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**NHS Productivity from
2004/5 to 2010/11**

CHE Research Paper 87

NHS productivity from 2004/5 to 2010/11

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Executive Summary

Overview

2010/11 was the first full financial year of a Coalition government committed to meeting the so-called “Nicholson challenge” of making £20bn efficiency savings in projected NHS expenditure by 2015. Securing improvements in NHS productivity is seen as a key element in meeting this challenge. In what follows we report year-on-year changes in productivity from 2004/5 to 2010/11.

Methods

Productivity change is measured by comparing year-on-year growth in output against growth in inputs. Output comprises the total volume of services provided to all NHS patients treated in hospital, outpatient, accident & emergency, diagnostic, mental health, community, and primary care settings. The quality of care is measured by inpatient and outpatient waiting times, 30-day hospital survival rates, health outcomes and blood pressure control.

Inputs include the staff, equipment and capital resources that contribute to the production of care.

We also assess how sensitive estimates of productivity change are to the choice of data used to populate the output and input indices.

Output growth

Since 2004/5 the volume of NHS activity across almost all settings has increased year-on-year. The exception is in primary care where survey data suggest that the number of consultations in 2010/11 has fallen back to 2006/7 levels.

In terms of quality, 30-day survival rates have improved year-on-year since 2004/5 as has management of blood pressure in primary care. Waiting times reached their lowest levels in 2008/9, since when they have been increasing.

Output growth increased by 27% between 2004/5 and 2010/11. Between 2009/10 and 2010/11, output growth amounted to 4.57%.

Input growth

There have been year-on-year increases in staffing levels, though these have flattened out recently. Growth in capital utilization peaked in 2007/8 and has been declining subsequently. There has been marked year-on-year growth in the use of intermediate inputs, such as drugs & gases, services & supplies, and energy.

Input growth increased by 18% between 2004/5 and 2010/11. Between 2009/10 and 2010/11, input growth amounted to 1.33%.

Productivity growth

Between 2004/5 and 2010/11 there has been an 8% increase in NHS productivity although year-on-year productivity growth tends to fluctuate around zero from positive to negative. Productivity growth between 2009/10 and 2010/11 amounted to 3.21%. This was driven mainly by a slowdown in input growth, with levels of output growth being maintained.

1. Introduction

The productivity of the health care sector is measured by comparing the total amount of health care 'output' produced to the total amount of 'input' used to produce this output (Eurostat, 2001). We construct indices for both output and input growth in order to calculate productivity growth for the English National Health Service over pairs of years from 2004/5 to 2010/11.

Output consists of the volume of all health care services provided to NHS patients and also accounts for quality improvements.

- The volume of NHS outputs across all health care settings is captured as comprehensively as possible, using the Hospital Episode Statistics and Reference Cost database and other data sources;
- The quality of NHS outputs is captured by inpatient and outpatient waiting times, 30-day hospital survival rates, and improved blood pressure control in primary care.

Inputs include the staff, intermediate goods and services, and capital resources that contribute to the production of health care.

- The volume of NHS labour is measured using data from the Electronic staff record
- The volume of prescriptions is measured using data by chemical composition from the Prescription Pricing Authority;
- The volume of all other inputs are derived from expenditure data compiled from NHS organisational accounts;
- The output and input indices are consistent in how they account for services procured from non-NHS bodies.

We explore alternative ways of populating the input index, which vary according to the data source used.

We find that productivity growth in 2009/10 – 2010/11 was around 2.5% to 3.5%, depending on the input index used. In the next section we describe our data sources. The output index is populated in section 3. Section 4 reports the elements of the input index. Section 5 summarises the productivity growth figures.

2. Methods and data

Total factor productivity growth is calculated by dividing an index of output growth by an index of input growth:

$$\Delta TFP = [I/Z] - 1 \quad (1)$$

Where ΔTFP is total factor productivity growth, I is the index of output growth and Z is the index of input growth. In order to estimate total factor productivity, it is therefore necessary to correctly define and measure the output and input indices.

2.1 Measuring output

Our index of NHS output growth captures all the activities undertaken for NHS patients. The datasets we use are comprehensive with the exception of consultations in primary care, for which we rely on nationally representative survey data.

Table 1 below summarises the data sources used to calculate the amount of activity undertaken and for cost weights for each activity type.

Table 1 Summary of output data sources

Output type	Activity source	Cost source	Quality	Notes
Elective	HES	RC	30-day survival; Health outcomes; Waiting times	Updated method to calculate CIPS
Non-elective	HES	RC	30-day survival; health outcomes	Updated method to calculate CIPS
Mental health	HES & RC	RC	30-day survival; Health outcomes; Waiting times	Updated method to calculate CIPS
Outpatient	RC	RC	Waiting times	Waiting times 2009/10 from DH Post-2009/10 from Outpatient Minimum Dataset
Community care	RC	RC	N/A	
Other (1)	RC	RC	N/A	
Primary care	Pre-2009/10 from QResearch Post-2009/10 for GP patient survey	PSSRU Unit Costs of Health and Social Care	QOF data	QResearch discontinued so switch to GP Patient Survey
Prescribing	Prescription cost analysis system	Prescription cost analysis system	N/A	
Ophthalmic and dental services	IC		N/A	
NHS Direct and NHS Choices	DH		N/A	Activity not included in baseline estimates

Notes HES: hospital episode statistics; RC: Reference costs; CIPS: Continuous Inpatient Spells; PSSRU Personal & Social Services Research Unit; IC NHS Information Centre; DH Department of Health (1) A&E, Radiotherapy & High Cost Drugs, Diagnostic Tests, Hospital/patient Transport Scheme, Radiology, Rehabilitation, Renal Dialysis, Specialist Services

The Hospital Episode Statistics (HES) is the source of data for both the amount of activity and for the measures of the quality of elective, non-elective and mental health care delivered in hospitals.¹ HES comprise over 18.5 million patient records for 2010/11. We convert HES records into Continuous

¹ As in previous years, we exclude patients categorised to HRG SB97Z (same day chemotherapy admission/attendance) because this is excluded from the hospital Reference Cost collection and is intended to attract a zero tariff under Payment by Results.

Inpatient Spells (CIPS) and then count the number of patients (ie CIPS) in each Healthcare Resource Group (HRG), which form the basic means of describing different types of hospital output. The cost of each CIPS is calculated on the basis of the most expensive FCE within the CIPS, with costs for each HRG derived from the Reference Cost data. We then calculate the national average cost per patient in each HRG.

The HES records include waiting times and can be linked to ONS death registry records. This allows us to calculate waiting times and 30-day survival which are used to assess the quality of hospital care.

An official algorithm for calculating CIPS has recently been published by the NHS Information Centre² and we have now adopted this, replacing the procedure that we had adapted from Lakhani et al (Lakhani et al., 2005, Castelli et al., 2008). The main difference between the algorithms is in how emergency readmissions are attributed to CIPS, and this has greatest impact on the amount of non-elective activity that is counted. To ensure like-with-like comparisons, output growth up to and including 2008/9-2009/10 is based on our previous algorithm while the growth rate for 2009/10-2010/11 is based on the new method.

The Reference Cost returns (RC) are used to capture activity in all settings except hospitals and primary care, as well as for the costs weights for these activities. The Reference Costs capture data about activities conducted in mental health and community care settings, outpatient and accident and emergency departments, and diagnostic facilities. These activity data are reported in various ways, including attendances, contacts, bed days, and number of tests. We use costs to weight these diverse activities in order to convert them into a common metric that permits aggregation.

There have been concerns about the accuracy of the reference cost data. In order to identify data error we have implemented a systematic procedure that allows us to identify substantial changes between adjacent years. For some types of Reference Costs categories there are implausibly large changes in volumes or costs from one year to the next. In Table 2 we have listed the reference costs which represent the biggest absolute cost difference between the years 2009/10 and 2010/11. These are included in the output index but these are weighted by the lowest reported cost across the two years.

Table 2: Candidate reference cost categories for omission from output index

Setting	Activity Code	Service Code	2010/11		2009/10		Cost difference
			Activity	Cost	Activity	Cost	
Outpatient	clfunff	TCMDT_C	1	£22,723	1	£201,975	£179,252
Outpatient	clfunff	TCMDT_SpU	1	£9,184	1	£130,907	£121,723
Outpatient	opproc	MA17C	1035	£37,903	874	£347	£37,556
Other	rdna	HB15G	4	£653	1	£20,511	£19,858
Other	rdna	FZ21Z	1	£304	2	£14,914	£14,609
Other	rdna	CZ17V	1	£8,115	1	£182	£7,933
Chemo/Radiotherapy & High Cost Drugs	rdthyother	SC26Z	505	£1,246	17	£7,364	£6,118

In the past, outpatient waiting times were based on data published on the Department of Health (DH) performance website, but these no longer appear. Instead, we calculate waiting times for first

² <http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=1072>

attendances using the outpatient minimum dataset³. These waiting times are somewhat higher than those reported previously, but the year-on-year trends are virtually identical. Consequently, the move to the new data series will not have an impact on the estimates of output growth. To ensure consistent comparisons, growth rates up to and including 2008/9-2009/10 are based on the previous data. The growth rate for 2009/10-2010/11 is based on the data constructed from the outpatient minimum data.

Comprehensive data on the activities performed in primary care settings remain unavailable. In their absence, nationally representative survey data have been used instead⁴. For the period 2004/05-2008/09 the volume of GP consultations was obtained from QResearch (QResearch, 2009, Fenty et al., 2006). This survey has since been discontinued, and the GLS (General Lifestyle Survey) no longer includes a question about visits to the doctor. Instead we have used the data from the annual GP Patient Survey⁵, using the percentage of patients answering "in the past 3 months" to the question "When did you last see a doctor at your GP surgery or health centre?" We used these percentages to estimate the volume of consultations in the current period, taking the 2008/9 volumes as the baseline. The Patient Survey does not provide a breakdown by type of consultation so we have assumed that the mix of consultations observed by QResearch in 2008/9 remained the same in 2010/11, these types being GP home visits, GP telephone consultations, GP surgery consultations, GP other consultations, Practice Nurse consultations and other consultations.

Unit costs for different consultation types are taken from PSSRU's Unit Costs of Health and Social Care.⁶ Data about the quality of primary care activity are obtained from the Quality and Outcomes Framework (QOF), which reports disease prevalence and achievement in reducing blood pressure for patients with coronary heart disease, transient ischaemic attacks or stroke and hypertension (The Information Centre for Health and Social Care, 2011).

Data about community prescribing are taken from the Prescription Cost Analysis (PCA) system, supplied by the Prescription Pricing Authority. The data are based on a full analysis of all prescriptions dispensed in the community, summarised into more than 8,000 categories defined according to chemical composition.

2.2 Measuring input

Inputs into the health care system consist of:

- Labour, such as doctors, nurses, technicians and managers;
- Intermediate goods and services, such as drugs and clinical supplies;
- Capital, such as buildings and equipment with an asset life of more than a year

We construct a comprehensive index of input growth, using the workforce data and financial returns made by all NHS organisations to quantify the amount of all inputs used in the production of care provided to NHS patients. These data sources are summarised in Table 3.

³ <http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=890>

⁴ We expect to obtain more exact data from April 2014 onwards, once the General Practice Extraction Service (GPES) is implemented.

⁵ http://www.gp-patient.co.uk/results/download/y5q4/y5q4_Summary.pdf.

⁶ <http://www.pssru.ac.uk/project-pages/unit-costs/2011/index.php> Table 10.8b for GP costs; Table 10.6 for Nurse Practitioner costs; and Table 10.7 (nurse advanced) as a proxy for other healthcare professionals' unit costs

Table 3 Summary of input data sources

Input type	Data source	Deflator
NHS staff	Electronic staff record	CHE pay index from ESR data
NHS staff	Organisational financial returns	NHS pay index
Agency staff	Organisational financial returns	NHS pay index
Intermediates	Organisational financial returns	NHS prices index
Capital	Organisational financial returns	ONS MM17 'Electrical machinery (3123)', ' Medical, precision and optical equipment (3300)'; the "Computers and other information processing equipment PQEK" index is no longer available and has been substituted with "Office machinery & computers PVJI".
General medical, dental, ophthalmic care, family health services	DH	NHS pay index and NHS pay & prices index
Prescribing	Prescription cost analysis system	CHE pharmacy price index
Central Administration	DH	NHS pay & prices index

NHS staff data

Workforce and earnings data are obtained from the NHS iView database (<https://iview.ic.nhs.uk/>) which draws data directly from the Electronic Staff Records (ESR), and combined payroll and Human Resources system for the NHS. The data contain numbers of full time equivalent (FTEs) staff and earnings by 480 different occupational groups for all staff employed in the NHS.

These data do not capture agency staff, self-employed GPs and practice staff. We account for agency staff and GPs using expenditure data. For reporting purposes only, we use the data on the GPs and GP practice staff from the Workforce census.

We use the national average earnings for each occupational group to construct a pay index by which to aggregate the total number of FTEs across occupational groups into a measure of total NHS labour input (see Appendix 1).

Expenditure data

We analyse financial data for all NHS organisations to construct our index of input use:

- Labour: the financial returns detail expenditure on both NHS and agency staff by broad categories of labour input.
- Intermediate inputs: include drugs and gases used in hospital, clinical supplies, catering, hotel services, uniforms, laundry, bedding, energy, establishment and premises costs. We use price deflators to wash out price changes in order to assess the amount of each type of input used.
- Capital: we account for depreciation on assets and for current outlays on equipment, making assumptions according to the asset in question about what proportion is employed in the current period.

We also account for expenditure that does not appear in organisational financial returns, including expenditure on general medical (including GPs and practice staff), dental and ophthalmic services and central administration. Data on these forms of expenditure were provided by the Department of Health.

Expenditure on non-NHS bodies

The financial returns for all NHS organisations include purchases of health care from non-NHS bodies. This category accounts for the largest share of expenditure by Primary Care Trusts, capturing care purchased from the voluntary sector, charitable institutions and local authorities for older people and those with mental or physical disabilities, and acute care for NHS patients purchased from the private sector (Zerdevas, 2009, Bojke et al., 2012). Many of these services are not captured in the Reference Costs, particularly those that are social care rather than health care services. In recognition of this, our baseline estimates of productivity growth are based on activity (output) and expenditure (input) reported in the Reference Costs. As a sensitivity analysis, the expenditure reported by PCTs is used in the input series.

Table 4 Current expenditure on services from non-NHS providers (pounds 000s)

	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
A. Expenditure for PCTs reported in Reference Costs ¹	112,009	152,953	196,757	194,398	229,603	334,167	381,495
B. PCT purchase of healthcare from non-NHS bodies	3,336,014	4,096,300	4,651,748	5,712,897	6,422,652	7,440,538	8,235,200
C. Foundation trusts	15,039	19,551	47,539	134,712	222,702	240,194	242,469
D. Trusts	344,254	319,231	292,770	294,919	236,863	199,563	218,440
A / B (%)	3.4%	3.7%	4.2%	3.4%	3.6%	4.5%	4.6%

¹This excludes expenditure on inpatient mental health care, this activity being captured in HES

Table 4 reports the total value of services from non-NHS providers that are included in the Reference Costs collection and the total value of purchases made by PCTs, Trusts and Foundations Trusts as reported in their financial returns. Many trusts became Foundation Trusts in recent years; therefore the reported expenditure has risen sharply in the Foundation Trusts and has fallen in the case of Trusts. Looking at PCTs, both the A and B expenditure series have increased rapidly over time, with (current) expenditure in 2010/11 almost 3.5 times that in 2004/5. From the Figure 1 we can see that the former series has risen more erratically than the latter. The fraction of PCT purchases from non-NHS bodies that are captured in the Reference Cost collection has been growing over the years, however it is still very small (4.6%). This means that the vast majority of services procured from non-NHS bodies are not captured in the output index.

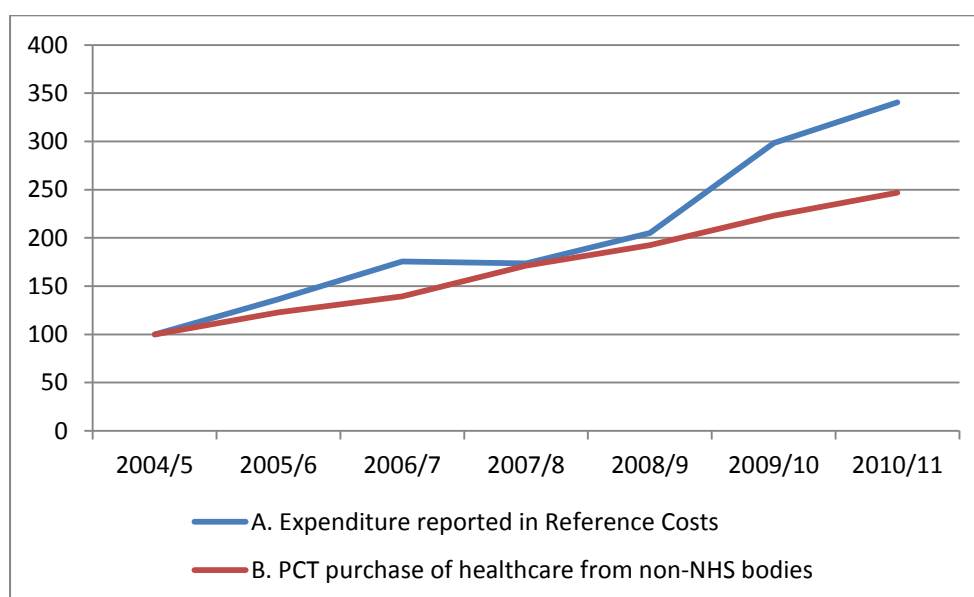


Figure 1: Growth in expenditure on non-NHS bodies (base=2004/5)

2.3 Measuring productivity

We report estimates for four different formulations of the productivity index. Our MIXED indices of productivity growth measure growth in NHS labour inputs using information recorded in Electronic Staff Records; and organisational expenditure data for non-NHS staff, all intermediates (other than community prescription items), and for capital. Two forms of this index are presented, depending on how expenditure on services procured from non-NHS bodies is dealt with.

Our INDIRECT indices of productivity growth estimate input growth using organisational expenditure data for NHS staff, non-NHS staff, all intermediate inputs and capital. Again two forms of this index are presented, depending on how expenditure on services procured from non-NHS bodies is dealt with.

3. Output growth

3.1 Hospital activity

Summarised data on the amounts of elective, non-elective and outpatient activity are reported in Table 5, together with information about mean costs, 30-day survival rates, and waiting times.

Table 5: Hospital output

Data Source	NHS Activity	Year							
		2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2009/10(a)	2010/11(a)
Hospital episode statistics (HES)	Hospital output								
	<i>Elective and day cases</i>								
	Volume of activity	6,433,933	6,864,612	7,194,697	7,598,796	8,148,229	8,474,088	8,465,757	8,755,081
	Average cost	1,031	1,041	1,036	1,090	1,092	1,154	1,087	1,106
	30-day survival rate	99.38%	99.47%	99.51%	99.72%	99.74%	99.76%	99.76%	99.78%
	Mean age	53.6	53.9	54.4	54.6	55	55.3	55.3	55.7
	Mean life expectancy	23.7	23.7	23.6	23.5	23.2	23.4	23.4	23.4
	80 th percentile waiting times	104	95	89	74	60	65	65	76
	Mean waiting times	71	67	65	57	51	57	57	62
	<i>Non-electives</i>								
	Volume of activity	6,009,802	6,291,117	6,363,388	6,593,136	6,826,035	7,151,256	6,951,379	7,109,358
	Average cost	1210	1,241	1,244	1,237	1,295	1,352	1,355	1,397
	30-day survival rate	95.16%	95.49%	95.65%	95.79%	95.85%	96.05%	96.07%	96.05%
	Mean age	41.6	41.6	41.6	41.4	41.9	42.3	42.1	42.2
	Mean life expectancy	34.1	34.3	34.6	34.7	34.4	34.4	34.6	34.8
Ref costs	<i>Outpatient</i>								
	Volume of activity	52,724,302	60,541,477	63,453,507	69,678,564	74,421,017	76,761,100		81,263,904
	Average cost	106	103	93	94	98	99		105
	Mean waiting times(weeks)	7.4	6.5	5.9	3.4	3.1	3.4		
				5.3 (b)	4.8 (b)	5.1 (b)		5.3 (b)	

Notes: (a) Volume of NHS activity using CIPS calculated with the new method (b) Derived from the HES outpatient minimum data

Figure 2 illustrates the consistent upward trend in elective and non-elective activity (2004/5=100). Growth in elective activity has been particularly strong, increasing by 36% from 2004/05 to 2010/11. Non-elective activity has increased by 18% over the same period.

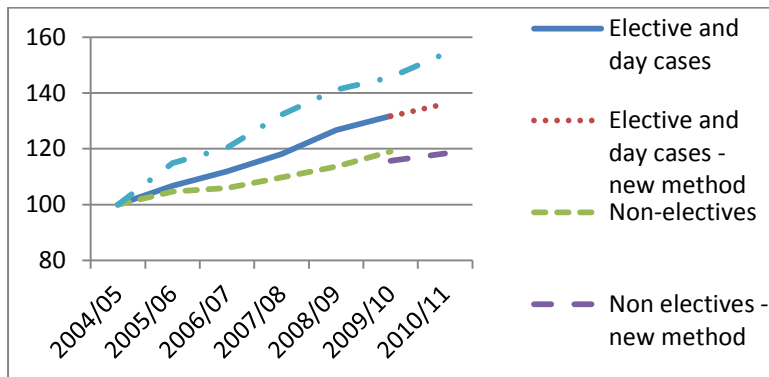


Figure 2 Trends in hospital activity

The broken series are due to the change in the CIPS algorithm that was introduced in 2009/10. As can be seen the revision has an impact on the number of CIPS recorded, particularly for non-electives. Between 2009/10 and 2010/11, the number of elective patients increased from 8.5m to 8.8m and non-elective activity increased from 7.0m to 7.1m. There has been a 28.3% growth in first outpatient attendances over the full period, from 52.7m in 2004/5 to 81m in 2010/11.

Along with the upward trend in activity, 30-day survival rates has also improved year-on-year, as indicated in Figure 3. For elective patients, the 30-day survival rate was 99.78% in 2010/11, up from 99.38% in 2004/5. The rate for non-elective patients was 96.05% in 2010/11 compared to 95.16% in 2004/5.

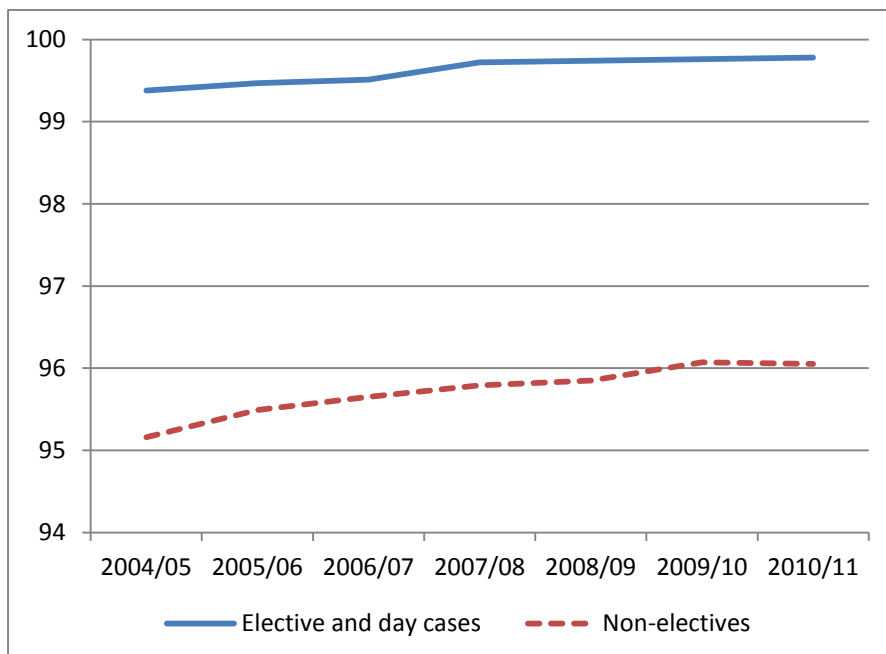


Figure 3: 30-day survival rates

Trends in inpatient and outpatient waiting times are depicted in Figure 4. Waiting times declined year-on-year from 2004/5 to 2008/9. But, as can be seen, inpatient waiting times (measured at the

80th percentile) increased from their lowest level of 60 days in 2008/9 to 76 days in 2010/11. The trend in mean waiting times matches that for the 80th percentile (see Table 5).

Outpatient waiting times also fell year-on-year between 2004/5 and 2008/9, before starting to increase in 2009/10. Reporting of these data was then discontinued. But waiting times calculated from the outpatient data set exhibit the same change as the “official” data for the three years over which the two series overlap. The waiting time for a first outpatient attendance in 2010/11 was 5.3 weeks, compared to 4.8 weeks in 2008/9.

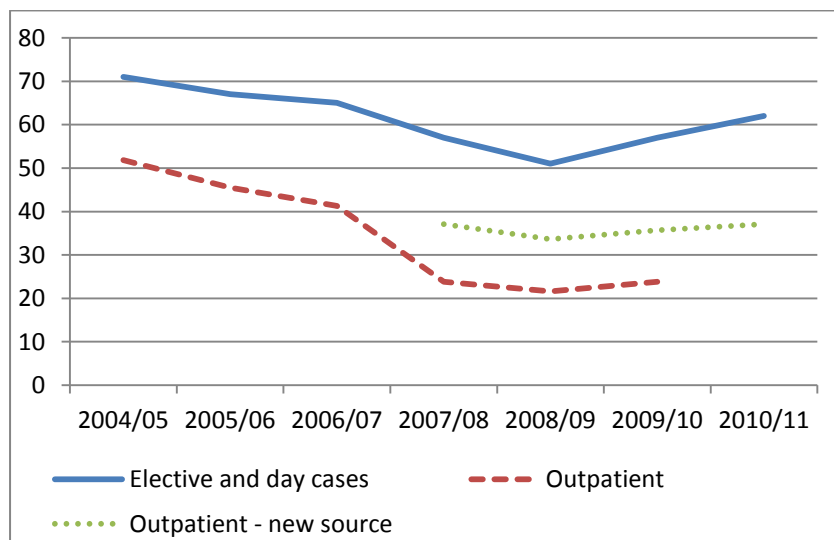


Figure 4: Trends in waiting times

3.2 Mental health and community care

A summary of mental health and community care activity is reported in Table 6. This shows gradual reductions in the amount of elective mental health care activity being undertaken in hospital settings, while non-elective activity has been fairly constant over time, despite some year-on-year volatility. In contrast there has been a steady increase in the amount of mental health care delivered in community settings, the number of contacts increasing from 16m in 2004/5 to 24m in 2010/11. The provision of other forms of community care has also increased over time, rising from 75m contacts in 2004/5 to almost 91m in 2010/11. These trends are depicted in Figure 5.

Table 6: Output in mental health and community care

Data Source	NHS Activity	Year								
		2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2009/10(a)	2010/11(a)	
Hospital episode statistics (HES)	Mental Health inpatient									
	Elective and day cases									
	Volume of activity	45,624	41,439	38,408	33,993	25,792	28,321	28,143	30,714	
	Average cost	689	673	656	1,141	1,133	1,195	1,195	1,297	
	30-day survival rate	97.72%	98.01%	98.15%	98.64%	98.71%	98.90%	98.61%	98.85%	
	Mean life expectancy	30.1	30	30.6	29.9	29	29.4	29.4	30.2	
	80 th percentile waiting times	40	265	257	28	42	28	28	37	
	Non-electives									
	Volume of activity	123,983	120,203	115,560	112,475	109,636	122,795	121,610	125,823	
	Average cost	1,012	1,012	1,012	1,364	1,319	1,365	1,365	1,445	
	30-day survival rate	96.96%	97.22%	97.38%	97.65%	97.56%	97.76%	97.68%	97.63%	
	Mean life expectancy	28.7	28.9	29	27.7	27.3	27.7	27.7	27.8	
	Ref costs	Community Mental Health								
		Volume of activity	16,389,891	17,738,894	19,259,205	21,751,043	22,674,811	23,440,616		24,341,950
Average cost		164	170	167	153	157	161		159	
Community care										
Volume of activity		75,673,792	85,092,838	83,895,139	85,470,688	88,513,663	92,412,727		90,724,524	
Average cost		39	38	40	42	45	46		47	

Notes (a) Volume of NHS activity using CIPS calculated with the new method

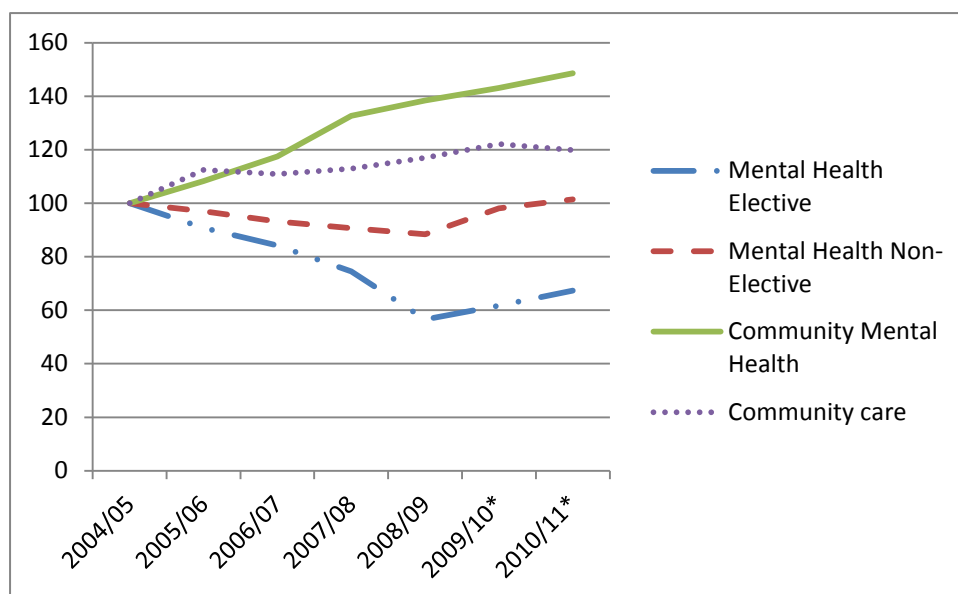


Figure 5 Trends in mental health and community care (* There was change in calculating CIPS in year 2009/10)

3.3 Primary care

We have two broad measures of activity in primary care: the number of consultations and the number of prescription items dispensed. Data for both of these measures is summarised in Table 7. The number of prescription items has been gradually increasing from 2004/05, amounting to 937m items in 2010/11.

Table 7: Output in primary care

NHS Activity	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Primary Care							
General Practice Consultations							
Volume of activity (000 contacts)	265,600	283,100	293,000	292,500	300,400	300,400	293,517
Quality adjusted volume	274,122	293,732	305,517	305,291	313,814	313,988	303,355
Average cost	20	21	25	26	27	28	29
Prescription items							
Volume of activity (000 items)	691,949	733,011	762,632	803,297	852,482	897,727	936,744
Average cost	12	11	11	10	10	10	9

Data about the number and cost of consultations are reported in Table 8, broken down by consultation type. From 2004/5 to 2008/9, the activity data were derived from QResearch. With these data being discontinued, data from 2009/10 are derived from the GP Patient Survey. The QResearch data suggest year-on-year increases in primary care consultations from 2004/5 to 2008/9. The GP Patient Survey suggests that consultation rates were unchanged between 2008/9 and 2009/10⁷ and fell between 2009/10 and 2010/11: in 2010/11 53% of respondents said they'd visited their GP in the previous 3 months, compared to 58% in the 2009/10 survey.

⁷ As do data from the General Lifestyle Survey

Table 8 Consultations by type

	2004/05		2005/06		2006/07		2007/08		2008/09		2009/10*		2010/11*	
	activity	cost	activity	cost	activity	cost	activity	cost	activity	cost	activity	cost	activity	cost
GP Home visit	5,800	69	6,000	69	5,900	55	5,900	58	6,000	117	6,000	120	5,793	121
GP Telephone	12,500	30	14,000	27	15,100	21	16,200	22	18,700	21	18,700	22	18,055	22
GP Surgery	148,300	24	153,900	24	156,600	34	155,800	36	158,800	35	158,800	36	153,324	36
GP Other	4,200	24	4,800	24	5,000	34	4,800	36	5,500	35	5,500	36	5,310	36
Practice Nurse	84,600	10	93,700	10	99,000	9	98,500	11	100,600	11	100,600	12	97,131	13
Other Clinicians	10,200	15	10,700	15	11,400	14	11,300	15	10,800	14	10,800	17	10,428	25
Total	265,600	20	283,100	20	293,000	25	292,500	26	300,400	27	300,400	28	290,041	29

* The data for 2009/10 and 2010/11 are calculated from the GP Patient Survey. Proportion of patients who visited their GP in the last 3 months is 58%, 58% and 53% for the years 2008/09, 2009/10, 2010/11 respectively.

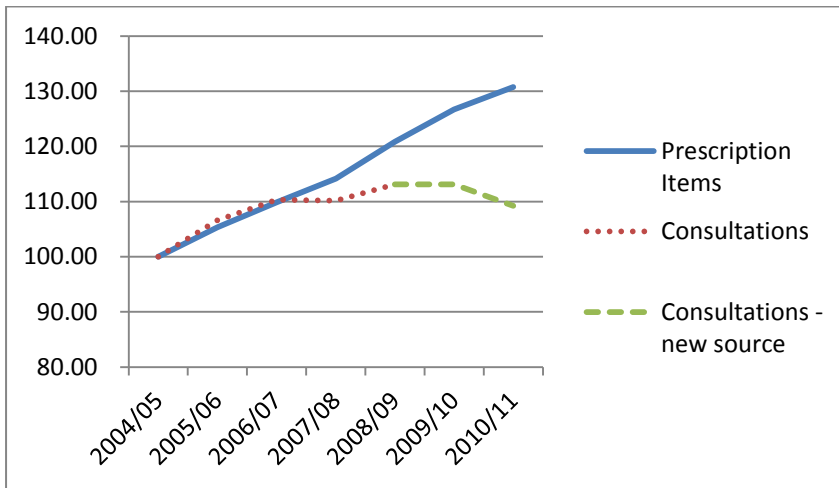


Figure 6: Trends in growth in primary care

Table 9 reports the trends in prevalence and achievement in reducing blood pressure for patients with CHD, stroke and hypertension. Achievement rates have increased year-on-year. We account for these improvements in measuring primary care output, as specified by Derbyshire et al (Derbyshire et al., 2007). Allowance for quality suggests that primary care output increased 9.2% between 2004/5 to 2010/11.

Table 9 Rates of prevalence and achievement in reducing blood pressure

	Prevalence			QOF achievement		
	CHD	Stroke	Hypertension	CHD	Stroke	Hypertension
2004/05	3.57	1.63	10.41	78.60	73.13	64.33
2005/06	3.57	1.66	11.48	84.44	81.22	71.05
2006/07	3.54	1.61	12.49	88.86	86.92	77.62
2007/08	3.50	1.63	12.79	89.41	87.51	78.35
2008/09	3.47	1.66	13.13	89.68	87.88	78.56
2009/10	3.44	1.68	13.35	89.77	88.12	78.72
2010/11	3.40	1.71	13.52	90.16	88.57	79.30

3.4 Other activities

Other types of activity reported in the Reference Costs are summarised in Table 10. The ways of classifying these activities has changed somewhat over time, so only data from 2007/8 are reported. Details for previous years are provided in a previous report (Castelli et al., 2008). For all but two of these broad groups of activity there have been year-on-year increases in volumes.

One of the exceptions is Radiotherapy & High Cost Drugs, for which there has a reclassification of how these services are described. This has resulted in lower amounts of activity being recorded, but these activities are now of higher cost.

In 2010/11, there was a marked reduction in the Hospital/Patient transport scheme, from 7m to 435k journeys. The reduction stems from concerns raised about the quality of these data, and work is being carried out to improve the data collection methodology (Department of Health, 2010). In the meantime, by and large the data have been excluded from Reference Costs in order to reduce the data collection burden. We have performed a sensitivity analysis to assess the implications inclusion/exclusion has on estimates of output growth.

Table 10 Other types of activity

	2007/08	2008/09	2009/10	2010/11
A&E Services				
Quantity	23,189,303	24,815,831	25,574,685	25,758,593
Mean cost	£114	£122	£129	£133
Radiotherapy & High Cost Drugs				
Quantity	11,851,877	16,598,539	6,150,933	5,342,811
Mean cost	£82	£92	£320	£409
Diagnostic Tests				
Quantity	258,217,386	279,722,459	301,073,413	321,876,384
Mean cost	£2.77	£2.45	£2.52	£2.50
Hospital/Patient Transport Scheme				
Quantity	7,654,290	8,965,833	7,236,366	435,669
Mean cost	£28	£28	£27	£13
Ophthalmology & Dentistry				
Quantity	47,034,815	48,704,692	50,401,166	51,183,058
Mean cost	£32	£33	£33	£34
Radiology				
Quantity	7,614,437	7,852,498	8,347,404	8,491,834
Mean cost	£103	£102	£104	£97
Rehabilitation				
Quantity	2,732,048	3,277,757	3,277,430	3,314,085
Mean cost	£259	£265	£279	£285
Renal Dialysis				
Quantity	3,980,793	4,091,245	4,050,658	4,088,817
Mean cost	£114	£120	£129	£129
Specialist Services				
Quantity	2,782,643	3,052,954	3,244,160	3,465,453
Mean cost	£820	£840	£850	£818
Other NHS Activity (1)				
Quantity	4,401,019	4,782,324	4,767,718	4,789,366
Mean cost	£71	£72	£72	£75

(1) this is a quite heterogenous grouping of the remaining Reference Cost data (ie hospital at home/early discharge), screening programmes (ie NHS Newborn Hearing Screening Programme) and transplantations (ie donor related activities).

3.5 Output growth

Output growth is measured by combining activities of different types into a single index using costs to reflect their values. This generates our cost-weighted output growth index. We then re-scale each type of cost-weighted output according to changes in survival rates, health improvements and waiting times. This generates our quality-adjusted index.

Table 11: Output growth

Output growth	All NHS	
	Cost-weighted growth	Quality adjusted CW growth
2004/5-5/6	6.53%	7.11%
2005/6-6/7	5.88%	6.50%
2006/7-7/8	3.41%	3.66%
2007/8-8/9	5.34%	5.73%
2008/9-9/10	3.44%	4.11%
2009/10-10/11	3.61%	4.57%
Growth including hospital/patient transport scheme		
2009/10-10/11	3.31%	4.27%

Cost-weighted NHS output increased by 3.61% between 2009/10-2010/11, with quality improvements adding some 0.96% to output growth. If patient transport services are included in the calculations, the growth in output appears some 0.3% lower. As mentioned, this is due to the reduced data collection pertaining to these services.

4. Input growth

4.1 Staff numbers

Summarised from 480 staff categories in ESR data, Table 12 reports NHS staff numbers (as Full Time Equivalents) aggregated in major staff groups for each year from 2004/5, while Figure 7 and Figure 8 present the information graphically. For years prior to 2007/08, we use the data from Workforce Census, 2007/08 being an overlapping year. Data for GPs and practice staff are always taken from the Workforce Census but, as noted earlier, these are not used in the construction of the input series because these are accounted for in the primary care expenditure data (see Figure 16) and are reported here merely for information.

The data show gradual growth over time in most staffing groups. The exception is for practice staff, numbers of which peaked in 2006/7. In 2010/11, the NHS employed 1.16m FTEs, up from 1.04m in 2004/5, an increase of some 10.9% over the seven years. Annual growth in FTEs has been uneven, with an increase of 1.5% between 2009/10 and 2010/11.

Table 12 Full time equivalent NHS staff numbers

	2004/5	2005/6	2006/7	2007/8 (a)	2007/8	2008/9	2009/10	2010/11
Medical staff	78,462	82,568	85,975	84,226	82,790	88,647	91,604	95,077
GPs*	31,021	31,901	33,384	33,384	33,384	33,730	34,043	36,085
GPs – Practice staff*	72,006	72,990	76,977	75,085	75,085	73,292	72,153	73,306
Ambulance staff					21,149	23,084	24,489	25,056
Administration and Estates staff					237,264	243,018	262,479	263,723
Health care assistants and other support staff					101,114	106,406	112,710	114,786
Nursing, midwifery and health visiting staff					363,344	369,509	377,308	377,938
Nursing, midwifery and health visiting learners					3,176	2,623	2,533	2,644
Scientific, therapeutic and technical staff					104,866	111,321	118,935	123,875
Healthcare scientists					36,888	38,735	40,603	41,539
Unknown					1,056	555	428	56
Non-funded staff					3,273	3,046	3,038	3,299
Professionally qualified clinical staff	412,013	425,044	425,983	425,983				
Support to clinical staff	271,347	278,994	273,202	273,202				
NHS infrastructure support staff	178,530	186,510	178,230	178,230				
TOTAL	1,043,379	1,078,007	1,073,751	1,070,110	1,063,389	1,093,966	1,140,323	1,157,384
Annual Growth FTE		3.32%	-0.39%	-0.34%	-0.63%	2.88%	4.24%	1.50%
Labour Index		3.44%	0.64%	N/A	0.64%	4.22%	4.55%	1.29%

Notes: FTE data from 2007/08 onwards is taken from Elsectronic Staff Recors; 2007/08 Census data is included for comparison purposes only. Data for GPs and GP practice staff is not available from ESR; Workforce census data is used instead.

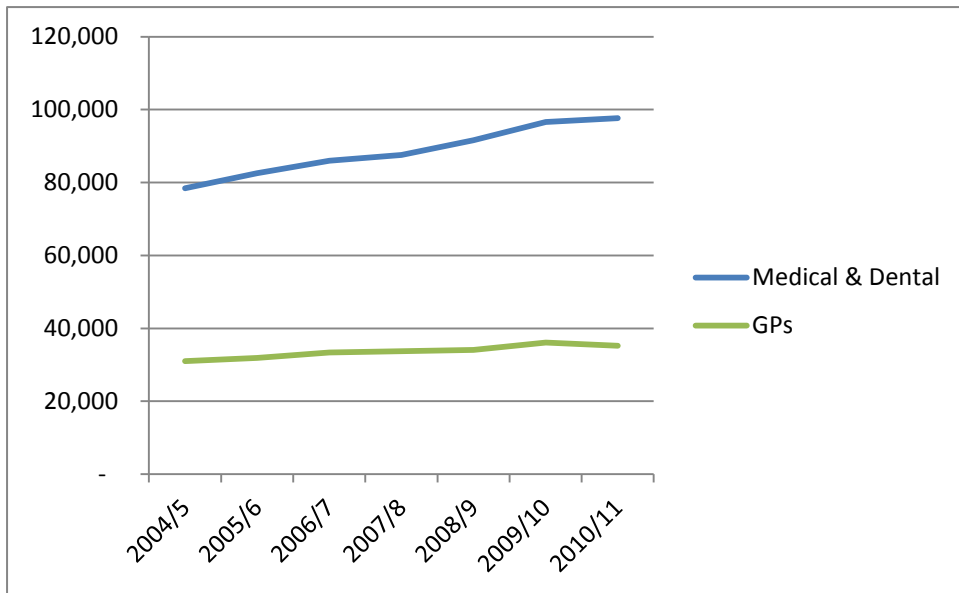


Figure 7: Trends in growth of medical and dental staff and GPs

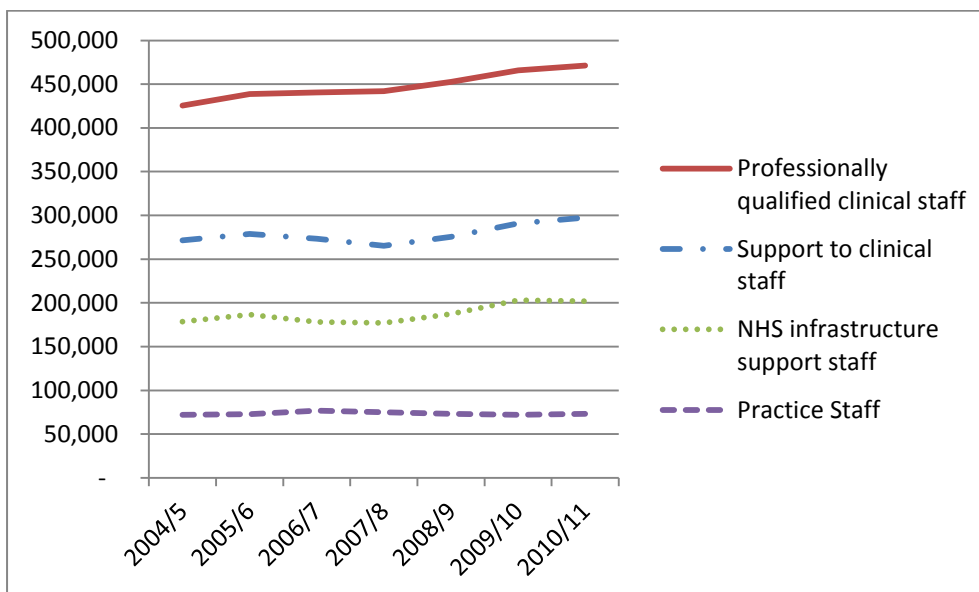


Figure 8 Growth in nursing staff, practice staff and support staff (*for the years from 2007/08 onwards, categories from ESR were mapped to the staff categories in the Workforce Census data)

The final row of Table 12 reports the growth in the volume of labour, which takes account of both the number of FTEs and the wage rate for each occupational group. Over time there may be changes in the staffing mix, and a simple count of the numbers employed fails to capture changes in the composition of staffing. The index of labour input overcomes this by weighting the number of staff of each type by their respective wages. For the entire period, the index of labour input growth is always greater than the growth in FTEs. This implies that there has been a progressive shift of staff toward higher wage categories. Accordingly, NHS labour input increased by 15.7% between 2004/5 and 2010/11. The growth in labour input between 2009/10 and 2010/11 amounted to 1.29%.

4.2 Input use derived from expenditure data

A summary of current expenditure appears in the top half of Table 13, followed by expenditure in constant terms, growth in which is interpreted as growth in input use. The difference between the two sets of figures is due to the deflators⁸ used to wash out price effects and, for capital, to the apportionment of current expenditure over the asset life. A detailed breakdown of current expenditure for Trusts, PCTs and SHAs is provided in Appendix 2.

Table 13 Current and constant expenditure (£000)

	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Current expenditure							
NHS staff	31,334,252	33,926,746	35,177,509	36,539,984	39,213,454	42,145,100	43,513,839
Agency staff	1,557,282	1,459,936	1,185,244	1,354,520	1,895,452	2,195,295	2,127,889
Intermediates (RC)	8,757,990	10,271,344	11,378,727	13,036,200	13,991,803	14,911,074	16,077,609
Capital	5,115,514	5,839,664	6,568,363	7,784,592	7,426,031	7,635,390	8,025,361
Prescribing	8,094,175	8,013,483	8,250,324	8,303,501	8,376,264	8,621,421	8,880,735
Primary Care	9,569,836	11,162,141	11,209,422	11,697,639	12,074,672	12,683,418	12,962,081
DH Administration	278,000	262,000	229,000	226,000	242,958	241,608	212,245
Total	64,707,050	70,935,314	73,998,589	78,942,436	83,220,634	88,433,307	91,799,759
Constant expenditure							
NHS staff	38,212,088	39,516,362	39,359,457	39,525,586	41,200,614	43,406,879	43,513,839
Agency staff	1,669,078	1,440,740	1,089,513	1,305,572	1,988,902	2,373,791	2,127,889
Intermediates (RC)	8,908,327	10,650,038	11,640,863	13,367,265	14,140,508	15,427,877	16,077,604
Capital	3,308,036	3,578,676	4,190,683	4,292,293	3,994,568	3,958,031	3,893,374
Prescribing	5,931,102	6,514,497	6,944,133	7,454,440	7,927,564	8,477,307	8,880,735
Primary Care	11,670,405	13,001,164	12,542,013	12,645,671	12,673,068	13,076,604	12,962,081
DH Administration	331,183	300,986	253,689	243,310	251,748	248,856	212,245
Total	70,030,219	75,002,464	76,020,350	78,834,137	82,176,973	86,969,345	87,667,768

To derive estimates of volume growth in input use from the expenditure data, it is necessary to wash out price changes from the expenditure series. By applying a price deflator, current expenditure is converted into constant expenditure. Changes in constant expenditure are driven by changes in the volume not the price of inputs. In Figure 9 the components of this calculation are illustrated for NHS staff. The expenditure series shows that expenditure in current terms has increased considerably over time, from £31bn in 2004/5 to £43.5bn in 2010/11, an increase of 12.5%. But wages have been increasing as well, indicated by the rising NHS pay index. Once these wage increases have been

⁸ Note that, unlike the prices of other inputs, the prices of computers and drugs have been falling over time.

taken into account, the volume of labour input can be calculated as the change in constant expenditure from £38bn in 2004/5 to £43.5bn in 2010/11, an increase of 13.9%. As the graph shows, volume growth has been less pronounced than wage growth over time.

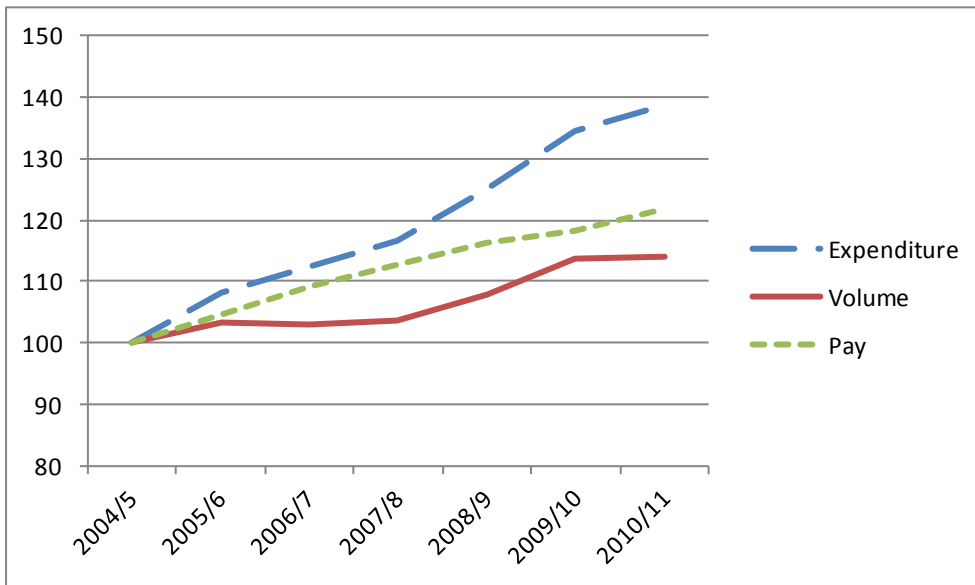


Figure 9 Trends in expenditure, prices and volume of NHS labour

As shown in Figure 10 volume growth in NHS staff as derived from the expenditure (series “L-input expenditure”) suggest a 13.9% increase over the full period. This growth lies between that indicated by crude growth in FTEs (11.4%) and in labour input calculated from the ESR data (15.7%). The two labour input series track each other closely but, nevertheless, we produce estimates of overall input and productivity growth using the alternative measures of growth in labour inputs.



Figure 10 Comparative trends in NHS staff growth

There have been marked annual changes in the use of agency staff, as Figure 11 indicates. This graph reports the changes in expenditure, prices and volume over time. Price changes are derived from the NHS pay index. The expenditure and volume series are closely related. As can be seen reduced use

was made of agency staff from 2004/5 to 2006/7, followed by three years of increased use. There was a decline in the use of staff between 2009/10 and 2010/11.

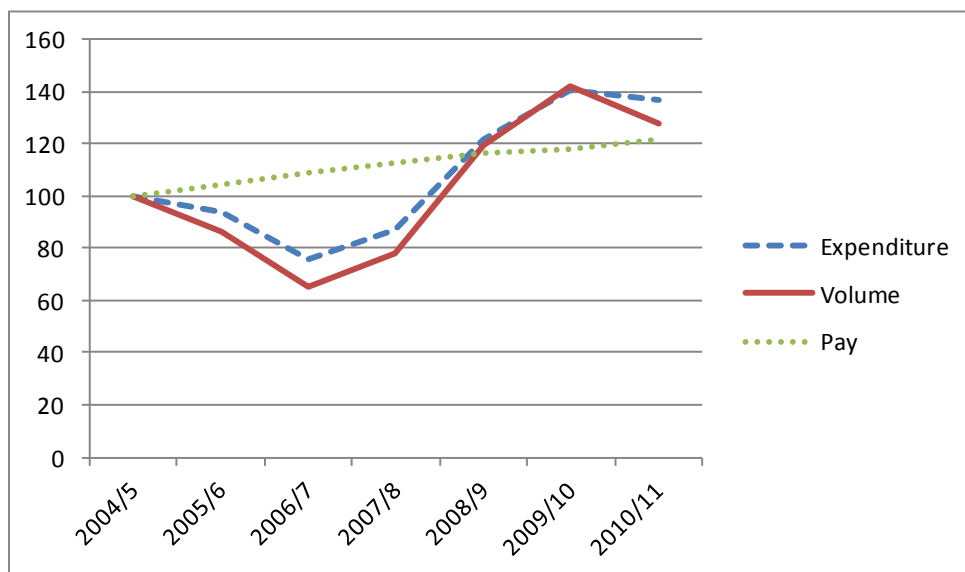


Figure 11 Trends in expenditure, prices and volume of agency staff

The trends in expenditure and volume of intermediate input growth track each other almost exactly. At first sight this might seem contrary to expectations, but the reason is due to changes in price. The prices of most intermediate inputs have been rising, as captured by the NHS prices index. But drugs & gases account for around 25% of intermediate inputs, the price of which have been falling steeply over time. The opposite direction of these price changes appear to offset each other.

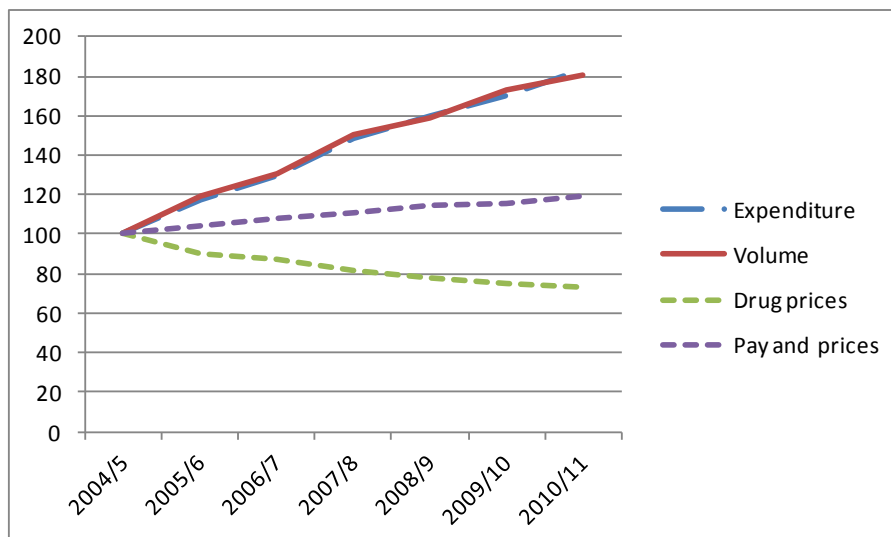


Figure 12 Trends in expenditure and volumes of intermediate inputs

Trends in expenditure on and use of capital are depicted in Figure 13, indicating growth up to around 2007/8, with decreased utilisation thereafter. The recent divergence between the expenditure and volume series is due to recent increases in the price of capital as reported in the ONS series that we use.

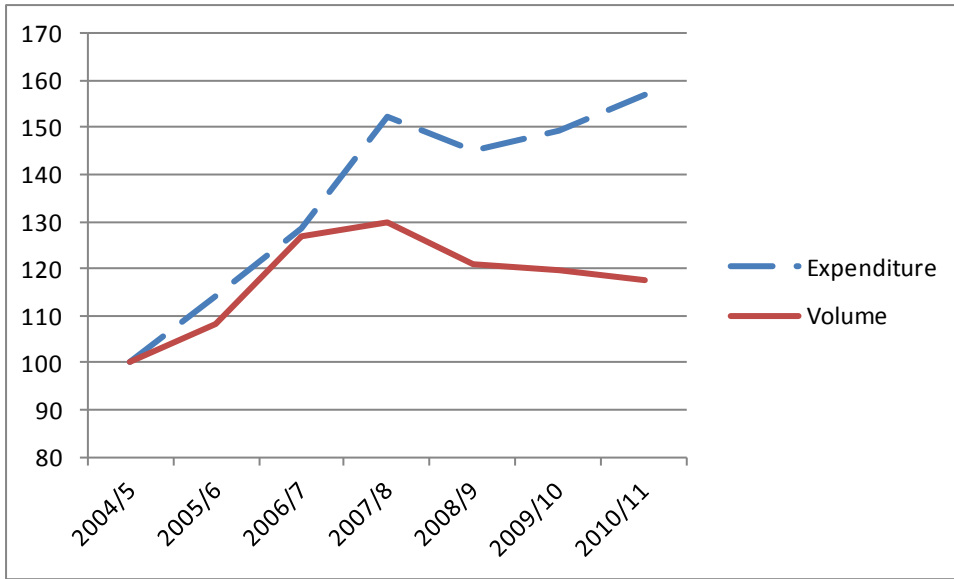


Figure 13 Trends in expenditure and volumes of capital inputs

The trends in use of labour, intermediate and capital resources, as derived from the organisational financial returns, are shown in Figure 14. Since 2004/5, labour input has increased by 14% and capital inputs by 18%. But the use of intermediate inputs has increased considerably, by some 80%.

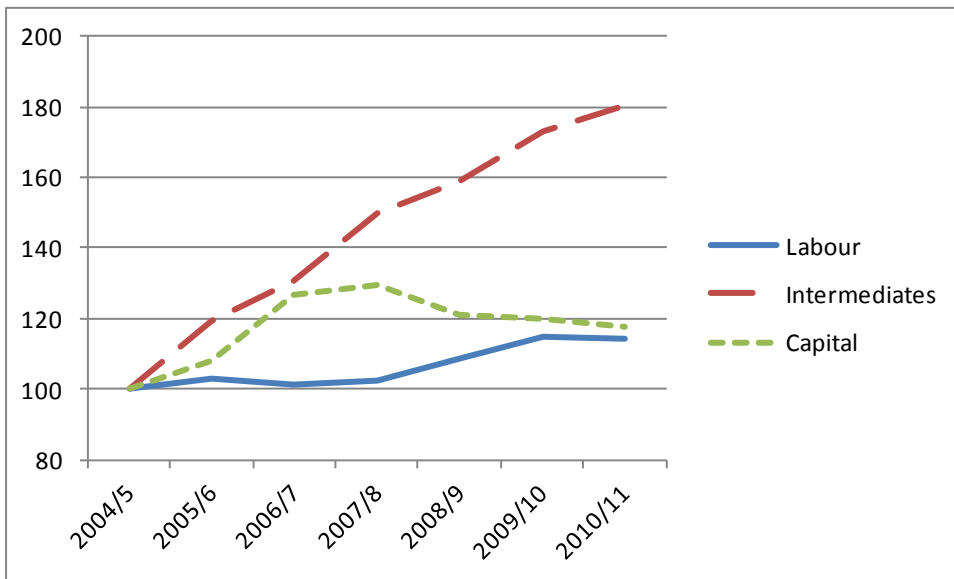


Figure 14 Use of labour, intermediate and capital resources

Trends in the expenditure and volume of community pharmaceuticals are shown in Figure 15. Note that, because prices have been falling over time, the rise in the volume of pharmaceuticals (50%) exceeds the increase in expenditure (10%).

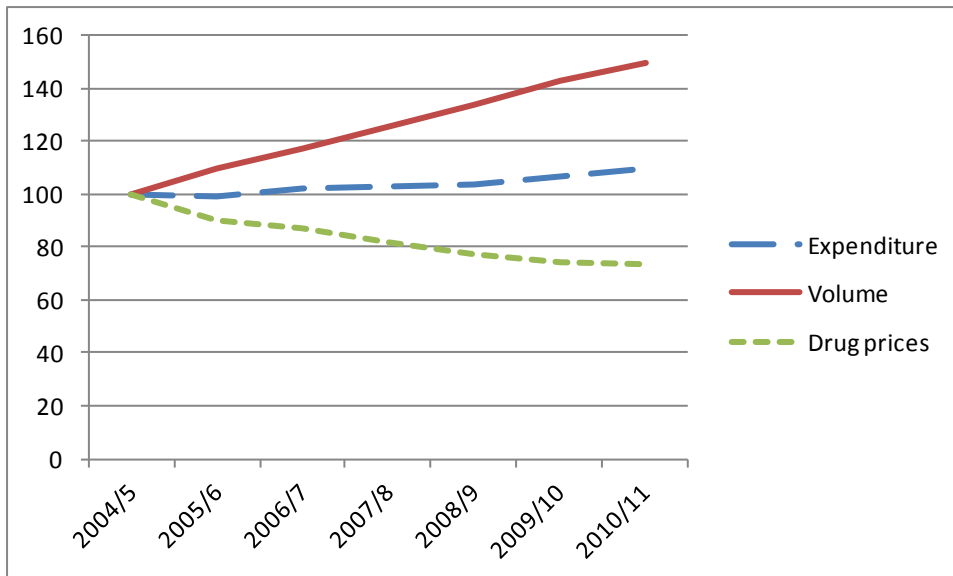


Figure 15 Trends in expenditure, prices and volumes for pharmaceuticals

Trends in the expenditure and volume of primary care inputs are shown in Figure 16. Apart from a large increase in 2004/05-2005/06, the series has been generally flat. As such the observed increases in overall expenditure are due more to price increases rather than increases in the underlying resource utilisation.

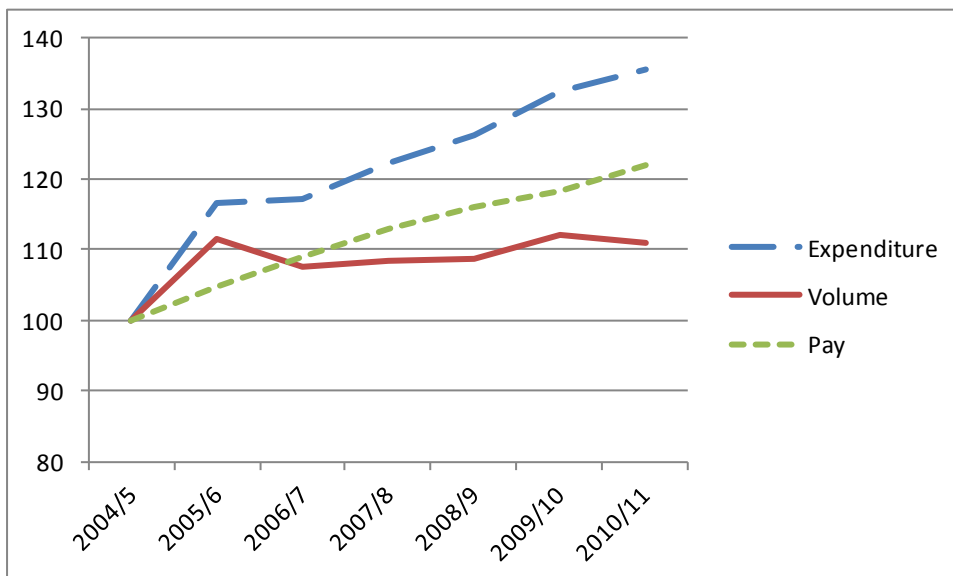


Figure 16: Trends in expenditure and volume in primary care

4.3 Input growth

Our measures of input growth are reported in Table 14, differentiated according to the use of the Mixed or Indirect index and to what data source is used to account for expenditure on services procured from non-NHS bodies. The following are of note:

- Estimates of input growth are generally higher if using the Mixed rather than the Indirect input index. This is because the growth rate in labour input is generally higher if based on data from the Electronic Staff Record than if based on expenditure data deflated by the NHS pay index.
- Input growth is always lower if expenditure on non-NHS bodies accords with that reported in the Reference Costs rather than that reported in the financial returns.

Table 14 Input growth

Input Growth	All NHS			
	Mixed	Mixed	Indirect	Indirect
	Non-NHS spend from RC	Non-NHS spend from TFRs	Non-NHS spend from RC	Non-NHS spend from TFRs
2004/05 – 05/06	7.19%	7.85%	7.10%	7.75%
2005/06 – 06/07	1.92%	2.35%	1.36%	1.82%
2006/07 – 07/08	3.88%	4.54%	3.70%	4.78%
2007/08 – 08/09	4.23%	4.40%	4.24%	4.41%
2008/09 – 09/10	5.43%	6.21%	5.83%	6.57%
2009/10 – 10/11	1.33%	1.81%	0.80%	1.32%

5. Productivity growth

Productivity growth figures are provided in Table 15. For each of these, output growth includes quality adjustment. The figures suggest that productivity growth in 2009/10 – 2010/11 was around 2.72% to 3.74%, depending on the input index used.

Table 15 Year-on-year productivity growth

	Mixed		Indirect	
	Non-NHS spend from RC	Non-NHS spend from TFRs	Non-NHS spend from RC	Non-NHS spend from TFRs
2004/05 – 05/06	-0.07%	-0.69%	0.01%	-0.59%
2005/06 – 06/07	4.50%	4.05%	5.07%	4.59%
2006/07 – 07/08	-0.21%	-0.85%	-0.04%	-1.07%
2007/08 – 08/09	1.44%	1.28%	1.43%	1.27%
2008/09 – 09/10	-1.25%	-1.98%	-1.63%	-2.31%
2009/10 – 10/11	3.21%	2.72%	3.74%	3.21%

2009/10 to 2010/11 has seen the lowest growth in inputs used in the NHS across the whole time series, a conclusion that is robust to which ever method of input calculation is used. With growth measured at around 1.3%, the increase is approximately a quarter of the average increase in recent years.

On the other side of the productivity equation, observed output growth has been relatively average with a cost-weighted growth of 3.61% and a quality-adjusted growth rate of 4.57%. As such, the measure of productivity growth in 2009/10 to 2010/11 is positive, this being robust to all alternative measures of input growth. The value of approximately 3% is surpassed only by the 2005/06 to 2006/07 figures, a year with similarly low input growth.

The positive growth continues a fluctuating series of negative/positive productivity estimates over time. The sign associated with the productivity measure seems largely determined by the magnitude of the input growth which shows greater variation over time than output growth. Furthermore, the largest year-on-year increases in inputs (2004/5 - 2005/6; 2008/9 - 2009/10) tend to be followed by lower than average increases in the following period. Thus a fluctuating pattern of above and below average changes in inputs tends to drive the series of productivity change.

Reinforcing this pattern is the observation that output growth seems to demonstrate a degree of lagged response to the input growth. For example, the previous lowest increase in inputs (1.9% in 2005/06 - 2006/07) were followed by the lowest level output growth in 2006/7 - 2007/8 of 3.66%. If there is a lagged effect, the full impact of low input growth this year is likely to more evident in next year's output figures. However, a firm prediction of the sign of next period's productivity measure is not possible because, with current levels of austerity, we do not expect a return to above average increase in input use.

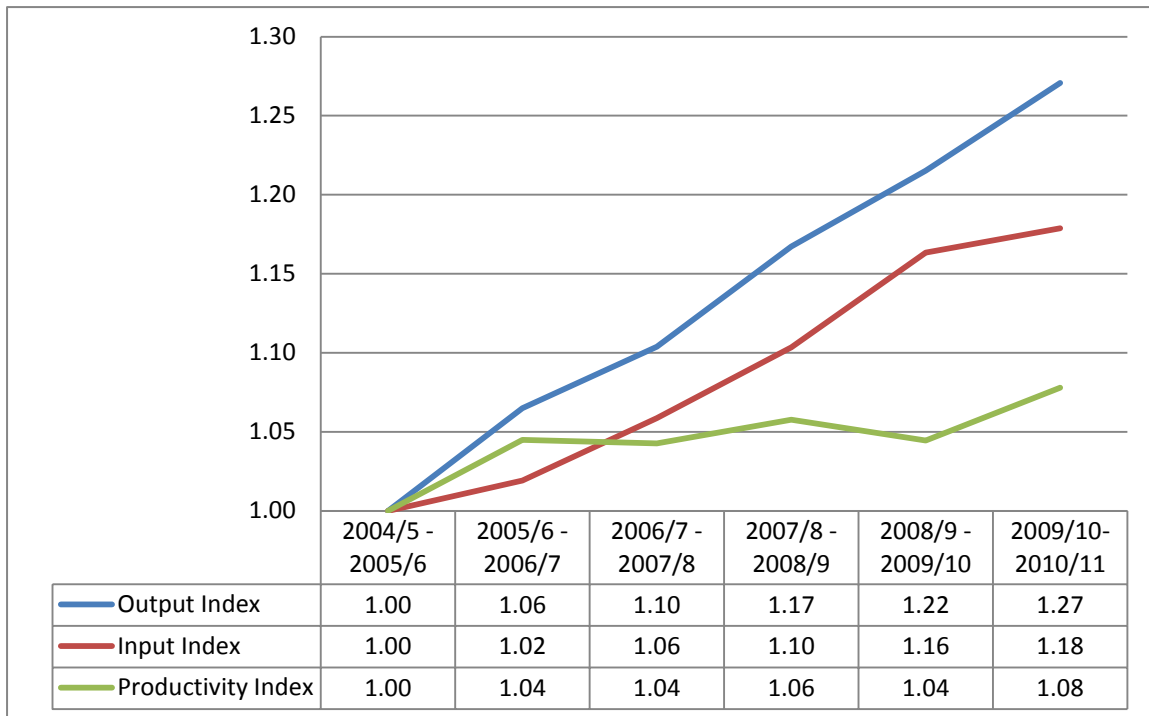


Figure 17: Outputs, Inputs and Productivity Index, rebased to year 2004/05

Our preferred measure of NHS productivity growth:

- Captures both the volume and quality of NHS services in construction of the output index;
- Uses direct, rather than expenditure-based, measures of the staff levels in construction of the input index;
- Uses data from the Reference Costs returns to estimate the amount of services procured from non-NHS bodies and the expenditure on these services, thus making these elements as consistent as possible in the output and input indices.

As figure 17 shows, between 2004/5 and 2010/11, the output growth index increased by 27% and the input growth index increased by 18%. Comparison of the growth rates of the two indices reveals that NHS productivity increased by 8% between 2004/5 and 2010/11.

Year-on-year productivity growth fluctuates around zero, with years of productivity growth followed by productivity decline. Productivity growth between 2009/10 and 2010/11 amounted to 3.21%. This was driven mainly by a slowdown in input growth, with levels of output growth being maintained.

References

Bojke C, Castelli A, Goudie R, Street A, Ward P. 2012. Productivity of the English National Health Service 2003-4 to 2009-10. *CHE Research Paper 76*. York.

Castelli A, Laudicella M, Street A. 2008. Measuring NHS output growth. *CHE Research Paper 43*, York.

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.

Department of Health. 2010. 2010-11 NHS reference costs collection guidance, Leeds, Department of Health.

Derbyshire K, Zerdevas P, Unsworth R, Haslam M. 2007. Further developments in measuring quality adjusted healthcare output, Leeds, Department of Health.

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

Fenty J, Coupland C, Hippisley-Cox J, Gravelle H. 2006. Determinants of consultation rates over time: implications for estimating the national volume of consultations. Nottingham, Qresearch University of Nottingham.

Lakhani A, Coles J, Eayres D, Spence C, Rachet B. 2005. Creative use of existing clinical and health outcomes data to assess NHS performance in England: part 1-performance indicators closely linked to clinical care. *British Medical Journal*. 330;1426-1431.

Massey F, 2012. Public service productivity estimates: healthcare, 2010, London, Office for national statistics.

Office for national statistics. 2008. Public service productivity: health care, London, Office for national statistics.

Qresearch. 2009. Trends in consultations rates in general practice 1995-2008 tables. NHS information centre for health and social care.

The information centre for health and social care. 2011. Quality and outcomes framework - 2010-11, England level.

Zerdevas P. 2009. Purchase of health care from non NHS bodies, Leeds, Department of Health.

Appendix 1: Deflators

Year	DH Pay Index	DH Prices Index	DH Pay & Prices index	ONS Medical equipment	ONS Computer machinery	ONS Electrical machinery	CHE pay Index	CHE pharmacy Index
2004/05	0.82	0.87	0.84	0.88	1.20	0.87		1.36
2005/06	0.86	0.89	0.87	0.89	1.12	0.88		1.23
2006/07	0.89	0.92	0.90	0.90	1.05	0.87		1.19
2007/08	0.93	0.93	0.93	0.91	0.97	0.88		1.11
2008/09	0.95	0.98	0.96	0.95	0.94	0.95	0.95	1.06
2009/10	0.97	0.97	0.97	0.97	0.98	0.98	0.98	1.02
2010/11	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Figure 18: Deflators base year=2010/11

The CHE pay and pharmacy indices are Paasche indices taking the general form:

$$p^{Paa} = \frac{\sum_{j=1}^J z_{t+1} p_{t+1}}{\sum_{j=1}^J z_{t+1} p_t}$$

For the pay index z indicates the number (FTEs) of staff in each occupational group $j=1...480$, p indicates the average wage of staff in the relevant group, and t indexes time.

For the pharmacy index z is the quantity prescribed of drug, defined according to its chemical composition, $j=1...c8000$, p indicates its price, and t indexes time.

Appendix 2: Organisational expenditure

Table 16 Current expenditure on NHS staff and wages (£000)

NHS STAFF Salaries and Wages - Current Expenditure (£000)							
	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Hospital and ambulance trusts							
Total Senior Managers & Managers	1,187,336	1,182,277	1,098,955	919,042	814,855	796,298	836,071
Total Medical Staff (including locums)	5,974,802	5,991,919	5,750,359	5,223,513	4,755,459	4,448,401	4,387,799
Total Dental Staff (including locums)	56,983	52,674	46,746	37,646	35,403	33,140	56,307
Total Nursing Midwifery & Health Visiting Staff	8,477,812	8,538,790	8,204,900	7,321,781	6,410,853	5,923,809	6,120,421
Total Scientific, Therapeutic & Technical Staff	2,942,535	2,994,992	2,904,196	2,581,216	2,310,988	2,192,407	2,394,988
Administrative and clerical	2,452,099	2,505,810	2,408,654	2,163,292	2,021,146	1,934,670	2,028,264
Healthcare Assistants and other Support Staff	1,115,684	1,166,179	1,130,289	1,017,431	944,590	878,497	1,015,203
Maintenance and works staff	219,448	210,717	195,169	173,882	149,775	134,844	119,866
Ambulance staff	662,651	737,866	773,365	832,961	915,701	961,293	977,907
Other employees	73,900	90,480	70,183	98,180	45,036	39,015	46,976
Chairman & Non-Executive Directors	16,125	15,226	12,232	11,560	8,083	6,779	7,465
Total NHS staff - hospital & ambulance	23,179,373	23,486,930	22,595,048	20,380,504	18,411,887	17,349,153	17,991,267
Foundation Trusts							
NHS Staff	2,471,600	4,075,900	6,026,996	9,520,162	13,519,900	16,802,900	18,376,975
Chairman & Directors	14,800	26,000	41,969	74,859	109,700	132,000	142,685
	30,925	41,226	54,201	86,419	117,783	138,779	150,150
Total NHS staff - FTs	2,486,400	4,101,900	6,068,965	9,595,021	13,629,600	16,934,900	18,519,660
Total NHS staff - all trusts	25,665,773	27,588,830	28,664,013	29,975,525	32,041,487	34,284,053	36,510,927
PCTs							
Total Senior Managers & Managers	780,970	863,892	825,938	808,074	891,739	1,041,803	979,417
Total Medical Staff (including locums)	340,367	359,456	386,793	379,779	447,445	449,359	399,512
Total Dental Staff (including locums)	76,315	81,672	79,642	93,216	97,205	104,662	79,489
Total Nursing Midwifery & Health Visiting Staff	2,389,454	2,652,729	2,714,685	2,720,984	2,808,387	2,961,335	2,503,670
Total Scientific, Therapeutic & Technical Staff	815,104	929,085	988,349	1,005,470	1,092,789	1,187,341	1,036,967
Administrative and clerical	772,569	910,954	1,004,588	1,079,280	1,264,287	1,458,809	1,384,532
Healthcare Assistants and other Support Staff	168,873	169,235	172,229	195,796	273,172	345,243	300,808
Maintenance and works staff	19,145	22,261	24,076	21,859	23,607	23,250	22,052
Ambulance staff	95	204	5,103	5,008	3,673	3,272	3,816
Other employees	31,311	49,201	49,731	84,346	71,614	63,784	56,676
Chairman & Non-Executive Directors	88,068	77,949	52,026	42,281	22,660	19,716	17,077
Total NHS staff - PCTs	5,482,270	6,116,638	6,303,160	6,418,594	6,996,578	7,658,575	6,784,016
Total NHS staff - SHAs	186,209	221,279	210,336	145,865	175,388	202,473	218,896
Total staff - NHS	31,334,252	33,926,746	35,177,509	36,539,984	39,213,454	42,145,100	43,513,839

Table 17 Current expenditure on Agency staff and wages (£000)

Agency Labour Spend - Current Expenditure (£000)							
	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Hospital and ambulance trusts							
Medical	299,054	228,969	148,384	155,532	218,586	294,025	339,138
Dental	1,044	3,315	464	155	376	307	240
Nursing, midwifery and health visiting	320,967	246,376	134,055	147,889	200,820	174,988	209,693
Scientific, Therapeutic & Technical Staff	158,854	126,380	86,494	66,054	92,668	113,277	101,122
Administrative & Clerical	114,061	113,867	98,565	131,360	183,103	166,615	134,357
Healthcare Assistants & Other Support Staff	44,408	46,890	35,313	35,010	36,440	39,657	39,947
Maintenance & Works Staff	7,959	4,515	4,008	6,925	7,047	7,013	5,399
Ambulance Staff	198	696	97	1,008	416	3,249	2,889
Other Employees	37,739	45,306	36,632	40,355	32,204	29,214	24,558
Total agency - hospital & ambulance trusts	984,283	816,314	544,012	584,288	771,661	828,345	857,341
Foundation Trusts							
Total agency	89,400	132,500	175,419	324,743	622,100	764,100	854,683
Total agency - all trusts	1,073,683	948,814	719,431	909,031	1,393,761	1,592,445	1,712,024
PCTs							
Medical	29,963	27,989	28,571	28,186	39,587	54,789	47,168
Dental	1,121	1,703	1,417	1,537	2,556	3,209	1,716
Nursing, midwifery and health visiting	81,324	74,856	59,009	61,113	80,990	91,847	70,358
Scientific, Therapeutic & Technical Staff	57,490	58,500	39,831	41,938	52,931	72,082	47,191
Administrative & Clerical	61,626	72,329	73,640	115,109	239,182	292,571	179,392
Healthcare Assistants & Other Support Staff	11,141	10,339	10,486	7,672	12,376	14,997	15,517
Maintenance & Works Staff	857	793	866	2,859	1,972	1,961	8,750*
Ambulance Staff	4	1	-	2	-	-	21
Other Employees	36,579	26,924	28,120	24,218	52,781	40,311	21,273#
Total agency - PCTs	280,105	273,434	241,940	282,634	482,375	571,766	391,383
Total agency - SHAs	203,494	237,688	223,873	162,855	19,316	31,084	24,482
Total agency - NHS	1,557,282	1,459,936	1,185,244	1,354,520	1,895,452	2,195,295	2,127,889
* In 2010/11 Camden PCT increased its expenditure on Maintenance and Works agency staff by £7.4m							
# In 2010/11 Croydon PCT decreased its expenditure on "other" agency employees by £10.3m							
http://www.hs-j.co.uk/opinion/columnists/croydons-finance-crisis-is-not-incredible/5051341.article							

Table 18 Current expenditure on intermediate inputs (£000)

Intermediate Figures - Current Expenditure (£'000)							
	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
NHS Hospitals, foundation trusts and ambulance trusts							
Drugs & gases	2,591,885	2,647,598	2,814,027	3,115,381	3,460,008	3,773,131	4,111,128
Clinical supplies & services	405,985	594,689	748,493	942,142	1,119,410	1,307,254	1,455,860
General supplies & services	743,426	853,397	911,504	1,045,835	1,119,750	1,177,681	1,226,148
Establishment	951,971	981,559	982,216	1,085,634	1,104,583	1,099,538	1,163,635
Energy & premises	799,962	1,031,786	1,161,463	1,279,173	1,506,901	1,289,767	1,436,318
External purchasing	609,215	669,508	738,923	916,352	962,768	950,531	1,061,324
Miscellaneous	888,577	1,435,572	1,612,571	1,747,727	1,852,820	2,243,732	2,506,806
Total intermediate costs - all trusts	6,991,023	8,214,109	8,969,197	10,132,245	11,126,240	11,841,634	12,961,219
PCTs							
Drugs & gases	56,869	113,846	139,378	170,870	187,408	200,988	186,145
Clinical supplies & services	67,404	86,998	73,611	95,094	120,947	124,955	129,315
General supplies & services	125,328	150,141	152,845	152,477	174,110	183,420	165,530
Establishment	426,848	444,423	424,533	480,041	559,159	584,065	501,123
Energy & premises	184,047	266,208	355,355	431,229	517,808	476,204	466,498
External purchasing	3,392,397	4,167,900	4,726,131	5,849,763	6,660,276	7,701,685	8,372,110
Miscellaneous	679,358	703,698	920,175	1,148,231	729,554	792,681	1,053,120
Total intermediate costs - PCTs	4,932,251	5,933,214	6,792,028	8,327,705	8,949,262	10,063,998	10,873,841
Total intermediate costs - SHAs	58,721	67,368	72,493	94,749	109,351	111,812	96,254
Total intermediate costs - NHS	11,981,995	14,214,691	15,833,718	18,554,699	20,184,853	22,017,444	23,931,314

Table 19 Current expenditure on capital inputs (£000)

Capital Costs - Current expenditure (£'000)							
NHS hospitals, foundation trusts and ambulance trusts	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Equipment							
Medical & Surgical Equipment - Purchase	1,111,881	1,362,224	1,339,694	1,355,021	1,245,422	1,167,041	1,197,825
Medical & Surgical Equipment - Maintenance	96,787	106,021	112,531	114,218	107,030	107,579	111,575
X-Ray Equipment - Purchase	26,298	27,600	29,187	33,498	29,704	24,939	22,819
X-Ray Equipment - Maintenance	57,223	55,030	56,133	51,721	47,581	42,277	42,858
Appliances	263,890	285,000	281,882	292,970	285,790	249,936	296,065
Laboratory Equipment - Purchase	270,876	288,360	282,818	268,995	257,484	252,223	253,170
Laboratory Equipment - Maintenance	25,023	27,197	29,163	27,917	22,215	23,367	20,895
Furniture, Office & Computer Equipment	152,182	141,995	134,995	165,375	130,867	110,643	105,856
Computer Hardware-Maintenance & Data Processing Contracts	153,909	153,539	144,839	135,976	122,961	118,483	126,216
FT services and supplies	222,471	348,042	525,340	819,274	1,040,250	1,289,967	1,470,957
FT operating lease rentals and Plant and Machinery	20,300	51,000	112,515	159,029	250,500	213,100	197,545
Premises							
Building and Engineering Equipment	88,141	85,151	86,569	95,776	79,577	75,322	66,904
Building & Engineering Contracts	186,380	197,368	210,435	243,097	196,779	122,817	138,915
FT premises - capital items	91,973	170,520	264,196	420,980	603,072	607,632	685,504
Business Rates	157,516	163,147	183,930	157,402	125,163	125,657	135,102
Total Depreciation	1,496,615	1,584,902	1,898,587	2,256,385	1,757,815	1,985,531	1,967,692
Total capital costs - all trusts	4,421,465	5,047,096	5,692,814	6,597,634	6,302,210	6,516,514	6,839,898
PCTs	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11
Equipment							
Medical & Surgical Equipment - Purchase	114,262	141,134	149,264	184,400	202,453	213,339	180,571
Medical & Surgical Equipment - Maintenance	9,179	10,449	13,611	15,587	14,085	16,785	15,630
X-Ray Equipment - Purchase	605	483	310	2,061	332	281	290
X-Ray Equipment - Maintenance	875	971	1,931	1,476	1,601	2,406	1,714
Appliances	76,628	92,845	93,524	119,113	127,138	117,031	95,473
Laboratory Equipment - Purchase	1,817	2,566	3,878	5,345	6,257	13,700	8,999
Laboratory Equipment - Maintenance	45	352	240	774	558	935	3,269
Furniture, Office & Computer Equipment	70,654	80,094	71,944	125,367	149,389	118,276	92,741
Computer Hardware-Maintenance & Data Processing Contracts	36,223	43,287	46,088	68,799	63,726	63,621	62,564
Premises							
Building and Engineering Equipment	29,255	24,040	26,888	48,240	48,939	49,961	38,229
Building & Engineering Contracts	39,315	46,128	37,675	77,803	102,408	77,041	57,286
Business Rates	41,416	49,829	62,083	65,901	71,700	81,760	80,420
Total Depreciation & Impairment	255,030	286,343	352,475	459,975	320,981	344,647	348,578
Total capital costs - PCTs	675,303	778,521	859,911	1,174,841	1,109,566	1,099,782	1,171,813
Total capital costs - SHAs	18,746	14,048	15,638	12,117	14,255	19,094	13,092
Total capital costs - NHS	5,115,514	5,839,664	6,568,363	7,784,592	7,426,031	7,635,390	8,025,361

Appendix 3: Comparison of CHE and ONS productivity indices

ONS provides yearly calculations of healthcare productivity. The methods and data used by the ONS differ slightly from the methods and data we use, leading to differences in ONS and CHE series. In 2012 ONS published report on productivity using a modified methodology⁹, most notably by including an inputs=outputs adjustment for expenditure on services procured from non-NHS bodies, revising the pharmacy deflator, and “correcting some historic errors in the calculation of healthcare quantity growth”¹⁰.

As can be seen from Table 20 and Figure 19, the output, input and productivity indices under the new ONS methodology are now closer to the CHE indices than was the case for the previous ONS methodology. Nevertheless, some differences remain.

Table 20: Reported ONS and CHE output, input and productivity indices

ONS – new methodology			ONS – old methodology (as reported in report published in 2011)			CHE ¹¹				
YEAR	Input Index	Output Index	Prod. Index	Input index	Output Index	Prod. Index	YEAR	Input index	Output index	Prod.
2004	1.49	1.52	1.02	1.50	1.44	0.96				
2005	1.56	1.63	1.05	1.57	0.02	0.96	2004/05 - 2005/06	1.00	1.00	1.00
2006	1.60	1.73	1.08	1.60	1.56	0.97	2005/06 - 2006/07	1.06	1.02	1.04
2007	1.67	1.79	1.07	1.67	1.61	0.97	2006/07 - 2007/08	1.10	1.06	1.04
2008	1.77	1.91	1.08	1.78	1.72	0.97	2007/08 - 2008/09	1.17	1.10	1.06
2009	1.87	2.01	1.07	1.89	1.84	0.97	2008/09 - 2009/10	1.22	1.16	1.04
2010	1.95	2.07	1.06				2009/10 - 2010/11	1.27	1.18	1.08

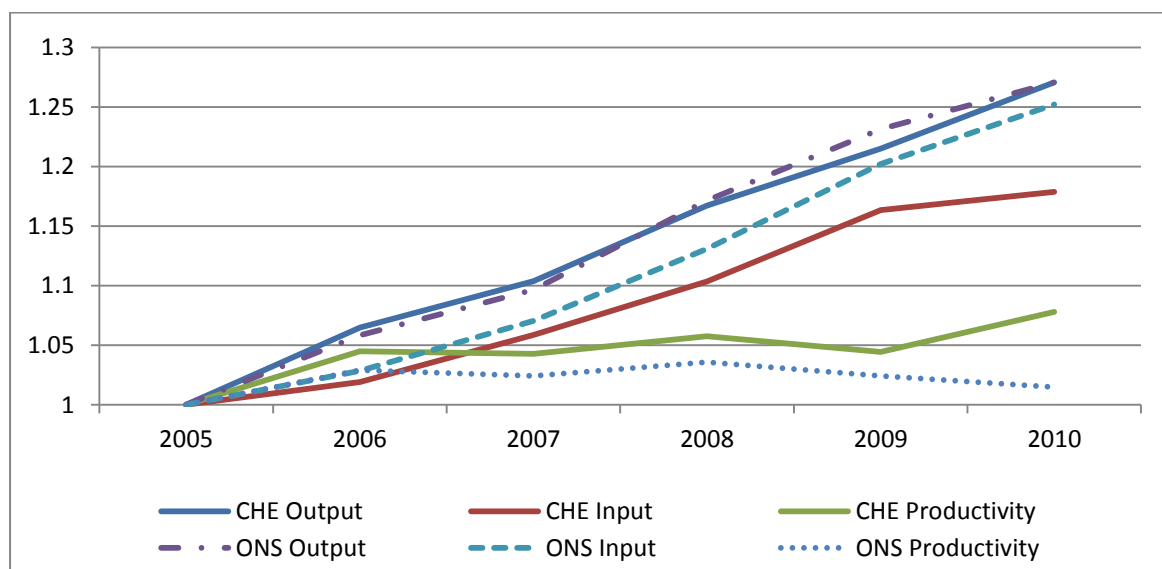


Figure 19: Graph of ONS and CHE Input, Output and Productivity indices (all indices are rebased to 2004/05)

⁹ http://www.ons.gov.uk/ons/dcp171766_289768.pdf

¹⁰ <http://www.ons.gov.uk/ons/guide-method/method-quality/specific/public-sector-methodology/articles/methods-changes-in-public-service-productivity-estimates--healthcare-2010.pdf>

¹¹ CHE calculates different forms of the input index; the one presented is based on the Mixed index using data from the reference costs to account for services procured from non-NHS bodies (ie the first set on figures reported in Table 14). Reported figures are re-based to year 2004/05.

The table below summarises the main differences in methodology and data sources in calculation of ONS and CHE indices.

	ONS	York	Notes
Region	United Kingdom	England	
Time period	Calendar year	Financial year	
Measure of hospital activity	FCEs (Finished consultants Episode) reported in Reference Costs	CIPS (Continuous Inpatient Spells) constructed from Hospital Episode Statistics	
Dealing with changes in output classifications	Mapping of old to new output categories; dropping of categories where mapping is not possible	Imputation of missing cost and quality weights so as to include all output categories	For discussion see (Castelli et al., 2011)
Quality adjustment	Hospital sector: <ul style="list-style-type: none"> - QALYs - Waiting time - Survival rates (30-day) - Patient experience Outpatient: <ul style="list-style-type: none"> - Waiting times Primary care: <ul style="list-style-type: none"> - Changes in blood pressure for patients with certain conditions 	Hospital sector: <ul style="list-style-type: none"> - QALYs - Waiting time - Survival rates (30-day) Outpatient: <ul style="list-style-type: none"> - Waiting times Primary care: <ul style="list-style-type: none"> - Changes in blood pressure for patients with certain conditions 	With the exception of the patient experience, ONS uses the quality measures provided by CHE
NHS Labour	FTEs in 20 categories reported in Workforce Census	Baseline: FTEs in 480 categories constructed from Electronic Staff Record Sensitivity analysis: expenditure reported in financial returns	
Intermediates	Derived from aggregated data at national level	Derived from organisational financial returns	The national statistics used by ONS include expenditure on some capital items
Prescriptions	Revised pharmacy deflator used from 2010	CHE pharmacy deflator	
Capital	Volume index of capital services for human and animal health care and social protection	Data about new purchases and depreciation of asset base extracted organisational financial returns	The ONS index is not a "full measure of the capital costs incurred by the NHS" (Office for National Statistics, 2008)
Services from non-NHS bodies	From 2010, inputs=outputs adjustment	Baseline: output and input data from Reference Costs Sensitivity analysis: input data from expenditure reported by PCTs	For discussion see (Massey, 2012)