rates were even larger

[45] Up to 2017/18, CHE NHS productivity updates referred to Critical Care under the 'Adult critical care' label.

when 2022/23 was compared with 2019/20, with a raw volume decline of -38.34% and a Laspeyres growth of -27.93% (corrected for the number of Trusts).

The main driver of this decline was the drop in audiological services, which is the major contributor to the setting. We note that the -27.94% (-41.08%) Laspeyres growth rate for the 2021/22-2022/23 (2019/20-2022/23) link, adjusted for the number of Trusts, may be explained by a concurrent rise in the respective specialty in the Outpatient setting. Therefore, the results are likely explained by the move of activity across points of delivery, rather than a genuine fall in the volume of audiological services provided.

As regards regular day and night attenders, we found that the Laspeyres cost-weighted growth rate, adjusted for the number of Trusts, increased by 21.92% between 2021/22 and 2022/23. Also showing a good recovery from the pandemic period, and having roughly reached pre-pandemic levels, with a 0.56% Laspeyres growth rate adjusted for the number of Trusts between 2019/20 and 2022/23.

6.5. Dentistry and ophthalmology

- **Between 2021/22 and 2022/23, the cost-weighted and working days adjusted Laspeyres output growth measure for**
  - **Ophthalmology was 1.36%;**
  - **Dentistry was 21.15%.**
- **Combining the two activities yielded growth of 17.66%.[46]**

Information about dentistry[47] (activity and costs) is published by NHS England. Up to 2019/20, activity data for Ophthalmology[48] were published by NHS England (previously NHS Digital), but this series has since been discontinued. From 2020/21 onwards, data on ophthalmological services are provided directly by NHS England. Table 23 shows the volume of activity and average costs for both types of outputs, with dental activity differentiated into dental bands for the last three financial years. Unit cost data for ophthalmological services were provided by the Association of Optometrists up until 2019/20, and since 2020/21 have been taken from the NHS Business Services Authority website.[49]

[46] Between 2019/20 and 2022/23, the cost-weighted and working days adjusted Laspeyres output growth for Ophthalmology was -3.08%, for Dentistry was -12.41%, and for the two activities combined was -11.07%.
[47] NHS Dental Statistics (last accessed 05/03/2025).
[48] Ophthalmic services activity (last accessed 05/03/2025).
[49] NHS Business Authority Cost of NHS Treatment (last accessed 05/03/2025).

Table 23: Ophthalmology and Dentistry

Output		2020/21		2021/22		2022/23	
		Volume of activity	Average cost (£)	Volume of activity	Average cost (£)	Volume of activity	Average cost (3)
Ophthalmology		9,199,829	22	12,719,843	22	12,790,385	22
Dentistry	Band 1	4,890,432	24	13,774,346	24	18,062,643	26
	Band 2	2,953,317	65	7,328,280	65	9,013,277	71
	Band 3	497,917	283	1,391,912	283	1,567,481	307
	Urgent	3,580,057	24	3,782,854	24	3,750,452	26
	Other	62,929	24	85,368	24	83,842	26
Total		**11,984,652**	**45**	**26,362,760**	**49**	**32,477,694**	**52**

The raw volume of ophthalmic services increased in 2022/23 by 0.55% compared to the previous financial year, with average costs remaining unchanged. Compared to pre-pandemic activity levels, the total volume of ophthalmological services in 2022/23 was still 4.23% lower than in 2019/20, with only a very marginal improvement to 2021/22, when the total volume of ophthalmological services was 4.76% lower compared to its pre-pandemic level.

Dental activity recorded another substantial raw volume growth of 23.2% in 2022/23, with the largest increases observed for Bands 1 and 2 (respectively, 31.13% and 22.99%). This shows a continued increase which started in 2021/22. When comparing activity volumes with 2019/20, dental activity has still not fully recovered to pre-pandemic levels, with total volumes in 2022/23 being 15.38% lower than in 2019/20. The growth rate for dental services has been negative for a while, and the pandemic exacerbated systemic issues, with significant number of NHS dentists having moved away from providing NHS treatments,[50] and this trend is likely to continue as in addition to those leaving, a large proportion of NHS dentists might further reduce their commitment with the NHS.[51]

Average costs of each type of dental activity slightly increased in 2022/23, and the average unit cost of dental services increased to £52.

Combining activity for dental services and ophthalmology, the cost-weighted and working days adjusted Laspeyres output growth measure was 17.66% between 2021/22 and 2022/23. The analogous measure between 2019/20 and 2022/23 was -11.07%.

6.6. Primary care activity

- **Between 2021/22 and 2022/23, the cost-weighted, quality and working days adjusted Laspeyres output growth of primary care activity was -4.84%.[52]**

[50] Campbell D. 'Dental deserts' form in England as dentists quit NHS, experts warn: The Guardian; 2022 (last accessed 11/04/2025).
[51] According to a survey run by the British Dental Association (last accessed 11/04/2025).
[52] Between 2019/20 and 2022/23, the cost-weighted, quality and working days adjusted Laspeyres output growth of primary care activity was 11.81%.

Since 2018/19, NHS England (formerly NHS Digital) has been releasing the General Practice (GP) appointments dataset, which is used to calculate the output growth of primary care activity (Arabadzhyan et al., 2021).[53,54] NHS England releases three separate datasets: (1) a monthly summary of GP appointments data at the national level, (2) a monthly dataset at the CCG level with NHS geographies up to regional local office included, and (3) a CCG-level dataset reporting daily appointment counts in general practices. The monthly and daily appointment datasets at CCG level allow for the grouping of GP appointment modes by appointment status and waiting time.

Each monthly data release covers the most recent 30 months, with updated information on the current month and the previous 17 months (18 months in total). The data include activity recorded within the appointment systems for the great majority of General Practices across England, with average patient coverage of about 99.8% during 2022/23.[55] For the purpose of our NHS productivity calculations, we use the monthly CCG-level dataset to obtain monthly appointment data, with a breakdown by appointment status and waiting time within each appointment mode. We use the national-level dataset for the monthly estimates of patient coverage. Since December 2020, data on COVID-19 vaccinations carried out by GP practices and Primary Care Networks have also been recorded and are included in our analysis.[56]

In this report, we calculate primary care output growth, with and without quality and working day adjustment, following the methodology outlined in the 2020/21 productivity update (Arabadzhyan et al., 2023). In addition to our analysis of activity and its growth between the latest two financial years, i.e. 2021/22 and 2022/23, we also provide an overview of how GP appointments compare with pre-pandemic volumes by calculating growth rates between 2019/20 and 2022/23. Note that COVID-19 vaccinations are not adjusted for waiting times since we do not have information on how long patients had to wait for their vaccination appointments.

In the remainder of this section: we outline the continued impact of the COVID-19 pandemic on the delivery of primary care services and the quality of the data recorded; provide information on assigning the unit costs to different appointment modes; report the cost-weighted, quality- and working days adjusted output growth rates of the primary care setting for the 2021/22-2022/23 and 2019/20-2022/23 links. Finally, we perform two sensitivity analyses. The first sensitivity check is the same as the one included in previous NHS productivity growth updates (Arabadzhyan et al., 2022, 2023, 2024). In it we use different unit cost weights for remote appointments. This exercise sheds light on the impact of using alternative value weights on the overall growth of primary care activity. The second sensitivity check reintroduces the Quality and Outcomes Framework (QOF) based quality adjustment. NHS England suggests that QOF achievement indicators for 2021/22 were payment protected,

[53] Up to 2017/18, the output growth measure of the primary care setting was calculated using GP Patient Survey data (Castelli et al., 2020, Castelli et al., 2019).

[54] NHS England GP appointments data (last accessed 11/04/2025). For the analysis presented in this section, we used the January 2024 publication.

[55] Calculated based on the January 2023 Appointments in General Practice publication.

[56] These data are published separately from the main GP appointments data, in the National Immunisation Management Service (NIMS) dataset. NIMS is the System of Record for the NHS COVID-19 vaccination programme in England.

while in 2022/23 payment protection was removed. Therefore, indicators are not directly comparable across years. For this reason, we keep this additional analysis as a sensitivity check, rather than incorporating it into the baseline figures.

6.6.1. GP services and the COVID-19 pandemic

The COVID-19 pandemic led to substantial changes in the way primary care services were provided. While patients avoided using primary care services either out of fear of contracting the virus or putting pressure on the NHS,[57] GP practices were faced with the task of reorganising service provision to contain virus spread. A higher proportion of appointments were offered as either telephone or video/online consultations. Importantly, these changes were implemented with the reassurance that GP practices would continue to receive the same income as they would have in the business-as-usual scenario.

As England started moving out of the pandemic, and a substantial fraction of the population was immunised, GP practices were advised to adapt their mode of operation accordingly, by ensuring that face-to-face appointments were re-offered to patients, and that patients' preferences for face-to-face consultations were respected.[58] Primary care services re-organisation was also supported by additional funding to increase practice capacity.[59]

Another important aspect which modified primary care provision was the COVID-19 vaccination programme. Similarly to the 2020/21 and 2021/22 NHS productivity updates, we continue to include vaccination appointments provided by GP practices in the primary care output measure.

The pandemic also affected the GP appointments data collection and data quality. As noted in the GP appointments data publication,[60] differences in appointment management systems among practices were exacerbated during the pandemic, negatively affecting the quality of the data recorded. As discussed in Arabadzhyan et al. (2023), it is also possible that the number of face-to-face appointments was overestimated, whilst the number of telephone appointments was underestimated due to misreporting and the use of block appointment bookings. The data publication suggests that in the post-pandemic period, the changes made in the ways GP practices provided care to patients, outlined above, may have partially persisted.

6.6.2. Assigning unit costs to primary care consultations

Unit costs for primary care consultations are taken from the 'Unit Costs of Health and Social Care' manuals (Curtis and Burns, 2020, Jones and Burns, 2021, Jones et al., 2023, Jones et al., 2024). In order to calculate the primary care cost-weighted output growth measures, we need to use appropriate unit costs for the different types of primary care activity.

---

[57] Fear of contacting GPs during Covid outbreak 'fuelling missed diagnoses' – The Guardian (last accessed 21/03/2025).
[58] See updated guidance for practices from 13/05/2021 (last accessed 21/03/2025).
[59] See GP access improvement plan from 14/10/2021 (last accessed 21/03/2025).
[60] Appointments in general practice: supporting information - NHS Digital (last accessed 21/03/2025).

We use the cost of patient contact per-minute of GP's time (excluding travel) as our primary unit.[61] The per-minute cost of a GP contact reported for both 2019/20 and 2020/21 was £4.30, while that for 2021/22 rose to £4.41.[62] In 2022/23, it saw a further increase up to £5.63.
Finally, in order to calculate the unit costs for different types of appointments, we need to know the average duration of each consultation type. It should be noted that changes in the way primary care services were delivered during the pandemic could have affected the total duration of a consultation. The GP appointments data collection started recording consultation duration from December 2021. However, these data are not available by mode of appointment. Also, data quality remains a concern, with about a quarter of observations having unknown consultation duration. In the absence of more recent empirical evidence, we are using the baseline estimates of consultation duration for each consultation type reported in the 2018/19 NHS productivity update (Arabadzhyan et al., 2021) and the cost per-minute of GP time as reported in the 'Unit Costs of Health and Social Care' manual, to obtain the unit costs for each appointment mode reported in Table 25.

As mentioned earlier in this section, the COVID-19 pandemic profoundly impacted the way primary care services were delivered, with some of the changes in work practices becoming the "new normal". Therefore, we continue to treat face-to-face, telephone and remote appointments as being of the same value to patients, assigning the unit cost of a GP face-to-face appointment also to the other two types of GP appointments (see Arabadzhyan et al. (2023) for a detailed analysis of the pandemic-driven changes to both demand for and supply of primary care activity).

In Table 24, we report the total volume of GP appointments by mode of appointment for the years 2019/20 to 2022/23, and their respective unit costs in Table 25 with the same unit costs for face-to-face, telephone and video/online consultations.

Table 24: Volume of GP activity

Appointment mode	2019/20	2020/21	2021/22	2022/23
Face-to-Face	244,918,881	143,040,299	184,508,264	219,195,814
Home Visit	2,868,106	1,612,794	1,990,396	2,549,152
Telephone	46 678,238	118,225,447	117,123,929	96,140,568
Video/Online	1,914,916	1,092,986	1,574,982	1,960,759
COVID-19 vaccinations	-	19,846,183	41,375,339	10,376,741
Total GP appointments	296,380,141	283,817,710	346,572,910	330,223,034

[61] A fuller explanation for this decision can be found in Arabadzhyan et al. (2021).
[62] This year, we amended the methodology on deriving the per-minute unit cost for home visits. Previously, a fixed additional cost of £0.9 was added to the pre-minute cost of a regular GP contact, multiplied by a ratio of change in annual travel costs between financial years. However, from this year onwards, we derive the per-minute cost of a GP's home visit using the methodology from the PSSRU 2013 report (pp. 190-191), whereby the per-minute cost of total time (including travel costs) is multiplied by a factor of 1.99 to account for the different ratio of direct to indirect time for out of surgery visits.

Table 25: Unit costs (£) of appointment modes

Appointment mode	2019/20 and 2020/21	2021/22	2022/23
Face-to-Face	39.65	40.62	51.91
Home Visit	121.68	123.48	157.29
Telephone	39.65	40.62	51.91
Video/Online	39.65	40.62	51.91
COVID-19 vaccinations	39.65	40.62	51.91

Overall, between 2021/22 and 2022/23 primary care output decreased by 4.72%, when considering its raw volume growth. This was mainly due to a substantial decrease in the number of COVID-19 vaccination appointments and telephone appointments, while face-to-face consultations saw an increase. However, in comparison with the pre-pandemic year 2019/20, the number of consultations was 11.42% higher. This increase was driven by telephone appointments, which doubled between 2019/20 and 2022/23, having peaked in 2020/21. Face-to-face consultations (including vaccinations) and home visits did not reach the pre-pandemic levels recorded for 2019/20.

6.6.3. Quality adjustments

We normally include two quality adjustments for primary care activity: improvement in disease management (blood pressure management) for coronary heart disease, history of transient ischaemic attack or stroke, and hypertension;[63] and waiting times.

However, in 2019/20, the necessary data to measure improvement in disease management were not comparable with previous years. This was due to a change in the definition of these indicators in the Quality and Outcomes framework (QOF) indicators.[64] In 2020/21, to alleviate primary care workload, the majority of QOF indicators were income protected. This meant that practices received funding independently from their performance.[65] NHS England therefore omitted the achievement data from the official publication. Comparison across years in this context would be misleading.[66] In 2021/22, achievement indicators, still income protected, were reintroduced in the official publication. However, we were not yet able to incorporate QOF quality adjustment into the productivity update due to lack of data for 2020/21. The 2022/23 QOF indicators were no longer income protected, which implies that they are not comparable with the 2021/22 data.[67] We do, however, include a sensitivity check, which reintroduces the QOF adjustment to understand how that impacts the baseline results.

[63] See Arabadzhyan et al. (2023) for further details on this quality adjustment.
[64] For further details on these changes, see the 2019/20 National Health Service productivity update (Arabadzhyan et al., 2022).
[65] COVID-19: toolkit for GPs and GP practices - BMA (last accessed 21/03/2025).
[66] Further details on Quality and Outcomes indicators, 2021, are available on the NHS Digital website (last accessed 21/03/2025).
[67] QOF 2022/23 results can be accessed also on the NHS England website (last accessed 21/03/2025).

6.6.3.1. *Waiting times quality adjustment*

Information on the time between the date an appointment is booked and the date of the actual appointment- waiting time (WT) - continued to be collected. In particular, the GP appointment dataset includes information on the number of appointments by time intervals for each appointment mode.[68]

Similarly to hospital inpatient and outpatient activity, we use the 80th percentile waiting time as our quality indicator. Further details can be found in Arabadzhyan et al. (2022).

Table 26 presents the 80th percentile waiting times for each appointment mode for the financial years 2019/20, 2020/21, 2021/22, 2022/23. It is worth noting that the waiting times distribution is positively skewed: in 2022/23, about 47% of face-to-face appointments,[69] 72% of home visits, 68% of telephone consultations, and 46% of video/online appointments took place within 1 day from the booking date. Compared to 2021/22, waiting times for all appointment types increased, which could be due to increased demand in 2022/23.[70] The 80th percentile waiting time for telephone consultations increased in 2022/23, although the volumes of telephone appointments were lower than those recorded in 2021/22. These changes might be explained by shifts in workforce capacity. It is plausible that some of the staff previously engaged in remote consultations were moved to providing face-to-face care. This could result in increased waiting times for remote appointments.

We also note that in 2022/23, waiting times for all types of GP consultations were quite different from those observed in 2019/20. Face-to-face and video/online consultations waiting times were lower, while home visits and telephone waiting times were higher.

Table 26: Waiting times (days) for GP appointments, 2019/20 – 2022/23

Appointment mode	80th percentile waiting time (days)			
	2019/20	2020/21	2021/22	2022/23
Face-to-Face	14.00	10.95	12.05	13.21
Home Visit	1	4.46	4.31	4.37
Telephone	3.36	3.74	5.71	6.07
Video/Online	17.61	10.57	11.08	13.56

6.6.4. Primary Care output growth

The cost-weighted Laspeyres output growth rates for the primary care setting, when adjusting for waiting time alone and correcting for the total number of working days (WD) for the last two links, are reported in Table 27. In the same table, we also report growth rates in primary care activity between 2022/23 and the pre-pandemic year 2019/20.

[68] The list of time intervals is as follows: same day, 1 day, 2 to 7 days, 8 to 14 days, 15 to 21 days, 22 to 28 days, more than 28 days, unknown (Appointments in General Practice, last accessed 21/03/2025).
[69] Note that vaccinations appointments do not have information on waiting times, so they do not contribute to the calculation of the 80th percentile waits for the face-to-face appointments.
[70] See Performance Tracker 2022/23: Spring update - General practice (last accessed 21/03/2025).

Focusing first on growth between 2021/22 and 2022/23, we found that the total number of appointments delivered fell by 4.72%, with a 4.34% decrease in the cost-weighted Laspeyres growth rate. This observed improvement in Laspeyres growth rate was due to substantial growth of home visits which had the highest unit cost and were therefore assigned the highest relative weight. Adjusting for waiting times decreased the cost-weighted Laspeyres growth rate further to -5.59%. These results can be explained by the substantial drop in the number of vaccinations (which were not included in the waiting times calculation) and the concurrent rise in the waiting times for all other appointment types. The working days adjustment improved the Laspeyres index yielding a -4.48% growth rate.

Comparing 2022/23 with 2019/20 yielded a large growth rate. The cost-weighted growth measure was 10.98%, whilst adjusting for waiting times decreases measured growth slightly, to 10.48%. The main driver of this substantial growth rate was the rise in telephone consultations. Correcting for the total number of working days further increased the growth rate, yielding a 11.81% Laspeyres growth between 2019/20 and 2022/23.

Table 27: Growth rates comparison

	2019/20-2020/21	**2020/21-2021/22**	**2021/22-2022/23**	**2019/20-2022/23**
Raw consultations	-4.24%	22.11%	-4.72%	11.42%
Laspeyres Cost-weighted (CW)	-5.02%	22.13%	-4.34%	10.98%
Laspeyres CW and WT-adjusted	-3.06%	19.89%	-5.59%	10.48%
Laspeyres CW, WT and WD-adjusted	-2.68%	19.89%	-4.84%	11.81%

6.6.5. Sensitivity analysis

In this sub-section, we perform two sensitivity analyses to examine the impact of using appointment type specific unit costs and re-introducing the QOF quality adjustment for effective blood pressure management.

6.6.5.1. Sensitivity to different unit costs of GP appointment types

Similarly to Arabadzhyan et al. (2023) and Arabadzhyan et al. (2024), the first sensitivity analysis tests different unit costs for different types of primary care appointments. For the 2021/22-2022/23 link this yields unit costs of £22.03 for telephone and video/online consultations, £40.62 for face-to-face appointments and £123.48 for home visits. For the 2019/20-2022/23 link this yields £39.65 for a face-to-face appointment, £121.38 for a home visit, and £21.5 for both telephone and video/online consultations. As we use a Laspeyres index, only the unit costs in the base year of each link are reported. Table 28 presents the results of this analysis for the 2021/22-2022/23 and 2019/20-2022/23 links, as well as the 2019/20-2020/21 and 2020/21-2021/22 links for comparison.

Table 28: Primary care output growth measures: sensitivity to the choice of unit costs

	2019/20-2020/21	2020/21-2021/22	2021/22-2022/23	2019/20-2022/23
Laspeyres Cost-weighted (CW)	-16.97%	27.44%	-1.95%	3.76%
Laspeyres CW and WT-adjusted	-14.77%	25.35%	-3.34%	5.34%
Laspeyres CW, WT and WD-adjusted	-14.44%	25.35%	-2.57%	6.60%

We find that assigning lower unit costs for telephone and video/online consultations yields higher growth rates of the primary care output between 2021/22 and 2022/23. This is due to two factors. The relatively larger weight assigned to face-to-face appointments, which recorded an increase. The lower weight assigned to telephone consultations, which decreased. The cost-weighted and waiting times adjusted growth rate amounts to -3.34%; about 2.3 percentage points higher than our baseline estimate. Adjusting for working days further increases the growth rate to -2.57%.

In contrast, when using 2019/20 as the baseline year, assigning lower unit costs to remote appointments yields substantially lower growth rates. The cost-weighted Laspeyres measure equals 3.76%, more than 7 percentage points lower than when using the same unit costs for remote and in-person consultations. This difference in growth rates is again due to a relatively higher cost weight assigned to both face-to-face consultations and home visits, which were, however, fewer in 2022/23 compared to 2019/20, and to relatively lower weights assigned to telephone appointments, which were the main driver of growth between these two financial years.

6.6.5.2. Sensitivity to QOF quality adjustment

We reintroduce QOF quality adjustment to our baseline estimates as a sensitivity check, due to QOF achievement indicators not being directly comparable between 2021/22 and 2022/23. Specific changes are detailed in section 6.6.3. QOF adjustment is introduced prior to waiting times adjustment (see Arabadzhyan et al. (2022) for more details). Table 29 below provides the baseline growth rates in the first column, and the growth rates when QOF adjustment is applied. As expected, QOF adjustment increases the resulting growth rates, since for all the three indicators used their achievement rates were higher in 2022/23 compared to 2021/22, when they were still income protected. The impact of the QOF adjustment is non-negligible and brings the growth rates up by about 1 percentage point.

Table 29: Primary care output growth measures: reintroducing QOF adjustment

	2021/22-2022/23	2021/22-2022/23 QOF-adj
Raw consultations	-4.72%	-3.76%
Laspeyres Cost-weighted (CW)	-4.34%	-3.38%
Laspeyres CW and WT-adjusted	-5.59%	-4.64%
Laspeyres CW, WT and WD-adjusted	-4.84%	-3.88%

6.7. Community prescribing

- **The Laspeyres cost-weighted and total days adjusted output growth measure for Community Prescribing was 5.57% between 2021/22 and 2022/23.**

Since 2020, we use the NHS Business Services Authority (BSA) Prescription Cost Analysis (PCA) publication as our source of Community Prescribing data. The publication includes information about the Drug code (PropGenLinkCode), Net Ingredient Cost (NIC), Quantity of Drug Dispensed, and Number of Prescription Items, which are published on a monthly basis. The data are complete and prices are available for all items and years.

6.7.1. Methods

The community prescribing dataset includes information on total expenditure and total volume for each drug prescribed (PropGenLinkCode). We calculate drug unit costs as the ratio of expenditure and volume. A drug can retain the same PropGenLinkCode over time but be reported in different units. This change can occur in the middle of a financial year (most often from January). This change impacts the calculated unit cost and critically prevents a like-for-like comparison. It is also possible for data entry error to lead to an artificial large change in volume or expenditure over time which might impact overall results. To minimise both possibilities in a transparent and automated way, we employ two outlier detection methods. In this way we exclude outliers which are unlikely to be comparable with similar data either within or between years, while retaining as much information as possible.

Table 30 presents information about the number of drug-months and drugs dropped because of respectively the within year and between year outlier methods. Each pair of years was considered in turn. Drug-months and drugs were dropped for both years for a given comparison, even if an outlier was only identified in one of those two years. The table indicates 71 drug-months were dropped when comparing 2021/22 with 2022/23. Similarly, 45 drugs were dropped compared to 26 for the previous link. The drugs dropped due to being outliers between years is the more critical element, as all months were dropped in these cases. Therefore, 26 drugs is equivalent to 312 (26 × 12) drug-months.

Table 30: Observations dropped as outliers for Community Prescribing

Years	Observations	
	Drug-months dropped (within year outlier)	Drugs dropped (between year outlier)
2020/21-2021/22	47	26
2021/22-2022/23	71	45

6.7.2. Activity and growth rates

Table 31 reports summary statistics for Community Prescribing. In 2022/23, 7,784 distinct drugs were observed. The total number of prescriptions made out increased by 36 million (3.2%), representing a similar increase observed between 2020/21 and 2021/22. The total number of items and expenditure on community prescribing also both increased, by 3.6% and 7.1% respectively, continuing generally upward trends. The larger proportional increase in expenditure is also reflected in the increase in the unit cost of items from 10p to 11p.

When compared with equivalent information reported by the NHS Business Service Authority[71] which reported 1.18 billion prescriptions at a cost of £10.4 billion, the total number of prescriptions and expenditure in 2022/23 was similar but lower. This aligns with excluding some drugs and drug-months to ensure a like-for-like comparison in calculating change over time.

Table 31: Community Prescribing, summary data 2020/21 – 2022/23

Year	Unique Drug Codes Observed	Total Prescriptions	Total Items Prescribed	Total Spend	Activity-weighted Prescription Unit Cost £	Activity-weighted Prescribed Item Unit Cost £
2020/21	7,137	1,106,274,762	89,217,616,708	£9,403,485,867	8.50	0.11
2021/22	7,175	1,139,254,272	92,514,172,928	£9,687,036,928	8.50	0.10
2022/23	7,784	1,175,244,672	95,852,462,080	£10,376,587,264	8.83	0.11

In 2022/23, 1,157 new drugs were observed, amounting to a total expenditure of £139.1 million in 2021/22 prices. 527 drugs prescribed in 2021/22 were not observed in 2022/23, representing £1.3 million of expenditure in 2022/23 prices. The number of new drugs and their total expenditure showed a significant increase from the previous year (499 new drugs amounting to a total expenditure of £9.2 million). Further investigation on the drug codes of both new and dropped drugs revealed that this increase consists of drugs prescribed under one particular drug category which related to nutritional supplements for metabolic disorders as well as staple food funded by the NHS. More information about this is available in Appendix 9.1.

Volume and price indices for community prescribing are reported in Table 32. Between 2021/22 and 2022/23, the Paasche Price ratio indicated an increase in price by 1.78%, reverting the reduction between 2020/21 and 2021/22. The Laspeyres volume index was positive between 2021/22 and 2022/23, at 5.57%.[72] When comparing 2019/20 with 2022/23, the total days adjusted Laspeyres volume growth was 12.20%. Without adjustment, this number is 11.90%

Table 32: Community Prescribing: price and volume indices 2019/20 – 2022/23

Years	Paasche Price Ratio	Laspeyres Volume Ratio
2020/21 – 2021/22	0.9610	1.0466
2021/22 – 2022/23	1.0178	1.0556
2019/20 – 2022/23	1.0016	1.1159

From the base year of 2004/05, trends in the volume and prices of items prescribed are shown in Figure 7. This figure highlights that the increase in volume observed continued an upward

[71] See NHS Business Services Authority publication (last accessed 11/04/2025).
[72] Total day adjustment does not impact the 2020/21-21/22 and 2021/22-22/23 growth rates due to there being the same number of days in both years.

trend of the most recent years, with volume in 2022/23 exceeding the previous peak of 2016/17. The observed fall in average price continued the generally downward trend of prices since 2004/05, though prices in recent years have been slightly increasing.

Figure 7: Price and volume changes for community prescribed pharmaceuticals

7. Growth in input categories

7.1. Direct labour growth measure

- **Between 2021/22 and 2022/23, the cost (salary)-weighted Laspeyres volume growth for NHS staff was 3.33%.**

Since 2007/08, Electronic Staff Record (ESR) data, provided by NHS England, have been used to calculate direct labour growth.[73,74,75] This dataset contains monthly provider level Full Time Equivalent (FTE) counts for over 500 categories of labour (occupation codes) and covers all staff employed by the NHS excluding agency and bank staff. Due to small number suppression, the aggregate figures we obtain will not match precisely with those published by NHS England using the same ESR data.[76,77]

National average staff earnings data, also provided by NHS England, cover the same staff groups and organisations as counts of staff at the occupation code or a more disaggregated level. Basic pay is reported per head and per FTE, whilst non-basic pay is reported per head only. We construct total pay per FTE as the sum of basic pay per FTE and non-basic pay per head times the ratio 'basic pay per FTE/basic pay per head'. This method of imputation relies on the assumption that for each occupation code, the ratio of 'basic pay per FTE/basic pay per head' is a good proxy for the ratio of 'non-basic pay per FTE/non-basic pay per head'.

From 2016, separate information has been provided for FTE count and earnings of staff working at 'core' and 'wider' services.[78] We take an FTE weighted average of wages of staff working in 'core' and 'wider' services and apply this calculated wage to all staff within the occupation code. In this way, a value by type of work is identified, rather than one also influenced by the type of provider worked for. If wage information is missing for either 'core' or 'wider' service providers for a specific occupation code, we assume the observed wage also reflects the average for equivalent staff in the other organisation group.

From the year 2021/22, FTE and salary information has been reported at a more disaggregated level than occupation code for a small number of occupation codes. For example, FTEs are reported for the same occupation code but a different care setting within the same provider. Equivalently to how `core' and `wider' providers are dealt with, an FTE weighted average of salaries of staff within the same occupation code is calculated and used as the wage for all staff in that occupation code. If wage information is missing for some instances of an occupation code but not others, the FTE weighted mean of observed salaries is taken as the proxy of wages for all staff within that occupation code.

[73] Before 2007/08, the number of staff was extracted from the Workforce Census.
[74] More precisely, NHS England shares the ESR and NHS combined Payroll data with us, but these can be accessed from the NHS iView database (last accessed 11/04/2025), which is constructed from the ESR and NHS combined Payroll and Human Resources System.
[75] In March 2016, the data collection method for ESR was updated, leading to improved quality. These changes are discussed in more detail in Castelli et al. (2019).
[76] If a provider-staff group cell contains fewer than 5 staff, the provider reports 0 or 5 at random.
[77] NHS workforce statistics (last accessed 11/04/2025).
[78] Core services are made up of hospital Trusts and commissioning bodies. Wider services are made up of central support services such as NHS England and NHS Improvement.

Also starting for growth between 2020/21 and 2021/22, direct labour growth is calculated using the software STATA 18, instead of SAS 9.2. As part of this change, analyses are performed using only the specific base and current year being considered. As a result, imputation of wages draws on information only from these two years, instead of all previous years, as was the case previously. This approach brings methodology in line with output care settings.

Table 33 shows the number of organisations reporting FTE counts information by organisation type.[79] Due to mergers, both Clinical Commissioning Groups (CCGs) and Trusts' figures have broadly decreased over time. On the 1st of July 2022, CCGs were formally abolished and Integrated Care Boards (ICBs) established. As a result, ICBs are observed only in 2022/23, with CCGs also observed in 2022/23. The number of Commissioning Support Units (CSUs) remained the same between 2021/22 and 2022/23.

Table 33 also reports total expenditure on staff by organisation type. Expenditure is calculated as the summed products of FTE staff employed in each occupation code in the provider type and the national average total earnings for that occupation code. Proportional increases in expenditure between 2021/22 and 2022/23 were generally similar to those observed between 2020/21 and 2021/22.[80] The exception to this is non-geographic staff, where proportional growth in expenditure between 2021/22 and 2022/23 was substantially smaller than between 2020/21 and 2021/22. The total expenditure for CCGs fell very sharply due to abolition of these organisations after one quarter of the year. Comparing combined expenditure on CCGs and ICBs in 2022/23 with expenditure on CCGs in 2021/22 indicates a similar proportional increase in expenditure between 2021/22 and 2022/23 as observed between 2020/21 and 2021/22 for CCGs alone. This finding aligns with a general shift of a similar level of resource from one form of commissioning to another. Proportional increases in expenditure were larger but overall expenditure substantially smaller for categories with small numbers of organisations (NHS England, CSUs and non-geographic staff). The increase in expenditure among Trusts from 2021/22 to 2022/23 (7.1%) was the same as between 2020/21 and 2021/22. See Table A26 in the Online Appendix for historic trends in expenditure by provider type from 2010/11 to 2022/23.

[79] For conciseness, this table includes only the main organisation types, which account for about 97% of FTEs and 98% of total expenditure. The main analysis includes all categories. A time series of equivalent information from 2010/11 is presented in Table A26 in the Online Appendix.

[80] A time series of equivalent information from 2010/11 onwards is presented in Table A27 in the Online Appendix.

Table 33: Number of reporting organisations and expenditure by type 2019/20 – 2022/23

Organisation type	2020/21		2021/22		2022/23	
	Orgs	Exp (£m)	Orgs	Exp (£m)	Orgs	Exp (£m)
CCGs	121	969	94	1,018	92	182
ICBs	n/a	n/a	n/a	n/a	42	902
CSUs	4	198	4	224	4	263
NHS England	1	362	1	451	1	547
Non-geographical staff	1	78	1	111	1	119
NHS Trusts	220	45,673	215	48,899	212	52,362

Table 34 reports the number of FTE staff employed by Trusts and other NHS organisations (hereafter non-Trusts) by broad categories for each year from 2020/21 to 2022/23.[81] These figures show that the majority of staff were employed by hospital Trusts and the largest employee group is that of 'Nursing, midwifery and health visiting staff and learners'. FTE staff in Trusts grew in each of the last three years for all categories except for 'Unknown and Non-funded staff'. The FTEs in non-Trusts have also generally grown over time. The proportional increase in FTEs among staff working for Trusts remained stable over the three years presented, while growth in non-Trusts was smaller between 2021/22 and 2022/23 than between 2020/21 and 2021/22.

Table 34: Count of FTE staff employed by category

NHS Staff type	2020/21		2021/22		2022/23	
	Trust	Non-Trust	Trust	Non-Trust	Trust	Non-Trust
Medical staff	122,009	1,354	126,212	1,662	130,723	1,708
Ambulance staff	35,837	4	36,983	5	38,008	6
Administration and estates staff	246,786	44,283	257,331	48,870	266,096	52,181
Health care assistants and other support staff	148,158	431	150,882	444	153,098	425
Nursing, midwifery and health visiting staff and learners	394,876	4,673	403,301	4,937	414,556	5,075
Scientific, therapeutic and technical staff and health care scientists	201,425	5,170	212,477	5,536	221,628	5,338
Unknown and Non-funded staff	1,352	101	662	108	510	96
Total	**1,150,443**	**56,016**	**1,187,848**	**61,562**	**1,224,618**	**64,828**

Notes: Data are taken from organisational returns of Electronic Staff Records. When there are 5 or fewer people employed in an occupational group, organisations report either 5 or 0 at random; these totals therefore will differ from those derived from national level data.

Figure 8 and Figure 9 present growth in FTE by staff category among staff employed by Trusts and by other organisations respectively. These figures highlight some findings from the previous table. First, that all specified categories of staff employed by Trusts increased between both 2020/21 and 2021/22 and 2021/22 and 2022/23. Staff employed by Trusts in

[81] Table A28 in the Online Appendix provides a longer time series of staff employed within Trusts from 2007/08 to 2021/22.

an unknown category fell substantially within both comparisons. This suggests a continued general improvement in the coding of staff compared to 2020/21, the year most impacted by COVID-19. Among staff employed at non-Trust organisations, FTEs in most staff categories grew in both years. However, "Health care assistants and support", "Scientific, therapeutic and technical" and "unknown" staff FTEs rose between 2020/21 and 2021/22 but fell in the following year. The impact of these proportional changes is limited given the small number of FTEs in non-Trusts and the specific categories.

Figure 8: Growth in Trust FTE staff by group 2020/21 to 2022/23

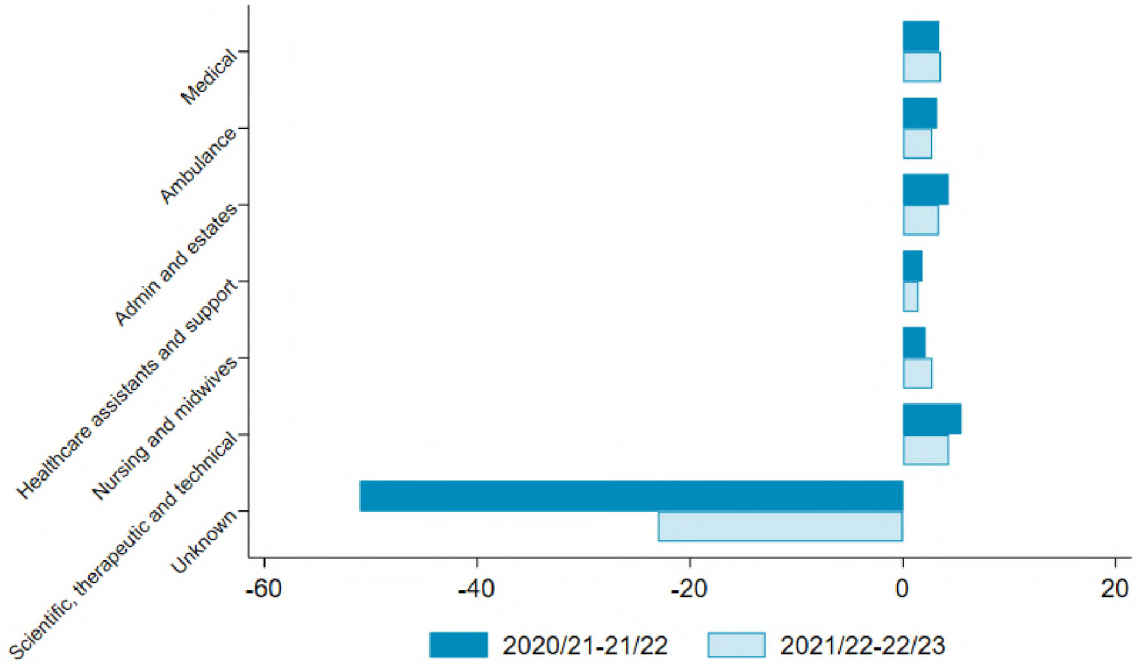


Figure 9: Growth in Non-Trust FTE staff 2020/21 to 2022/23

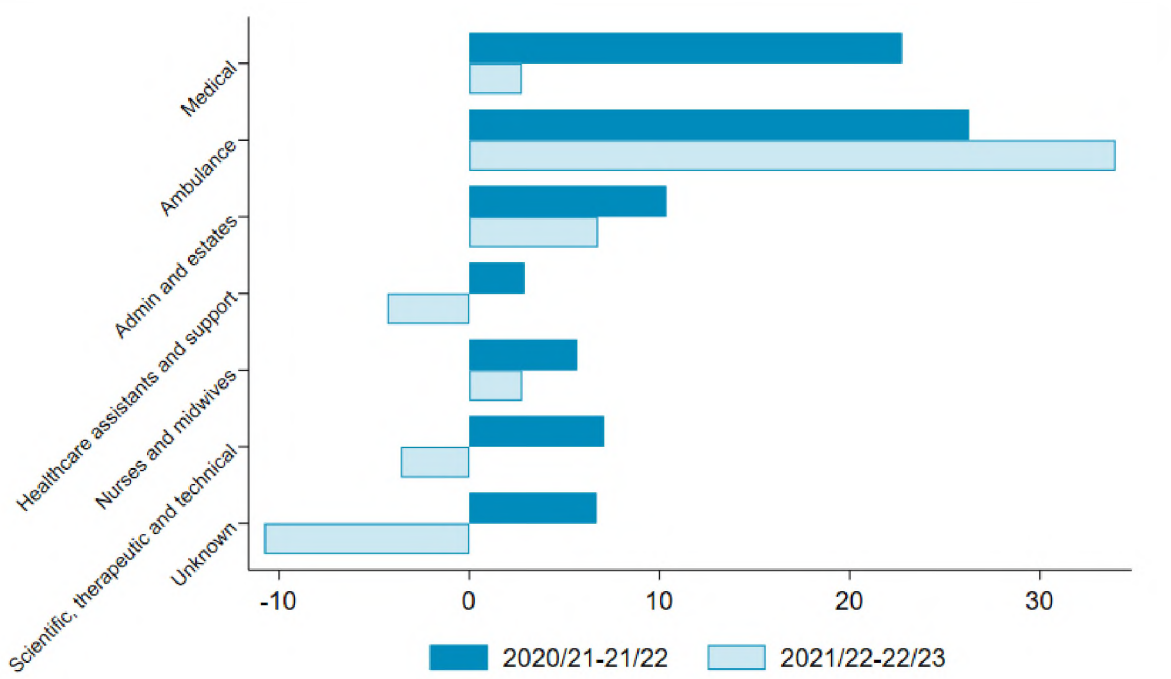


Table 35 presents nominal expenditure growth and Laspeyres volume growth in labour for the NHS overall and for Trusts alone from 2020/21 to 2021/22, 2021/22 to 2022/23 and 2019/20 to 2022/23.[82]

Laspeyres volume indices indicate growth of 3.33% overall and 7.16% for the group of Trusts between 2021/22 and 2022/23. These growth rates are moderately smaller than those recorded between 2020/21 and 2021/22. The results imply the reduction in growth was concentrated in non-Trusts. As has been seen historically, nominal expenditure growth was substantially larger than Laspeyres volume growth in Trusts and non-Trusts. This indicates part of nominal growth reflects inflation and a shift in the distribution of staff employed to those commanding higher salaries. Relatively to nominal growth between 2020/21 and 2021/22, growth overall was moderately lower, while growth in Trusts was slightly higher when comparing 2021/22 with 2022/23. As in comparing Laspeyres growth, this suggests less growth in non-Trusts organisations.

Table 35 also presents equivalent information when comparing the year 2019/20 with 2022/23. This comparison provides information about staff employed in the most recent year, compared to just before the COVID-19 pandemic. Growth rates between 2019/20 and 2022/23 are substantially larger than the sum of growth rates between 2020/21-2021/22 and 2021/22-2022/23 for all columns of the Table. This is due to a combination of substantial growth in staff between 2019/20 and 2020/21 being retained in subsequent years and the impact of compounding.

[82] See Table A29 in the Online Appendix for the equivalent series from 2007/08 to 2022/23.

Table 35: Growth in direct labour 2019/20 – 2022/23

Years	Nominal expenditure growth		Laspeyres volume growth	
	All*	Trusts	All*	Trusts
2019/20 – 2020/21	8.52%	8.60%	4.81%	4.95%
2020/21 – 2021/22	7.38%	7.05%	3.82%	3.47%
2021/22 – 2022/23	7.16%	7.12%	3.33%	3.29%
2019/20 – 2022/23	24.82%	24.51%	12.38%	12.10%

* All NHS organisations.

7.2. Indirect NHS input growth measures

- **Between 2021/22 and 2022/23, the indirect growth rate for NHS inputs was 1.49% and the mixed NHS input growth rate was 1.33%.[83]**

7.2.1. Expenditure data sources

Expenditure on inputs by the NHS England Group[84] and NHS Trusts are taken from published financial accounts. Items of expenditure from each account are aggregated to the broad categories of Labour, Materials, and Capital. Labour covers expenditure on staff wages and other payments for work. Materials consist of assets which are expected to be consumed within the financial year they are purchased. Capital consists of expenditure on assets which are expected to be retained and used in multiple years. By using these broad categories, we can generate comparable figures over time and across organisations, despite differences in the precise reporting requirements of different organisations and changes in these requirements over time. Expenditure of the NHS England Group is reported in the annual reports and accounts of the Department of Health and Social Care (DHSC).[85]

Further, we were advised by NHS England that from October 2021, the NHS Supply Chain Co-Ordination Limited (SCCL) moved from being reported in the 'Other Groups' category in the DHSC Annual Reports and Accounts (ARA) to the 'NHS England Group' category. Following advice from NHS England, we included the expenditure for "Supplies and services – clinical" and "Supplies and services – general" of the 'Other Group' to the 'NHS England Group' for the calculations of the indirect input growth measure between 2021/22 and 2022/23.

The items of expenditure used to calculate Labour, Materials, and Capital in the 2021/22 – 2022/23 accounts are presented in Table 36.

We also use Trust level accounts for all NHS Trusts (non-FT) and Foundation Trusts (FT). Each FT and Non-FT publishes accounts annually, with a specified set of items of expenditure in TACs. Table 37 reports the sources of expenditure data used. Similarly to previous years, in 2022/23 NHS Trust and Foundation Trust accounts included extra items of expenditure

[83] Comparing NHS inputs in 2022/23 to 2019/20, we find that growth is equal to 13.91% for the mixed approach and 14.63% for the indirect approach.
[84] NHS England Group includes CCGs and NHS England and NHS Improvement.
[85] See DHSC annual reports and accounts 2022-2023 (last accessed 25/03/2025).

related explicitly to COVID-19. Specifically, two expenditure items under Materials and one under Capital (see Table 36). However, these represented a very small fraction of total expenditures on either Materials or Capital (0.58% and 0.02% respectively). It is not possible to fully disentangle the COVID-19 response resources in other items. Therefore, the true impact of COVID-19 on input expenditure cannot be evaluated.

Table 36: Categorisation of operating expenditure items

Organisation	Labour	Materials	Capital
NHS Foundation Trusts and Non-Foundation Trusts Source: TAC	• Staff and executive directors' costs • Non-executive directors	• Purchase of services • Supplies and services – clinical • Supplies and services – clinical: utilisation of consumables donated from DHSC group bodies for COVID response • Supplies and services – general • Supplies and services – general: notional cost of equipment donated from DHSC for COVID response below capitalisation threshold • Drugs costs • Consultancy • Establishment • Transport • Audit services and other remuneration • Clinical negligence costs • Research and development • Education and training • Redundancy costs • Legal fees • Insurance • Early retirement costs • Car parking and security • Hospitality • Other losses and special payments • Other	• Premises • Depreciation • Amortisation • Impairments • Operating lease expenditure • Changes to operating expenditure for on-SoFP and off-SoFP IFRIC 12 schemes • Inventories written down (not including drugs) • Inventories written down (consumables donated from DHSC group bodies for COVID response) • Provisions arising/released in year
NHS England Group Source: DHSC Annual Report and Accounts	• Staff costs	• Consultancy services • Transport • Clinical negligence costs • Establishment • Education, training & conferences • Supplies and services – general • Inventories consumed • Research & development expenditure • Other	• Premises • Impairment of receivables • Rentals under operating leases • Depreciation • Amortisation • Impairments & reversals • Interest charges

Note: Items of expenditure for Foundation Trusts and Non-Foundation Trusts are taken from accounts of 2022/23. The items used in previous years can be found in Table A30 in the Online Appendix.

For the NHS England Group accounts, it was not possible to separate the resources allocated for the COVID-19 response, hence it was not possible for us to estimate the extra (financial) resources raised specifically for the pandemic effort.

Finally, we obtain expenditure on agency and bank staff directly from the DHSC.

Table 37: Sources of expenditure information 2013/14 – 2022/23

Years	Foundation Trusts	Non-Foundation Trusts	NHS England Group
2013/14 – 2016/17	Consolidated NHS Financial Trusts Accounts	Financial monitoring and accounts	DHSC Annual Reports and Accounts
2017/18 – 2022/23	Trust accounts consolidation		

7.2.2. Expenditure on inputs

This section describes nominal expenditure on inputs, which is converted to real terms using appropriate deflators. We use the NHS Cost Inflation Index when considering Materials and Capital. For NHS Staff, we normally use the CHE ESR deflator, but this was adjusted to take account of the NHS Pay Award that was paid out only in 2023/24 but was effective from 2022/23.[86] For further details on the deflators used see section 9.2 in the Appendix.

Table 38 presents current expenditure on Labour, Materials, and Capital of the NHS England Group from 2019/20 to 2022/23. Expenditure on Labour and Materials increased respectively by 27.70% and by 7.78%, whilst expenditure on Capital reduced by 6.81%. Total expenditure of the NHS England Group increased by 13.25% between 2021/22 and 2022/23.

Table 38: Current expenditure by NHS England Group (£000)

Year	Labour	Materials*	Capital*
2019/20	2,126,458	2,009,981	540,893
2020/21	2,270,582	3,296,681	621,361
2021/22	2,549,296	3,273,357	572,190
2021/22**	-	4,639,030	-
2022/23**	3,255,557	4,999,739	533,202

* Interest payments are moved from Material to Capital expenditure, to align with the practice followed with NHS Trusts. ** Expenditure for "Supplies and services – clinical" and "Supplies and services – general" of the 'Other Group' included in the 'NHS England Group' expenditure.

Expenditure on Labour, Materials, and Capital among NHS Foundation and non-Foundation Trusts is reported in Table 39.

Expenditure on all input categories increased in 2022/23. The nominal increase in Labour expenditure was 11.14% in 2022/23. The increase follows a year of more modest growth in nominal labour expenditure on the previous financial year. Materials nominal expenditure

[86] Further information on the Pay Award can be found on the NHS Employers website (last accessed 11/04/2025).

decreased by 1% compared to the previous year. Following the negative growth in nominal capital expenditure recorded in 2021/22, this is now 9.08% in 2022/23 compared to 2021/22.

Table 39: Current expenditure by NHS Trusts (£000)

Year	Labour	Materials	Capital
2019/20	59,601,842*	25,041,698	8,769,510
2020/21	67,106,390	28,504,921	11,078,757
2021/22[87]*	71,134,250	31,846,873*	10,569,042*
2022/23	82,310,792	33,781,003	11,182,682

* Expenditure figures incurred by NHS Trusts for both Materials and Capital for 2021/12 have been corrected as a coding issue was detected. Expenditure for Materials is calculated as a residual from total operating expenditure once we deduct both expenditure for both Labour and Capital. Erroneously in the 2021/22 update, part of the Capital expenditure was attributed to Materials. This has no overall effect on Total expenditure and on the indirect and mixed input growth rates, and NHS productivity growth rates.

Overall NHS (nominal) expenditure on all input items from 2019/20 to 2022/23 is summarised in Table 40. The table includes the sum of Labour (NHS Staff and Bank staff), Materials and Capital across NHS Trusts and NHS England Group. Expenditure on Primary Care and Community Prescribing (Prescribing) are also included. Details about the source of information of Community Prescribing are given in section 6.7. Expenditure on NHS staff constituted the largest proportion of total input expenditure in 2022/23, a 49.16% share, this was followed by Materials at 24.18%, Primary Care at 10.72%, with Capital and Prescribing contributing respectively 7.31% and 6.47% of total expenditure.

Nominal expenditure on overall NHS staff grew by 11.49% in 2022/23 compared to 2021/22. Materials nominal expenditure increased by 6.29%, whilst capital nominal expenditure increased by 5.16% between 2021/22 and 2022/23. Finally, nominal expenditure on primary care decreased by 1.01% between 2021/22 and 2022/23.

Table 40: Total NHS current expenditure 2019/20 – 2022/23 (£000)

Year	NHS Staff	Material	Capital	Prescribing	Primary Care
2019/20	59,348,146	27,051,717	9,333,550	9,281,577	14,751,852
2019/20	-	29,393,786^	9,310,403§	9,019,680§	-
2020/21	66,935,079	31,801,635	11,700,085	9,403,486	16,176,029
2021/22*[88]	70,723,546	36,485,903*^	11,141,232*	9,687,037	17,367,209
2022/23	78,847,992	38,780,742^	11,715,884	10,376,587	17,191,969

*Expenditure figures for both Materials and Capital for 2021/12 have been corrected as a coding issue was detected. Expenditure for Materials is calculated as a residual from total operating expenditure once we deduct both expenditure for both Labour and Capital. Erroneously in the 2021/22 update, part of the Capital expenditure was attributed to Materials. This has no overall effect on Total expenditure and on the indirect and mixed input growth rates, and NHS productivity growth rates.
^ Expenditure for "Supplies and services – clinical" and "Supplies and services – general" of the 'Other Group' included in the 'NHS England Group' expenditure. § Updated as part of the recovery calculations between 2019/20 and 2022/23.

[87] The expenditure figures for Materials and Capital for NHS Trusts reported in Arabadzhyan et al (2024) were respectively equal to £33,850,830 and £8,565,085.
[88] The expenditure figures for Materials and Capital for the NHS as a whole reported in Arabadzhyan et al (2024) were respectively equal to £37,124,187 and £9,137,275.

Finally, comparing NHS expenditure for each input type between 2019/20 and 2022/23, we found that nominal expenditure on overall NHS staff grew by 32.86%, expenditure on materials increased by 31.93%, whilst capital nominal expenditure increased by 25.84%. Finally, nominal expenditure on primary care decreased by 16.54% between 2019/20 and 2022/23.

8. Concluding remarks

Overall NHS output, adjusted for quality, increased by 2.39% between 2021/22 and 2022/23. An indication of a sustained increase in healthcare services delivery, which was one of the policy focuses of NHS England's elective recovery plans in both 2021 and 2022. Improvements in the quality of care are primarily due to improvements in life expectancy. Further adjusting NHS outputs to account for avoidable emergency readmissions and hospital-acquired infections (HAIs) resulted in a slightly higher NHS output growth rate of 2.42%. This positive effect was solely due to reductions in avoidable emergency readmissions in 2022/23. The inclusion of HAIs slightly dampened the output growth measure.

NHS inputs grew by 1.33% when measured using the mixed approach (our preferred measure), between 2021/22 and 2022/23.[89]

NHS productivity continued to grow in 2022/23, although at a significantly slower rate compared to the previous year of 1.05% (using the mixed approach). This slower growth is expected, as the substantial increase recorded between 2020/21 and 2021/22 reflects the resumption of elective activities in the NHS. Throughout most of 2020/21 due to pandemic restrictions elective care had been largely suspended. In 2021/22, NHS hospitals returned to more normal working conditions.

Similarly to Arabadzhyan et al. (2023, 2024), test and trace services were not included in our output measure due to a lack of comprehensive data. To the extent these services were delivered by NHS staff within their NHS roles, their costs would have been captured in our input measure but not in our output measure.

Further, we compared productivity in 2022/23 with the pre-pandemic year of 2019/20, to directly investigate the extent of NHS recovery. We found that compared to the pre-pandemic year of 2019/20, both the NHS cost-weighted and the quality-adjusted output grew by 1.89% and 2.34% respectively. NHS inputs were also higher in 2022/23 compared to 2019/20, with a growth rate of 13.91% for the mixed measure and 14.63% for the indirect measure. This is in line with expectations, as NHS England has consistently provided additional financial resources to support the elective recovery programme.

Due to sustained growth in inputs, NHS productivity in 2022/23 remains lower compared to 2019/20, showing a decrease of between 9.65% and 9.07%, depending on the method used. Nevertheless, this marks an improvement from 2021/22, with productivity rising by between 1.72 and 3.14 percentage points. Despite these gains, a significant productivity gap as compared to the pre-pandemic period still remains in 2022/23.

When comparing total factor productivity in the NHS to the broader UK economy, as measured by the Gross Value Added per Hour (labour productivity, LP), we find that NHS

[89] Our preferred measure for the 2022/23 NHS productivity update is based on the mixed approach. This follows two years of using the indirect approach in measuring growth in NHS inputs as the Department of Health and Social Care noted delays in updating the staff and pay-roll systems by NHS Trusts during the pandemic, while financial accounts correctly reflected the expenditure on NHS staff.

productivity has substantially recovered from 2020/21. However, it still remains below the productivity levels of the UK economy as a whole.

Finally, taking a longer-term view from 2004/05 to 2022/23, we calculated the average annual growth rate for NHS outputs, inputs, and productivity. It's important to note that, until 2018/19-2019/20, the mixed approach was used to calculate both NHS inputs and productivity growth rates, whilst the indirect approach was used for the 2019/20-2020/21 and 2020/21-2021/22 links.[90] Over this period, we find that growth in NHS quality-adjusted outputs averaged 3.30% per annum, while NHS inputs grew by an average of 3.01% annually, resulting in annual NHS productivity growth averaging at 0.31%.

These figures remain below the average annual growth rates achieved by the NHS before the pandemic (up to 2018/19). During that earlier period, NHS quality-adjusted output growth averaged 3.75% annually, input growth averaged 2.63%, and productivity growth averaged 1.11% per annum.

[90] Please note that for 2022/23 we reverted back to using the mixed NHS productivity growth measure.

9. Appendix

9.1. Community Prescribing

The Community Prescribing section of the 2022/23 National Productivity Update reported **527** drugs which were prescribed in 2021/22 but not observed in 2022/23, and **1,157** drugs which were prescribed in 2022/23 which were not prescribed in 2021/22.

We refer to these as ***dropped drugs*** (527), and ***new drugs*** (1,157) in this addendum.

Within a given link, the likely reason for drugs to be dropped, and new ones to surface are rebranding, or patented drugs being switched to generic. The number of dropped drugs and new drugs are often similar. In the 2021/22 National Productivity Update, 566 drugs were dropped, and 499 new drugs were observed.

In the current productivity update, however, there is a much higher number of new drugs prescribed in 2022/23 which were not prescribed in 2021/22. This addendum details the investigation of this unusual occurrence.

Independently from the process used to produce the report, we matched the community prescribing record of 2021/22 with 2022/23, and found 1,156 new drugs and 528 dropped drugs. The difference of 1 drug in this statistic result from the outlier exclusion process applied for the main report.

We then looked at the PropGenLinkCode, which utilises a top-down hierarchical coding system to separate drugs by disease categories and medical conditions. We look at three layers of PropGenLinkCode in our comparison for new and dropped drugs.

Table A 1 summarises the number of new and dropped drugs by tier-1[91] of PropGenLinkCode in the latest link. The number for dropped and new drugs are more or less the same for each of the tier-1 categories, with the exception for category 09, where there were 735 new drugs in 2022/23 that were not prescribed in 2021/22, while only 53 drugs that were prescribed in 2021/22 were no longer used in 2022/23.

[91] We consider the first 2 characters within the PropGenLinkCode as tier-1, the first 4 characters as tier-2, and the first 6 characters as tier-3. As PropGenLinkCode follows top-down hierarchical coding system, this means any conditions under tier 3 would be nested under its corresponding condition in tier-2, and similarly tier-2, tier-1. An example would be metabolic disorders for tier-1, amino acid metabolism disorders for tier-2, and phenylketonuria (PKU) for tier-3.

Table A 1: Tier-1 of PropGenLinkCode for New and Dropped Drugs between 2021/22 and 2022/23

PropGenLinkCode	Number of New Drugs	Number of Dropped Drugs
01	32	38
02	39	52
03	16	20
04	91	81
05	44	61
06	36	35
07	7	7
08	33	33
09	735	53
10	18	21
11	15	13
12	10	11
13	48	60
14	7	7
15	2	9
19	7	5
20	1	2
21	3	1
22	4	7
23	8	12

Based on this result, we looked at the tier-2 of PropGenLinkCode nested under category "09" of tier-1, and found 127 tier-2 categories under it.

Again, most of these 127 categories report numbers of new and dropped drugs in the single digit, that are consistent between the number of new drugs and the number of dropped drugs, with the exception of two categories reported in Table A 2.

Table A 2: Tier-2 of PropGenLinkCode for New and Dropped Drugs between 2021/22 and 2022/23, Irregular Categories

PropGenLinkCode	Number of New Drugs	Number of Dropped Drugs
0913	592	0
0914	80	0

We then looked at the conditions under these two tier-2 categories, and identified four tier-3 categories with the highest number of new drugs. As Table A 2 suggests, none of these categories have dropped drugs.

Tier-3 Category 091301

There were **104** new drugs under this category in the most recent link. All of the drugs in this category are nutritional supplements.

One example is *aymes actasolve savoury powder 57g vegetable sachet*, which are used to support the dietary management of individuals with or at risk of disease-related malnutrition. The sachets claim to contain nutritionally balanced range of vitamins, minerals, protein,

carbohydrates, fat and calories. Aside from individuals with malnutrition, they are also used for those on a fluid restricted diet e.g. ICU, wounds, pressure sores, burns, renal disease, oncology, liver disease, bariatrics and the elderly malnourished.

Tier-3 Category 091320

There were **71** new drugs under this category in the most recent link. All of the drugs in this category tackle some form of metabolic disorder – genetic or otherwise.

One example is *HCU express 15 oral powder 25g sachet*. This is a protein substitute used on individuals with homocystinuria. Individuals with this genetic condition cannot process methionine without medical intervention.

Another example is *MSUD amino5 oral powder 6g sachet*. This is a protein substitute for Maple syrup urine disease where the body cannot process certain amino acids leading to harmful build-up of substances in blood and urine.

Tier-3 Category 091326 and 091327

There were **86** new drugs for 091326, and **70** new drugs for 091327. The former is for low protein food (i.e. *low protein shortbread biscuits*, *low protein cookies*, *low protein pizza base*), and the latter is for a gluten-free product (i.e. *barkat gluten free par baked white bread sliced*).

Many practices changed the policy to allow bread and mixes prescribing as an adaptive measure to the cost of living crisis and reduced availability of fresh produce that could be accessed by groups of patients who are protein or gluten intolerant as per NHS England recommendation.

We conclude this exercise that looks at the unusually high number of new drugs in the 2022/23 link for Community Prescribing, and identify the source of impact to be metabolic disorders as well as staple food funded by the NHS.

9.2. Deflators

In order to construct a Laspeyres volume growth measure for NHS inputs, expenditure reported in the most recent year needs to be deflated (see section 2.2 for methodological details). This is to purge any changes in expenditure due to changes in prices. Because inflation rates can vary for different sources of expenditure, we use the most appropriate and disaggregated measures available.

We employed specific deflators for four categories of expenditure (Materials and Capital are considered as a homogenous category) until 2015/16. From 2016/17 and limited to Community Prescribing, we use the direct Laspeyres output growth, instead of deflating its

expenditure.[92] In 2018/19 we incorporated a specific deflator for agency staff. The various categories of expenditure and deflators used from 2013/14 onwards are summarised in Table A 3.

Table A 3: Sources of deflator data

Years	Labour	Materials & Capital	Primary Care	Prescribing
2013/14 – 2014/15	ESR deflator	Hospital and Community Health Services (HCHS) deflator	Pay and Price deflator 0.1 + 0.4*ESR deflator + 0.4*HCHS deflator	PCA / NHS BSA
2014/15 – 2015/16				
2015/16 – 2016/17				
2016/17 – 2017/18		NHS Cost Inflation Index: Provider Non-Pay Index (NHSCII-PNPI)	NHS Cost Inflation Index: General Practice Index (NHSCII-GPI)	
2017/18 – 2022/23	ESR deflator and Agency deflator (from NHSCII)			

The deflators applied to Labour and Prescribing expenditure are constructed using the ESR dataset and Prescribing data (PCA, NHS BSA) respectively, and imply calculating the Paasche price index for these two NHS inputs.

The Hospital and Community Health Services deflator and Pay and Price deflator were provided by DHSC. In 2016/17, the Pay and Price deflator was discontinued and we replaced it with a combination of ESR and HCHS deflators. In 2017/18, the DHSC created a set of new deflators – known as the NHS Cost Inflation Index[93] – from which we use specific deflators for Materials and Capital, and Primary Care. We use the Provider Non-Pay Index to deflate expenditure on Materials and Capital, and the General Practice Index to deflate expenditure on primary care. The Provider Non-Pay index (PNPI) is calculated by weighting several sub-components – various expenditure categories in the providers accounts. Each of them is deflated using the most appropriate available deflator: components of Producer Price Index (PPI), Services Producer Price Index (SPPI),[94] Consumer Price Index (CPI), etc. and their combinations are used to construct item-specific deflators. As regards the General Practice Index, it is computed as a weighted average of the staff and non-staff subcomponents. The former is calculated using GP and other staff earnings data provided by NHS England, whereas intermediate consumption is deflated using the Consumer Price Index, including the owner occupiers' housing costs (CPIH) published by ONS.

In addition, starting from 2018/19, a separate deflator for agency staff was produced within the NHSCI index. For the financial years 2020/21 and 2021/22 the agency deflator is calculated using data from the Crown Commercial Services/London procurement partnership. This data does not provide full coverage of Agency Expenditure, it is only data on agency supply through the NHS Workforce Alliance framework agreements, and they estimate that this accounts for around 40% of the total market. In previous years, the agency deflator was calculated using

[92] This approach yields a more precise real input growth rate of the sector. However, we still calculate and report the deflator for Prescribing to give an idea of the price dynamics in this expenditure category in recent years.
[93] Details on the methodology behind the index can be found in NHS Cost Inflation Index (last accessed 11/04/2025). For a comparison of HCSC and NHSCII see p.154 Unit Costs of Health and Social Care 2019 (last accessed 11/04/2025).
[94] ONS have introduced some changes to the construction of the PPI and SPPI indices, because of these some of the components of the indices used for the NHSCII are not produced anymore. As a consequence, alternative indices were used and the NHSCII back series were updated accordingly. This change does not affect our productivity series.

data collected by NHS England and NHS Improvement from all NHS Trusts, cover NHS Trusts' agency staff spending and the number of shifts worked, which allowed one to calculate the change in the cost of an agency staff shift, based on the assumption that the length of an agency staff shift was constant, which was deemed to be a reasonable assumption.[95] As agency expenditure normally accounts for a large share of expenditure, it is important to understand more closely how agency staff costs vary over time and reflect this back into our measures of NHS input and NHS productivity growth. This is particularly important when agency staff costs have different growth rates compared to NHS provider staff costs, as shown in Table A 4.

In 2022/23, the ESR deflator (Labour) was adjusted to take account of the NHS Pay Award that was paid out only in 2023/24 but was effective from 2022/23.[96]

Table A 4 shows deflation figures for each category of expenditure from 2019/20 – 2020/21 to 2021/22 – 2022/23. These figures indicate that between 2020/21 and 2021/22 all input categories were subject to an increase in costs, with the exception of prescribing and agency expenditures.

Table A 4: Deflator values 2019/20 – 2022/23

Years	Labour	Materials and Capital	Primary Care	Prescribing
2019/20 – 2020/21	3.49%	0.78%	6.04%	1.06%
2020/21 – 2021/22	3.43%	1.70%	4.48%	-3.90%
2021/22 – 2022/23	7.52%	7.15%	3.60%	1.78%

Note: agency deflator in brackets; the agency deflator for financial years 2019/20 to 2022/23 has been suppressed as it is based on management information from NHSEI.

[95] As highlighted by ONS (last accessed 11/04/2025), discussions with the NHS experts suggest agency staff shift lengths have been stable in recent years.

[96] Further information on the Pay Award can be found on the NHS Employers website (last accessed 11/04/2025).

9.3. NHS Trust-only productivity measures

While the main body of our research concerns the calculation of productivity growth for the whole NHS, we also produce an NHS Trusts-only productivity growth measure.

Table A 5 reports NHS output, input and productivity growth rates for NHS Trusts only. Their output growth measure for the 2021/22 – 2022/23 link, adjusted for both quality, and working and total days, where appropriate (see section 2.4 for further details on working and total days adjustment) continued to grow at 2.88%. However, when comparing 2019/20 with 2022/23, the Trust-only output growth is -0.32% and lower than overall NHS output growth between 2019/20 and 2022/23, an indication of substantial positive growth driven by Community Prescribing.

Trust specific input growth was similar to that of the NHS as a whole: 1.41% using the mixed method and 1.34% using the indirect method between 2021/22 and 2022/23. When comparing growth in NHS inputs between 2019/20 and 2022/23, we still find sustained growth in inputs.

Between 2021/22 and 2022/23 Trust-only productivity growth was 0.4 percentage points higher than that of the NHS as a whole for the mixed productivity measure and 0.64 percentage points higher than that of the NHS as a whole for the indirect measure.

Finally, comparing 2022/23 with the pre-pandemic year 2019/20, Trust-specific productivity growth was less negative than the overall NHS one by about 1.55 percentage points for the mixed productivity growth measure (see Table A 5 for full details).

Table A 5: Input, output and productivity growth, Trusts only

Years	Quality and working days adjusted Output growth	Input growth		Productivity growth rate	
		Mixed	Indirect	Mixed	Indirect
2020/21 – 2021/22	20.09%	4.84%	3.72%	14.55%	15.79%
2021/22 – 2022/23	2.88%	1.41%	1.34%	1.45%	1.52%

Years	Quality and working days adjusted Output growth	Input growth		Productivity growth rate	
		Mixed	Indirect	Mixed	Indirect
2019/20 – 2021/22	-3.17%	14.71%	15.52%	-15.85%	-16.18%
2019/20 – 2022/23	-0.32%	9.07%	17.06%	-8.61	-14.85%

9.4. Working and Total Days

Total days and working days for the last three financial years are reported in Table A 6.

Table A 6: Total days and working days in the last three financial years

Year	Total days	Working days
2020/21	365	253
2021/22	365	253
2022/23	365	251

10. References

ARABADZHYAN, A., CASTELLI, A., CHALKLEY, M. J., GAUGHAN, J. M. & MATIAS, M. A. 2021. *Productivity of the English National Health Service: 2018/19 update,* York, Centre for Health Economics Research Paper 182, University of York.

ARABADZHYAN, A., CASTELLI, A., CHALKLEY, M. J., GAUGHAN, J. M. & MATIAS, M. A. 2022. *Productivity of the English National Health Service: 2019/20 update*.

ARABADZHYAN, A., CASTELLI, A., GAUGHAN, J. & CHALKLEY, M. 2024. *Productivity of the English National Health Service: 2021/22 update*.

ARABADZHYAN, A., CASTELLI, A., GAUGHAN, J. M., ANAYA MONTES, M. & CHALKLEY, M. J. 2023. *Productivity of the English National Health Service: 2020/21 update*.

ATKINSON, T. 2005. *Atkinson Review: Final Report. Measurement of Government Output and Productivity for the National Accounts,* Basingstoke, Palgrave Macmillan.

ATKINSON, T. 2010. *Measuring Health Output, Productivity and Equity,* London, Office of Health Economics.

BLUNT, I., BARDSLEY, M. & DIXON, J. 2010. Trends in emergency admissions in England 2004–2009: is greater efficiency breeding inefficiency? *Emergency,* 1000**,** 0.

BLUNT, I., BARDSLEY, M., GROVE, A. & CLARKE, A. 2015. Classifying emergency 30-day readmissions in England using routine hospital data 2004–2010: what is the scope for reduction? *Emergency Medicine Journal,* 32**,** 44-50.

BOJKE, C., CASTELLI, A., GRAŠIČ, K., HOWDON, D. & STREET, A. 2016. *Productivity of the English NHS: 2013/14 update,* York, Centre for Health Economics Research Paper 126, University of York.

BOJKE, C., CASTELLI, A., GRAŠIČ, K., HOWDON, D. & STREET, A. 2017. Productivity growth in the English National Health Service from 1998/99 to 2013/14. *Health Economics,* 26**,** 547-565.

BOJKE, C., CASTELLI, A., GRASIC, K., MASON, A. & STREET, A. 2018. Accounting for the quality of NHS output. *CHE Research Paper.* University of York, York, UK.

BOJKE, C., CASTELLI, A., GRAŠIČ, K. & STREET, A. 2014. *Productivity of the English National Health Service from 2004/5: updated to 2011/12,* York, Centre for Health Economics Research Paper 94, University of York.

CASTELLI, A., CHALKLEY, M. J., GAUGHAN, J. M., PACE, M. L. & RODRIGUEZ SANTANA, I. 2019. *Productivity of the English National Health Service: 2016/17 update,* York, Centre for Health Economics Research Paper 163, University of York.

CASTELLI, A., DAWSON, D., GRAVELLE, H., JACOBS, R., KIND, P., LOVERIDGE, P., MARTIN, S., O'MAHONY, M., STEVENS, P., STOKES, L., STREET, A. & WEALE, M. 2007. A new approach to measuring health system output and productivity. *National Institute Economic Review,* 200**,** 105-117.

CASTELLI, A., LAUDICELLA, M., STREET, A. & WARD, P. 2011. Getting out what we put in: productivity of the English National Health Service. *Health Economics, Policy and Law,* 6**,** 313-335.

CHALKLEY, M. & MALCOMSON, J. M. 1998. Contracting for health services with unmonitored quality. *The Economic Journal,* 108**,** 1093-1110.

CURTIS, L. & BURNS, A. 2020. *Unit Costs of Health and Social Care*, Personal Social Services Research Unit, University of Kent, Canterbury.

DAWSON, D., GRAVELLE, H., O'MAHONY, M., STREET, A., WEALE, M., CASTELLI, A., JACOBS, R., KIND, P., LOVERIDGE, P., MARTIN, S., STEVENS, P. & STOKES, L. 2005. *Developing new approaches to measuring NHS outputs and productivity, Final Report,* York, Centre for Health Economics Research Paper 6, University of York.

DIEWERT, W. E., BALK, B. M., FIXLER, D., FOX, K. J. & NAKAMURA, A. O. 2010. *Price and Productivity Measurement: Volume 6 - Index Number Theory*, Trafford Press.

EUROSTAT 2001. *Handbook on price and volume measures in national accounts*, Luxembourg: Office for Official Publications of the European Communities.

FRIEBEL, R., HAUCK, K., AYLIN, P. & STEVENTON, A. 2018. National trends in emergency readmission rates: a longitudinal analysis of administrative data for England between 2006 and 2016. *BMJ open,* 8**,** e020325.

GUEST, J. F., KEATING, T., GOULD, D. & WIGGLESWORTH, N. 2020. Modelling the annual NHS costs and outcomes attributable to healthcare-associated infections in England. *BMJ open,* 10**,** e033367.

JONES, K. C. & BURNS, A. 2021. Unit Costs of Health and Social Care 2021.

JONES, K. C., WEATHERLY, H., BIRCH, S., CASTELLI, A., CHALKLEY, M., DARGAN, A., FORDER, J. E., GAO, M., HINDE, S. & MARKHAM, S. 2023. Unit costs of health and social care 2022 manual.

JONES, K. C., WEATHERLY, H., BIRCH, S., CASTELLI, A., CHALKLEY, M., DARGAN, A., FORDER, J. E., GAO, M., HINDE, S. & MARKHAM, S. 2024. Unit Costs of Health and Social Care 2023 Manual.

OECD 2001. *OECD Productivity Manual: a guide to the measurement of industry-level and aggregate productivity growth*, Paris: Organisation for Economic Cooperation and Development.

PODULKA, J., BARRETT, M., JIANG, H. J. & STEINER, C. 2012. 30-day readmissions following hospitalizations for chronic vs. acute conditions, 2008: statistical brief# 127.

ROBINSON, P. 2010. Hospitals readmissions and the 30 day threshold: CHKS.

UK HEALTH SECURITY AGENCY 2021. Thirty-day all-cause mortality following MRSA, MSSA and Gram-negative bacteraemia and C. difficile infections, 2020 to 2021. UK Health Security Agency London.

Part of