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**Measuring health output and productivity in the UK:
an essential element of public accountability**

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Abstract

We describe the basis of calculating public sector health output and productivity in the UK. Estimates are complicated by the fact that the UK comprises different services in England, Wales, Scotland and Northern Ireland. We also report experimental measures that take into account the most recent research on adjusting output for quality.

Government healthcare output during the period 1999-2004 is estimated to have increased by an average of around 3.8% p.a., which rises to 5% p.a. when the proposed quality adjustments are made. The growth in productivity is estimated to lie in the range -0.9% to -1.5% pa over the period 1999 to 2004; including quality adjusters leads to estimates of between -0.5% to +0.2% pa.

1. Introduction

The public sector accounts for around a fifth of total GDP in the UK. Accurate measures of public sector output and productivity are necessary if we are to have a clear understanding of the National Accounts for the purposes of macroeconomic management, to assess the contribution of economic activity to welfare, and for general public accountability of government expenditure. The National Health Service (NHS) is the largest government service, with around 30% of final government consumption, and is the focus of this paper.

Considerable progress has been made in the way health output is measured in the UK since the first direct measures were published in 1998. Specific recommendations for this approach had been made in the UN System of National Accounts (1993) and subsequently in the European System of Accounts (1995). A significant step in the UK development of methodologies for measuring public sector output was the Atkinson Review (Atkinson 2005). The Review laid out nine broad principles for the measurement of government output and productivity which, together with 54 specific recommendations, form the cornerstone of the work carried out in the UK Centre for the Measurement of Government Activity at the ONS.

Estimates of health output and productivity have been published in two Public Service Productivity articles (ONS 2004, 2006a) and iterative improvements to the way health output in the public sector is reported in the National Accounts continue to be introduced as a result. In this paper, we discuss the methodology and sources used to estimate health output and productivity in the UK, and present the most recent figures, including an experimental measure that includes the adjustment of output for quality.

2. Output

2.1. Sources and Methodology

The UK National Accounts are compiled and published by ONS in the Blue Book (ONS 2006) and incorporate estimates of health output. The NHS is funded and operated by the Department of Health (DH) in England and by the health departments in the devolved administrations of Wales, Scotland & Northern Ireland and governed by different laws and regulations. Each of these constituent parts of the UK also has its own system for collecting health activity and financial data.

Since June 2004, the methodology used to compile the output estimates captures the majority of NHS activities in England and Northern Ireland (ONS 2006a,b). In the

absence of output data from Scotland and Wales, England and Northern Ireland output growth rates are weighted together according to their shares in total UK health expenditure and used as a proxy for the whole of the UK. In 2004/05, England & NI accounted for 85% of the identifiable current expenditure on health in the UK.

Annual output data supplied for Blue Book 2006 covered 81% of the value of NHS activity in England; the corresponding figure for NI was 79%. Health activity is captured from a variety of sources. In England they are: the Department of Health's National Schedule of Reference Costs (which provides unit costs for the various hospital treatments provided); the General Household Survey (for use of primary care services); the NHS Direct telephone service and Walk-In Centres; NHS Direct Online; the Prescription Pricing Authority; dentists; ophthalmists; and ambulance services. Together, these sources provide information on units provided of over 1,900 types of NHS activity in the latest period. Corresponding sources in Northern Ireland cover around 1500 treatment types. Both England and NI use a classification by "health resource groups" - similar to diagnostic resource groups - to classify hospital activity.

Growth in NHS output is measured using a cost weighted activity index using base year costs (Laspeyres index). It is calculated and analysed in UKCeMGA before being delivered to National Accounts. The output series omits patients' contributions towards the cost of prescription drugs and dentistry from the cost weights. Currently adjustments for quality change are not included in these compilations, but methodologies that do this are the focus of considerable development, and experimental output measures incorporating such adjustments have now been trialled.

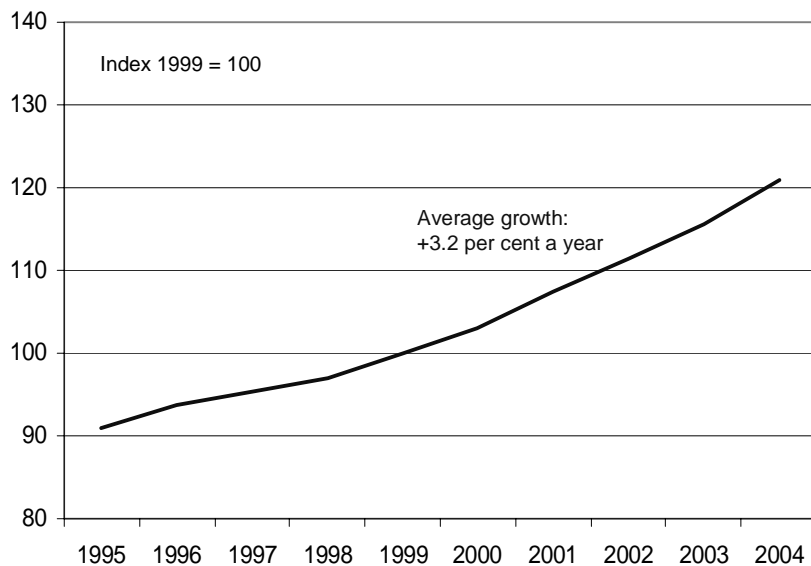


Figure 1. NHS Output – without quality adjustments.

2.2. Output Estimates

Using the methodology outlined above, NHS output is estimated to have increased steadily during the period 1995-2004 by an average of 3.2% per annum (Figure 1).

According to the Atkinson Review, NHS output growth should be adjusted to take account of changes in quality, based on health outcomes directly attributable to the NHS. This is a complex procedure and the data and methodologies necessary to make this adjustment are still being developed. Recent research carried out by the University of York Centre for Health Economics and the National Institute for Economic and Social Research (York/NIESR 2005), commissioned by the Department of Health (DH), and a further study by the DH itself (DH 2005) has made it possible to explore the possible impact of some proposed quality adjusters in our own work. A series of adjusters has been applied, including factors such as survival rates and health effects, changes in life expectancy and waiting times (York/NIESR); changes in primary medical care provision, patient experience, use of more effective drugs to treat coronary heart disease and specific longer term survival rates (DH). Further details are discussed by Simkins (2006).

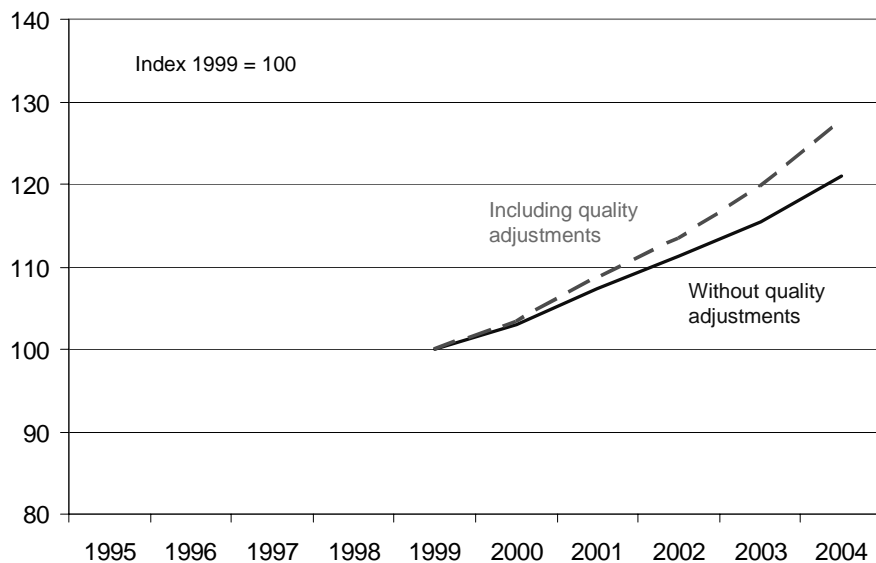


Figure 2. NHS Output – with and without quality adjustments. Note that quality adjusters are not available for the years prior to 1999.

Quality adjusters are not available for the years prior to 1999. Using all of the quality adjusters that have been proposed (Simkins 2006), NHS output during the period 1999-2004 would have increased by an average of around 5% p.a., as opposed to 3.8% p.a. without adjustment for quality.

Development of methods for incorporating quality is a fertile area of research and much remains to be done. The methods developed by York/NIESR and DH depend on what

data are available as much as methodology and therefore are not likely to be fully representative of the whole of the NHS at present. Questions also exist concerning relative weightings and the use of value weights. However, their work has provided us with a solid base on which to build.

3. Input and Productivity

3.1. Sources and Methodology

The growth in NHS productivity is calculated from the ratio of the growths in the volumes of output and input.

NHS input comprises the resources used in the production of NHS activities and output that contribute to NHS outcomes. NHS input includes, for example, medical staff (labour), prescription drugs and electricity (procurement), and hospitals (capital). The National Accounts provide information on general government final consumption expenditure on health which can be converted to volume measures by taking out changes in pay and prices over time.

There are two alternate approaches used to convert expenditure figures into volume measures: an 'indirect' approach (applied to labour, intermediate consumption and capital) and a 'direct' approach (applied only to labour and capital).

The 'indirect approach' deflates NHS expenditure on labour and intermediate consumption expenditure using suitable pay and price indices, respectively. For the National Accounts, health expenditure on labour and intermediate consumption at current prices is available from the detailed accounting data maintained by HM Treasury and the health administrations. A range of new, more appropriate deflators for labour and intermediate consumption have been identified and used in the latest work. Two methods of deflating prescription drug expenditure have been used, due to uncertainty over the effect on prices of branded drugs coming off patent prior to 2003. Individuals' contributions to input, such as prescription charges and dental charges paid by patients, are excluded, whereas public expenditure on procuring health services from the private sector is included. The available deflators relate only to the NHS in England and not to the whole of the UK.

The 'direct approach' is used to convert expenditure on English NHS staff numbers into a volume measure by adjusting for hours worked and taking into account differences in earnings. Atkinson (2005) and the OECD manual *Measuring Productivity* (OECD 2001) recommend this approach as the preferred way to measure the quantity of labour input in production. An exploratory direct measure has been developed in accordance with the OECD manual based on available NHS sources relating to staff levels and earnings differential by grade of staff.

An indirect and a direct measure of the volume of UK health capital expenditure have been computed. The National Accounts provide estimates of capital depreciation, which have been used by ONS as an indirect measure of change in the volume of capital input ('capital consumption'). By contrast, Atkinson (2005) suggested a direct measure. *Measuring Productivity* (OECD 2001) stated that the quantity of capital input to production should be measured by 'capital services' and the price of those services by the user costs of capital. ONS published experimental estimates of capital services for

the whole economy in November 2005 (ONS 2005b), including a distinct set of estimates for health and social work at the level of the total economy (including private sector).

An overall aggregate deflator for English NHS labour and intermediate consumption is calculated and applied to National Accounts UK current price expenditure figures and the result added to the constant price estimate of UK capital expenditure. The estimates of change in input which constitute the highest growth over the period 1995 to 2004 are based on measuring:

- the volume of growth in labour using the indirect approach (deflating expenditure on labour using price indices);
- the volume of growth in intermediate consumption including a Paasche Price index for prescription drugs; and
- the volume of input from capital using estimates of capital services of total economy health and social services.

The estimates of change in input which constitute the lowest growth over the period 1995 to 2004 are based on measuring:

- the volume of growth in labour using the direct approach (counting number of staff);
- the volume of growth in intermediate consumption including an average cost of items for prescription drugs; and
- the volume of input from capital using estimates of capital consumption.

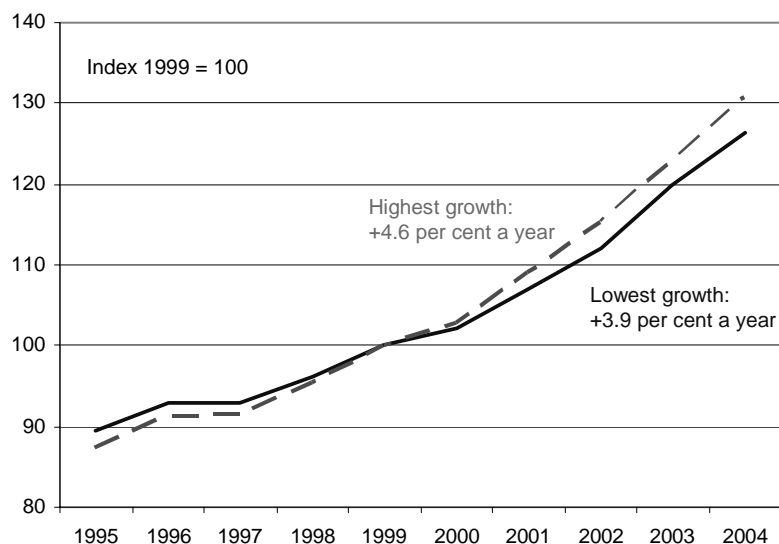


Figure 3. NHS Input.

3.2. Input and Productivity Estimates

The volume of NHS input has risen over 1995-2004 by an average of between 3.9% and 4.6% per annum (Figure 3). The range of input estimates results from trialling the several competing measures of the volume of labour and capital, and deflators for prescription drug expenditure as described in section 3.1.

Using these input figures together with the output estimates published in the National Accounts for the period 1999-2004, for which quality adjusters are available, NHS productivity is estimated to have fallen by an average of between 0.9% and 1.5% per annum (Figure 4).

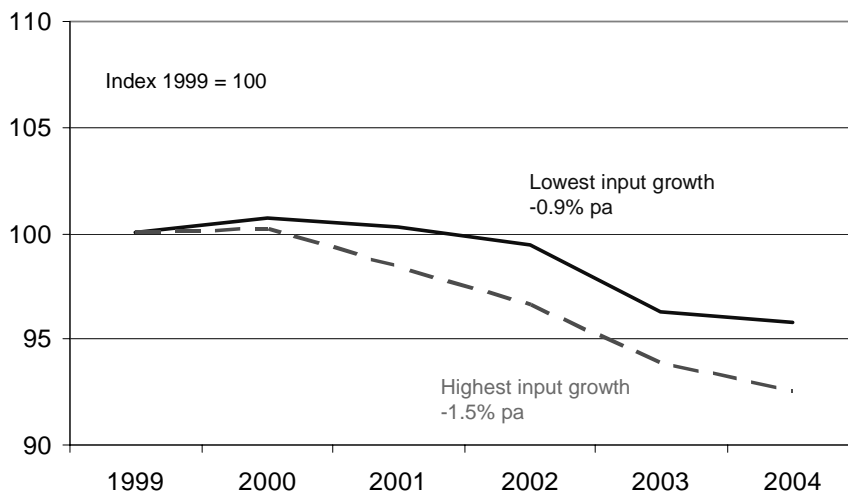


Figure 4. NHS Productivity – without quality adjustments.

Applying quality adjusters to the output, the change in productivity during 1999-2004 is estimated to lie within the limits of an average increase of 0.2% pa and an average fall of 0.5% pa (Figure 5). The effect of including quality is to add an annual average of around 1.1% points to output and hence to productivity growth. The impact is significant as it is sufficient to turn a falling productivity into one that is relatively flat.

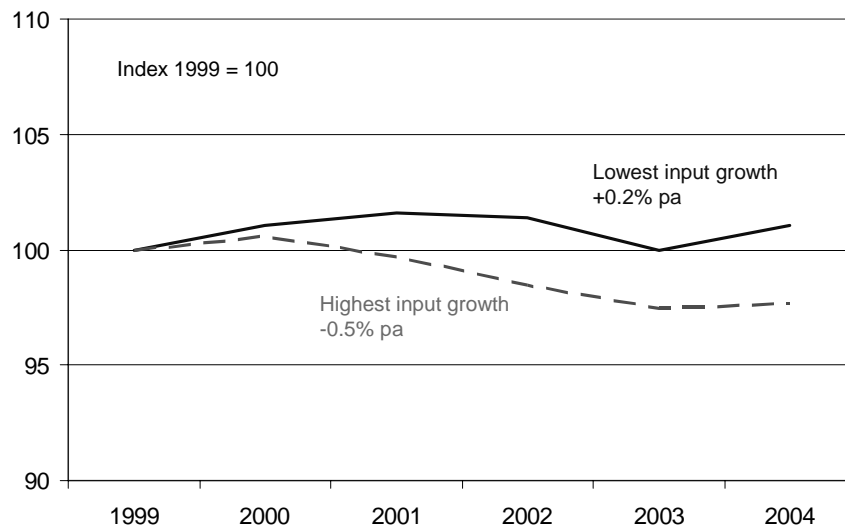


Figure 5. NHS Productivity – with quality adjustments. Note that quality adjusters are not available for the years prior to 1999.

4. Current and Planned Work

Whilst there has been much progress made in the development of output and productivity estimates for the NHS, a considerable amount of work is still required. ONS is working with DH, Devolved Administrations and other experts to further improve these estimates. The ongoing development agenda includes the following:

- Expanding coverage of NHS activities used to measure NHS output, by adding in more data from the Devolved Administrations. The current measure covers around four-fifths of English NHS activity and three-quarters of NI NHS activity. NHS activity in Scotland and Wales are yet to be incorporated into the output growth measure. This is a priority if we are to have a truly UK representative figure for output growth.
- Improvements in measuring NHS output from primary care using data from a research database which holds microdata from general medical practices. Current estimates of patients' use of general practitioner services are taken from the General Household Survey (GHS), a sample survey of 20,000 people living in Great Britain: this produces growth estimates which have unacceptably large sampling errors.
- Treatment of prescription drugs, and what value is added by the NHS. This is a fundamental question as to how this category should be treated in the calculations. At present it appears in both output and input sides of the equation.
- Consideration of the best source for NHS hospital activity. A working group involving members from DH, other health departments and experts on data sources and methodology has recently been considering how hospital activity

should be measured in England and could have ramifications for the rest of the UK. Issues being considered include:

- whether activity should be measured using episodes or spells (linked episodes within or across providers)
- which source of activity should be used (a choice between the Hospital Episodes Statistics database or the new Care Records Service Secondary Uses Service with their patient level activity, including data that may be suitable for making quality adjustments, and
- the current National Schedule of Reference Costs where activity and costs are linked to audited hospital accounts).
- Further development of the quality adjustment of NHS output, taking into account the latest research available.
- Investigations of the use of value weights rather than cost weights for NHS activities.
- Further development of measuring NHS input, in particular, developing better direct measures of labour input.
- The use of wider evidence to corroborate estimates of NHS productivity, building in the latest available datasets.

Bearing in mind the significant impacts that including quality adjustments has on the estimates of output and productivity, it is recognised that a wide debate is required on the nature of quality indicators and how they should be applied. Adjusting NHS output for quality is therefore currently the subject of a major public consultation exercise.

5. Conclusion

Estimating the output and productivity of the public health service in the UK is complicated by the fact that it comprises different services in England, Wales, Scotland and Northern Ireland, that operate along similar but distinct lines, and have separate data sources on activity, cost and detailed expenditures. Progress has been made in estimating UK health output and productivity to the highest international standards, but there is still much to do.

We have reported experimental estimates that take into account the most recent research on adjusting NHS output for quality. Using all of the quality adjusters that have been proposed, NHS output during the period 1999-2004 is estimated to have increased by an average of around 5% pa, as opposed to 3.8% pa without adjustment for quality.

Using the output estimates without quality adjustment, the growth in productivity of the NHS is estimated to lie in the range -0.9% to -1.5% pa over the period 1999 to 2004. Including the quality adjusters proposed by York/NIESR and DH leads to estimates of between -0.5% to +0.2% pa. Work continues on the development of improved measures of output and productivity.

Quality adjusters have significant impacts on output and productivity figures. Their application is now the subject of extensive public consultation to direct the future development of output and productivity estimates in the UK.

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