national STATISTICS

UK Centre for the Measurement of Government Activity

February 2006

Public Service Productivity

Health

- Measuring the productivity of public services is complex. The estimates of National Health Service (NHS) productivity presented in this paper build on those in the first health productivity article published in October 2004. This article is one of a series that is developing and improving productivity information in light of the best sources of data and methodologies available.
- The ideas and methods presented in this article, particularly those on the quality adjustment of NHS output, are presented as a basis for further public consultation and debate.
- The primary aim of the NHS is to improve and maintain the health of the population. However, health outcomes, such as increases in life expectancy, and reductions in mortality rates, are also influenced by factors outside the control of the NHS, such as diet, housing and smoking habits. NHS output is therefore best defined as the contribution of the NHS to improved health outcomes, that is excluding improvements in outcomes due to other factors.
- NHS productivity is estimated by dividing NHS output by NHS inputs. Key to this calculation is the appropriate coverage and quality adjustment of output, and the conversion of expenditure into volumes of inputs.
- The first set of NHS productivity estimates presented are based on NHS output as currently published in the National Accounts. On this basis, NHS productivity fell from 1995 to 2004 by an average of between 0.6 and 1.3 per cent per year. This compares with an average fall of between 0 and 1 per cent per year as presented by the ONS in October 2004. However, these estimates make no allowance for quality change, although the *Atkinson Review* recommended that productivity estimates should take account of quality change.
- So further sets of estimates are presented that do have regard for quality change, based on research by the Centre for Health Economics at the University of York and the National Institute of Economic and Social Research, and by the Department of Health.
- A related key issue to take into account is the argument that health and NHS output become increasingly valuable in material terms over time, in an increasingly prosperous economy. The *Atkinson Review* recommended such an adjustment but suggested it should be used cautiously pending further debate. Accordingly, this article presents estimates both with and without this adjustment.
- Including adjustments for quality change but not for increasing value of health, NHS productivity could have changed on average by between +0.2 per cent or -0.5 per cent per year from 1999 to 2004, the period for which the quality change information is available.
- Including adjustments for quality change and for increasing value of health, NHS productivity is estimated to have risen on average by between 0.9 and 1.6 per cent per year over the same 1999 to 2004 period.
- Finally, estimates of productivity need to be interpreted alongside other forms of corroborative evidence, for example, information on average length of stay in hospital, or elective day case rates. It is unlikely that a single number for productivity will ever capture all the costs and benefits of the NHS. The methodologies and estimates presented here should be regarded as a staging point in an ongoing agenda to refine the measurement of NHS productivity.

Contents

1 Executive summary

1.1 This article estimates the change in productivity associated with public expenditure on health using National Accounts data from 1995 to 2004, in the context of wider information about health spending, output, outcomes and measurement issues. It is the third in the Office for National Statistics' (ONS) series of articles on Public Service Productivity. The first in the series, also on health, was published in October 2004. The second in the series, on education, was published in October 2005.

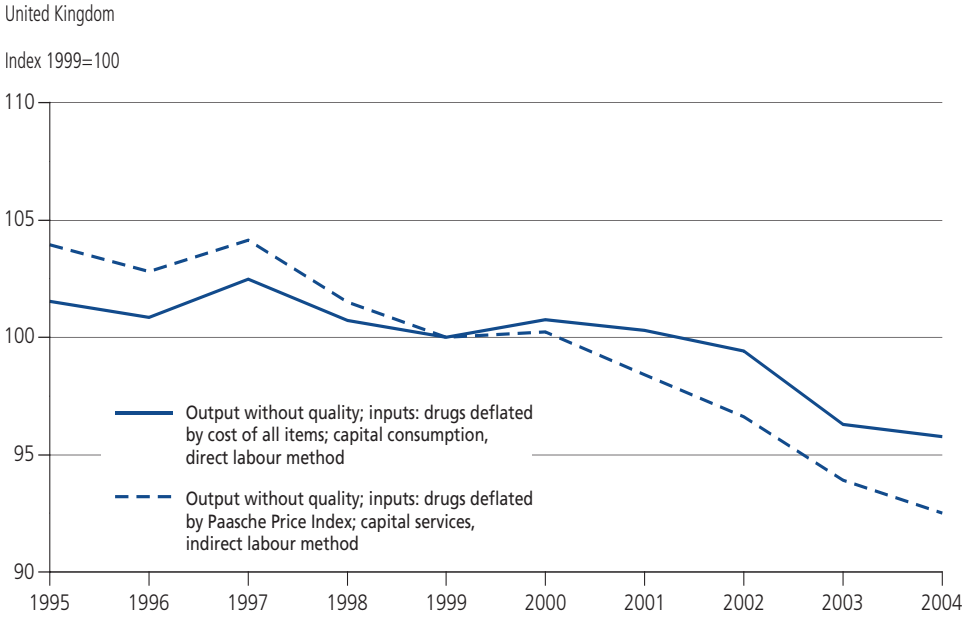
1.2 Measuring productivity for public services is complex. The information presented in this article should therefore be regarded as a staging point in moving steadily towards better and more comprehensive measurement of National Health Service (NHS) productivity. Public debate and scrutiny are now needed to help move this process forward with as wide a consensus as possible. ONS, in association with the Department of Health (DH) will be facilitating consultation to this end.

1.3 The primary aim of the NHS is to improve and maintain the health of the population served. However, health outcomes and the overall health of the population are only in part due to the activities performed by the NHS. They are also due to other factors, such as housing, diet, smoking, as well as change in demography, for example, the effects from an ageing population and population movements. NHS output is best regarded as the improvement in health outcomes directly attributable to the NHS.

1.4 One set of estimates of NHS productivity is based on current National Accounts estimates of output as in *Blue Book 2005*. Using this measure, NHS output is estimated to have increased during the period 1995 to 2004 by an average of 3.2 per cent per year; with the volume of NHS inputs rising over the same period by an average of between 3.9 and 4.6 per cent per year. This means that NHS productivity is estimated to have fallen during the period 1995 to 2004 by an average

Figure 1:

NHS productivity, excluding quality change for NHS output, 1995 to 2004



Source: ONS

of between 0.6 and 1.3 per cent per year. This set of estimates takes no account of quality change, however, and must be firmly understood as such. Figure 1 presents this first set of estimates.

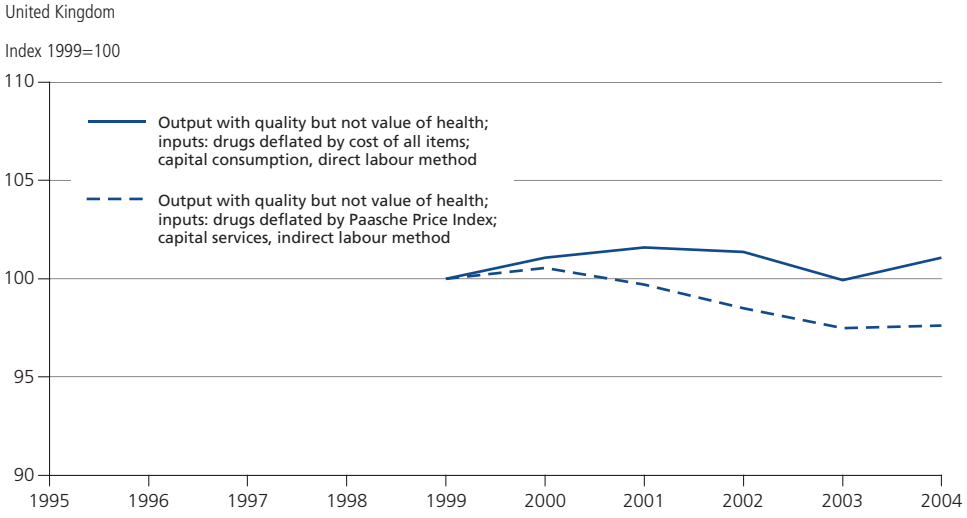
1.5 By contrast, the *Atkinson Review* recommended that NHS output should be adjusted to take into account quality change, where quality is based on health outcomes directly attributable to NHS output, as well as other measures of change in the NHS. This is a complex procedure and the data and methodology necessary for quality adjustment are still developing. However, using new research by the Centre for Health Economics (CHE) at the University of York and the National Institute of Economic and Social Research (NIESR), and by DH, significant advances have been made possible. The ideas and methods presented in this article, particularly those on the quality adjustment of NHS output, are presented as a basis for further public consultation and debate.

1.6 A number of quality indicators are used to build up more relevant estimates of NHS output growth:

- survival rates;
- health effects;
- an adjustment for life expectancy for survival rates and health effects;
- waiting times;
- improvements in primary medical care;
- longer term survival rates for myocardial infarction; and
- patient experience.
- In addition, DH proposes a new quality measure that uses value weights instead of cost weights for statins used to treat patients with coronary heart disease (CHD). This impact is also included in quality adjustments.

Figure 2:

NHS productivity including quality change in NHS output but no allowance for increasing value of health, 1999 to 2004



Source: ONS

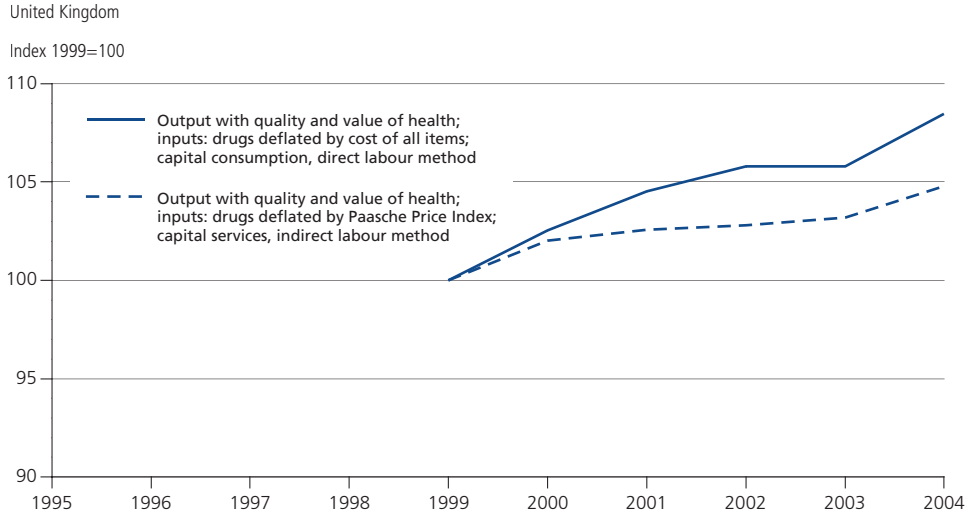
1.7 NHS output growth with all these quality adjustments during the period 1999 to 2004 is estimated to have increased by an average of around 5 per cent per year. With the volume of NHS inputs rising at between 4.8 and 5.5 per cent during this period, this leads to a second set of estimates which suggests that NHS productivity is estimated to have either increased by an average of 0.2 per cent per year, or has fallen by an average of 0.5 per cent per year, over the same period. Figure 2 presents this second set of estimates.

1.8 The *Atkinson Review* also recommended adjusting the value of NHS output by rising real earnings in the economy (estimated to be 1.5 per cent per year) to reflect the fact that health becomes increasingly valuable in a growing and increasingly productive economy, but at the same time suggested this adjustment should be used cautiously pending further debate. DH includes this value of health adjustment in their total estimates for quality adjusted NHS output growth.

1.9 This leads to a third set of estimates. NHS output growth with all of the quality adjustments listed above, and an allowance for the increasing value of health, is estimated to have increased by an average of around 6.5 per cent per year during the period 1999 to 2004. With the volume of NHS inputs rising at between 4.8 and 5.5 per cent during this period, NHS productivity is estimated to have increased by an average of between 0.9 and 1.6 per cent per year. Figure 3 presents this third set of estimates.

Figure 3.

NHS productivity including quality change in NHS output and allowance for increasing value of health, 1999 to 2004



Source: ONS

1.10 Finally, the article provides corroborative evidence to support the existing estimates. Section 9 shows that since 1991/92 the average length of stay in hospital has been falling steadily (apart from a small rise between 1999/00 and 2000/01); and there has been a steady increase in the rate for elective day case treatments. This suggests a shift towards more cost effective treatment and would be consistent with a productivity increase from NHS resources. At the same time, emergency readmission rates have increased very slightly over the period. If this requires additional NHS resources, this could dampen down productivity. More information is needed to check on this impact.

1.11 These new estimates of NHS productivity are based on significant methodological improvements compared with those reported in the first health productivity article published in October 2004. The main improvements which have been made for measuring NHS output are:

- the coverage of the output measure for England has been widened;
- information on activity in Northern Ireland has been included for the first time; and
- NHS output has been quality adjusted using the latest research available.

1.12 The main improvements which have been made for measuring NHS inputs are:

- in the deflation methods; and
- two new measures for estimating the volume of labour inputs.

1.13 However, there is still more work to do:

- further improvements in measuring the quality of NHS output remains a priority;
- data on GP contacts continue to be derived from a household survey which does not provide accurate estimates of growth from one year to the next;
- notwithstanding wider coverage introduced by the new methodology in June 2004 and further in June 2005, the output estimates are still based on a subset of activities carried out by the NHS, and growth in these may not be representative of all activities;
- the output estimates are calculated using data from the NHS in England and Northern Ireland, and growth for these two countries may not be representative of the UK overall; and
- information systems do not necessarily reflect the most recent changes in the structure of and practice in the NHS. For example, much activity that was once carried out in hospital inpatient settings is now carried out in outpatient settings or in general practice. But information systems do not yet identify the extent of this change.

2 Introduction

2.1 This is the third in a series of articles that examines public service productivity within the context of the National Accounts, painting a broader picture of public service output and productivity than the National Accounts alone. More precisely, the focus is on productivity associated with money spent by the public sector, including central and local government, in providing health care services to the public.

2.2 This means, therefore, that private purchases from government providers are excluded (for example, figures in this article are net of prescription and dental charges paid by patients). On the other hand, government purchases from the private sector are included (for example, NHS contracts with private companies to provide, say, hip replacement and cataract operations).

2.3 ONS has drawn the material required to estimate NHS productivity from a wide range of sources and used expert advice[1] according to the principles set out in the National Statistics Code of Practice, particularly regarding relevance, fitness for purpose and production with integrity in the interests of all.

2.4 In compiling estimates of NHS productivity, ONS has aimed for conformity with the guidance available from the international community. In particular, the Organisation for Economic Cooperation and Development (OECD) has published *Measuring Productivity* (OECD, 2001) and Eurostat has published a *Handbook on price and volume measures in national accounts* (Eurostat 2001).

2.5 Health is the subject of two of the first three in this series of productivity articles. Health expenditure is important as it constitutes the largest single item of expenditure on public services (Social Security has a larger share of overall public expenditure, but the majority of this is payment of benefits rather than government providing goods and services).

2.6 The general framework for measuring productivity in the public sector is based on the relationship between inputs, activities, output and outcomes. In health, inputs are the resources used to produce NHS activities, for example, medical staff, prescription drugs, and hospitals. Health outcomes are the final events produced by NHS output, for example, increased life expectancy. However, it is important to recognise that other factors outside the control of the NHS also impact on health outcomes, such as smoking habits, diet and lifestyle. Accordingly, NHS output should be regarded as only the improvement in health outcomes directly attributable to the NHS.

2.7 An overview of the process of measuring NHS productivity is as follows:

- NHS treatment activities are weighted by their relative costs to measure volume growth in NHS output in a cost weighted activity index;
- the cost weighted activity index is then adjusted to take into account quality, using, for example, data that are available for NHS outcomes;

---

[1]Writing this article has benefited from the advice of a Quality Assurance Panel, chaired by Professor Peter Smith, University of York. Members of the Board are Richard Willmer, Director of Statistics at the Department of Health; Peter Goldblatt, Director of Health & Care Division at ONS; Joe Grice, Executive Director of the UK Centre for the Measurement of Government Activity at ONS; Graham Jenkinson, a senior member of the National Accounts Group at ONS; Professor Alistair Maguire, London School of Economics; Simon Compton, a senior methodologist in ONS; and, Rhys Herbert and Geoff Tily, Economic Advisors at ONS. ONS gratefully acknowledges this help and assistance, but takes final responsibility for the contents of this article.

- expenditure on NHS inputs is divided into three main categories: labour, procurement (goods and services) and capital, and then converted into volumes of inputs by taking into account pay and price increases, and changes in the rental value of capital;
- a direct measure of labour input is also used. This involves counting the volume of NHS labour, for example, using number of staff;
- NHS productivity is estimated by dividing NHS output by NHS inputs, using volume measures;
- growth in NHS productivity is estimated as the change in NHS productivity over time; and
- estimates of NHS productivity are tested against wider corroborative evidence that was not used directly in the productivity estimates. This procedure of cross-checking is called 'triangulation'.

2.8 ONS has already published aggregate estimates of government inputs and output in the *United Kingdom National Accounts Blue Book* (ONS 2005a); and inputs, output and implied productivity in *Public Service Productivity: Health* (ONS 2004a). These estimates form the starting point for new estimates of NHS productivity in this paper.

2.9 Sir Tony Atkinson published the final report of his review of the *Measurement of Government Output and Productivity for the National Accounts* (Atkinson 2005) in January 2005. The final report set out a number of recommendations and suggestions for further work for measuring government output and productivity in general as well as specifically for health. This article draws on these recommendations and suggestions.

2.10 A joint project by CHE at the University of York and NIESR has produced a set of estimates of quality change in NHS services which were published in *Developing New Approaches to Measuring NHS Output and Productivity* (York 2005). DH has been working in parallel and has published estimates of quality change in NHS services which complement and broaden the York / NIESR estimates, in *Healthcare Output and Productivity: Accounting for Quality Change* (DH 2005a). All of these estimates are taken into account in this article, and are complemented by other sources of information.

2.11 As the productivity series is developed, ONS will draw further on available information including, for example, material in the various reports published by government and associated institutions such as the Healthcare Commission, and in studies conducted by academic institutions.

2.12 In many cases, analysis is limited to England, or to financial years. As the work continues, ONS intends to expand the analysis to include all constituent parts of the UK, as well as to consider calendar year information, in order for there to be full consistency with the estimates from the National Accounts.

2.13 Annual information is presented in this article, as in articles previously published by ONS in *Economic Trends.* ONS will consider whether to widen the analysis presented in this productivity series to include quarterly information, but publication of quarterly figures would depend on fitness for purpose.

2.14 'Triangulation' evidence is intended to corroborate (or otherwise) the estimated productivity figures. At the same time, this evidence helps to paint a broader picture of productivity in the NHS. Triangulation material is presented separately in section 9 but sections 3 (Health outcomes) and 5 (Quality of NHS output) also help paint a wider picture of productivity in the NHS.

2.15 The first *Public Service Productivity: Health* article was explicit in recognising that the output and productivity estimates made no allowance for changes in health care quality over time. This article presents a range of estimates which do allow for various dimensions of quality change. They are presented as one stage in an ongoing programme to understand this better. The sources and methodologies presented now need public scrutiny and discussion.

2.16 The rest of this article is as follows:

- section 3 presents the health outcomes that are the prime focus of the NHS but which are also affected by factors outside the control of the NHS;
- section 4 sets out the measurement of NHS output as currently in the National Accounts and also outlines some potential improvements not involving incorporation of quality change. Estimates of output form the starting point for measuring productivity;
- section 5 presents the quality adjusted estimates of output in light of research published in 2005;
- section 6 gives estimates of inputs at current prices in the National Accounts;
- section 7 sets out various estimates of NHS inputs in volume terms, based on improved methodologies;
- section 8 shows new measures of NHS productivity in light of the material presented in sections 4 through to 7;
- section 9 describes additional evidence on triangulation not covered in earlier sections; and
- section 10 outlines the next steps in measuring NHS output and productivity.

2.17 This article is also accompanied by *Sources and Methods* (ONS 2006), a supporting article that describes the data, sources and methods used in compiling the estimates in this article.

3 Health outcomes

3.1 The primary aim of the NHS is to improve and maintain the health of the population served. The NHS is therefore mainly concerned with delivery of improved health outcomes.

3.2 This section sets out some information on key health outcomes covering infant mortality, life and healthy life expectancy, and mortality rates. But it is important to recognise that health outcomes are influenced by many factors and are not solely, or even mainly, due to the activities or output of the NHS. Smoking, housing, the environment, diet, changes in demography, socio-economic status, education levels and so on also play their part. Estimates of NHS output need to focus on the improvements in outcomes solely attributable to the NHS, abstracting from the wider factors.

3.3 Nevertheless, as a starting point, it is useful to consider how overall health outcomes have evolved. It is then necessary to consider the extent to which these outcomes are directly affected by the NHS. Principle B in the *Atkinson Review* states that 'the output of the government sector should in principle be measured in a way that is adjusted for quality, taking account of the attributable incremental contribution of the service to the outcome'. Section 4, therefore, presents how NHS output is currently measured in the National Accounts, and section 5 provides an account of how NHS output can be adjusted to take into account quality, based on some of the outcomes described in this section but also on wider criteria.

3.4 ONS, health departments and other authorities publish a range of health statistics on how health outcomes such as mortality and life expectancy have changed over the last century, for example, see *Twentieth Century Mortality Trends in England and Wales* (ONS 2003). This section will limit information on health outcomes to 1980 onwards.

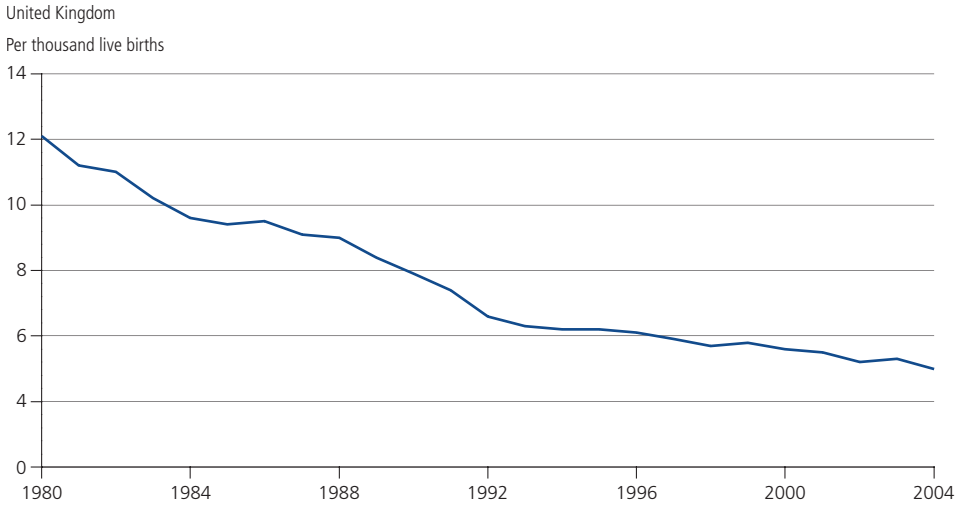
Infant mortality

3.5 Figure 4 shows the reduction in the rate of infant mortality between 1980 and 2004. Infant mortality has fallen throughout this period with the exception of a rise in 1986 which was associated with the exceptional cold weather in February of that year (MacFarlane A and Mugford M, 2000). In 2004, the infant mortality rate was five per 1,000 live births compared to 12 in 1980.

3.6 Over two-thirds of the decline in infant mortality during this period took place in two relatively short intervals. The first, between 1980 and 1984, was predominantly associated with a reduction of around a quarter in mortality rates in the first four weeks of life. It is thought that this was due to the increased survival rate of low birth weight babies as a result of advances in neonatal special and intensive care (MacFarlane A and Mugford M 2000). The second large reduction was between 1988 and 1992. This was associated mainly with a reduction, of just under a half, in death rates of babies aged between four weeks and a year. This followed advice to mothers on avoiding cot deaths (such as that given in the DH campaign 'Back to sleep') (OPCS 1995). The decrease in the infant mortality rate can also be attributed to other factors such as better antenatal, postnatal and medical care; and the development and use of vaccine and immunisation programmes in the NHS. The reduction could also be attributed to factors outside the control of the NHS such as diet. The reduction in the infant mortality rate has been a contributing factor to the overall increase in life expectancy.

Figure 4:

Infant mortality (deaths within one year of birth), 1980 to 2004



Source: ONS, General Register Office for Scotland, Northern Ireland Statistics and Research Agency; Government Actuary's Department

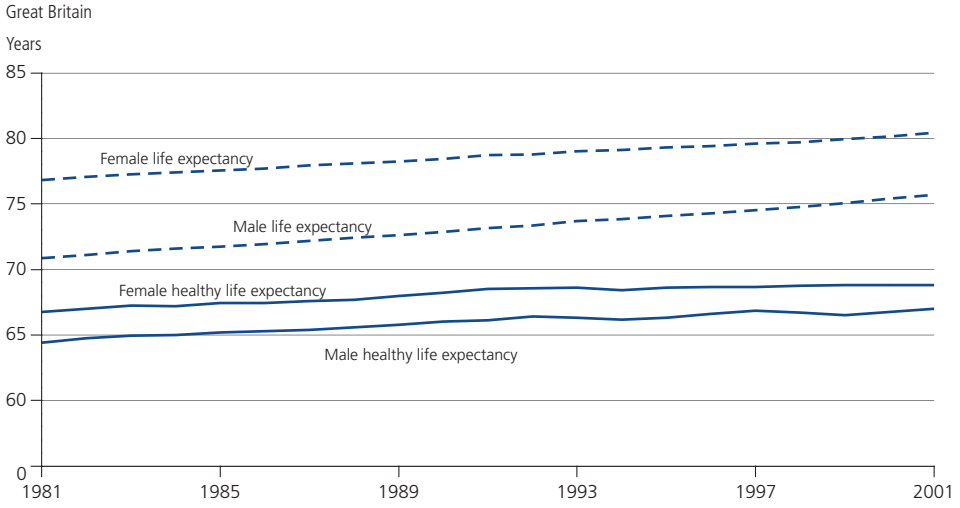
Life expectancy

3.7 Life expectancy is a widely used indicator of health status. Healthy life expectancy partitions total life expectancy into years free of health-related problems, and it includes a quality of life aspect that life expectancy does not. As figure 5 shows, there has been an increase in life expectancy at birth for both males and females during the period presented.

3.8 Female life expectancy at birth has continued to be higher than that for males, though the gap narrowed by one year from six years in 1981 to just under five years in 2001. During this period life expectancy for men increased by five years, one year more than for women. Healthy life expectancy during the same period increased by just under three years for men – again, around one year more than for women. Therefore for both sexes, not all the gains in life expectancy were gains in healthy life years.

Figure 5:

Life expectancy and healthy life expectancy at birth, by sex, 1981 to 2001



Source: Government Actuary's Department, ONS

3.9 A possible explanation for the absolute difference in male and female life and healthy life expectancy may be the result of differences in their chosen life styles. For example, men are more likely to adopt behaviour considered risky, such as heavy smoking, drinking and having an unhealthy diet. Men are also less likely to use health services for prevention of diseases. However, as the trend in healthy life expectancy shows, there has been a narrowing in the gap between men and women.

Mortality rates

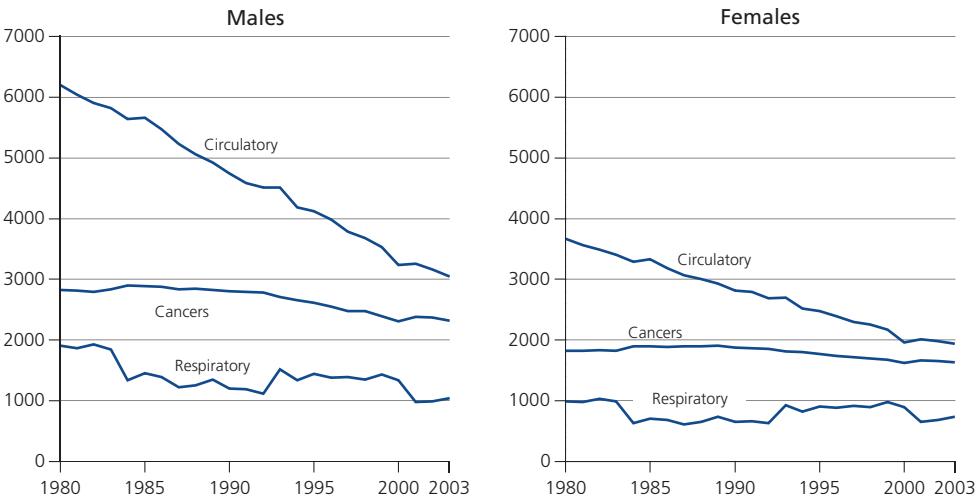
3.10 Figure 6 presents age-standardised mortality rates by sex for the major causes of death. Since the early 1970s, circulatory diseases (including both heart disease and stroke) have remained the most common cause of death in the UK, but they have also shown the greatest decline. The three major risk factors for CHD are smoking, high cholesterol and high blood pressure. A recent study (BMJ 2005a) looked at contributory factors to explain the 54 per cent fall in CHD mortality rates during the period 1981 to 2000. The study found that approximately half of this fall can be attributed to primary prevention which is aimed at reducing the three major risk factors in people without known CHD. This is four times the impact on mortality rates from secondary prevention which is aimed at reducing risk factors for known CHD patients.

Figure 6:

Standardised mortality rates by sex and major cause, 1980 to 2003

United Kingdom

Per million population



Source: ONS, General Register Office for Scotland, Northern Ireland Statistics and Research Agency

Note: Data for 2000 are for Wales and England only.

3.11 Cancer is the second most common cause of death, and there have been reductions in mortality from cancer over the last two decades or so. Breast cancer is the most common type of cancer among women. Since a peak in 1988, the mortality rate has declined as a result of better breast self-examination and because of treatments, including the use of Tamoxifen, and to a lesser extent, earlier diagnosis by breast screening (BMJ 1994, BMJ 2000).

3.12 Many major causes of death, such as heart disease, respiratory diseases and lung cancer, are affected by smoking trends. For example, smoking is estimated to be the main cause of 90 per cent of lung cancer cases (Cancer Research UK 2002). The time it takes for changes in smoking habits to affect such major causes of deaths is thought to differ by cause: from a rapid effect for heart disease, to around 20 years for lung cancer.

3.13 Numerous anti-smoking campaigns and other measures have influenced the proportion of adults who smoke cigarettes, which has fallen from 45 per cent in the early 1970s to 26 per cent in 2003/04, and consequently have had an effect on mortality rates (ONS 2004b).

3.14 Overall, it is clear that some important health outcomes in the UK have been improving. What is less clear is what part of this improvement can be directly attributed to the NHS and thus count as output. The following two sections consider NHS output in more detail, with section 5 in particular discussing proposals for incorporating changes in health outcomes into measures of NHS output change.

4 NHS output in the National Accounts

4.1 NHS output represents the direct contribution it makes to improved health outcomes. This section:

- sets out the current methodology and output estimates used in the National Accounts. These already incorporate improvements made in the 2004 and 2005 *National Accounts Blue Books* as a result of *Atkinson Review* work; and
- then outlines further potential improvements to current methodology, other than steps to be taken to incorporate quality change into the output estimates.

4.2 Satisfactory incorporation of quality change is a substantial topic in its own right and this subject matter is the focus of the next section.

Current methods in the National Accounts

4.3 The methodology used to compile NHS output estimates for the National Accounts since June 2004 distinguishes between different types of detailed activity, and it captures the majority of, but not all, NHS activities in England. Since June 2005, the methodology has also started to capture activity in Northern Ireland. The current methodology does not include quality change as part of output, as recommended by the *Atkinson Review;* and it assumes that output change for Wales and Scotland is the same as that for England and Northern Ireland combined.

4.4 Measuring change in NHS output is based on a number of different sources: the DH National Schedule of Reference Costs (Reference Costs), the General Household Survey, information from NHS Direct, Walk-In Centres, NHS Direct Online, the Prescription Pricing Authority, General Dental Services, General Ophthalmic Services, and on ambulance emergency journeys. Together, these sources provide information on changes for over 1,900 NHS activity types in the latest period. DH estimates that around four-fifths by value of all NHS activity in England is covered by the aggregate measure; and the Northern Ireland Department of Health, Social Services and Public Safety estimates that just under three-quarters by value of all NHS activity in Northern Ireland is covered by the aggregate measure.

4.5 Growth in NHS output is measured using a cost weighted activity index. In simple terms, this is a large basket of treatment activities where each activity is given importance (weight) as measured by the unit cost associated with its production. As the volume of NHS activities change over time, this volume is adjusted according to the relative weight given to it.

4.6 Table 1 sets out the current *National Accounts Blue Book 2005* estimates of annual growth in NHS output for the years 1995 to 2004, during which NHS output increased by an annual average of 3.2 per cent. These estimates of NHS output growth are the starting point from which to consider how to make adjustments to incorporate NHS quality.

4.7 This average growth of 3.2 per cent per year compares with an annual average growth figure of 3.1 per cent as reported in the first *Public Service Productivity: Health* article in October 2004. The small difference is due to stronger growth between 2003 and 2004 than on average in earlier years. Growth during the period 1999 to 2004, the years for which quality adjustments to outputs are available is higher: 3.9 per cent per year. There are also some methodological improvements incorporated in the later figures. These include:

- additional coverage of a wider range of NHS activities; and
- incorporation of figures for Northern Ireland for the first time.

While these changes are important in principle, they appear to have made little quantitative difference to the estimates.

Table 1:

Quantity growth in NHS output (cost weighted activity index using a Laspeyres chained volume measure)

United Kingdom

Index 1999=100 Percentages

											Average annual growth		
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	1995-2003	1995-2004	1999-2004
Quantity growth in NHS output in *Blue Book 2005*	90.8	93.8	95.2	96.9	100.0	103.0	107.4	111.4	115.5	121.0	*3.0*	*3.2*	*3.9*
Quantity growth in NHS output October 2004 article	91.1	93.8	95.2	96.9	100.0	103.0	107.3	111.7	116.3	-	*3.1*	-	-

Source: ONS

Potential improvements for measuring NHS output, other than quality adjustment

4.8 This section discusses further potential improvements to the existing measure of NHS output, other than for quality adjustment which is covered in section 5. They cover the use of different sources of information on hospital activity and different base years for unit costs.

4.9 In addition, the impact of using different indices for measuring change in the growth of NHS activities over time is also an important topic for discussion. But given the technical content of this work, this is presented in the accompanying *Sources and Methods.*

Different sources of information on hospital activity

4.10 The most important improvement made in June 2004 was the differentiation in the NHS output index of many different types of health activity. This was made possible because of the availability of unit cost information at a disaggregated level from the Reference Costs. Information on changes in activity had been available for several years from Hospital Episode Statistics (HES), and had been the source of information on activity for the National Accounts prior to June 2004, but only at an aggregated level, and only with unit costs at the aggregate level. It was thus possible in 2004 to differentiate between some 1,700 NHS activities, as compared to only 16 previously. A desire to retain the consistency of the activity and unit cost information from a single source, alongside the fact that the totals reported in the Reference Costs tally with audited NHS Trusts accounts, meant that the Reference Costs became the source of both activity and unit cost estimates for the NHS output index from June 2004.

4.11 An alternative approach has been considered by the York / NIESR project, which has based estimates of NHS output on the activity figures from HES, because their proposals for incorporating quality adjustments require analysis of patient-level

information which is only available from HES, and not from Reference Costs. The researchers also combined individual episodes to form continuous inpatient spells, and constructed adjusted unit costs consistent with this approach. The York / NIESR methodology is not possible using information ONS currently receives from Reference Costs.

4.12 Further discussion of the pros and cons of this change will be needed, as well as consideration of its feasibility. A project has accordingly been set up, involving the ONS, the health administrations and the Health and Social Care Information Centre to consider the most appropriate methods and source of information on NHS activity for the future.

Different base line for unit costs

4.13 A further difference in methodology in the York / NIESR project is the use of a different base year for unit costs to measure NHS output growth. To measure change in the volume of NHS output in the National Accounts, ONS, after consultation with the DH, decided to use unit costs for the most up to date period, 2002/03, as a proxy for unit costs in previous years. The York / NIESR estimates are based on the use of actual unit costs each year to measure output growth in a cost weighted activity index.

4.14 The same project group as mentioned in paragraph 4.12 will also consider which of these unit cost schemes should be preferred.

4.15 Table 2 illustrates the difference between the ONS estimates of change in NHS output growth and those from the York / NIESR project, encompassing both the use of different sources of data on hospital activities and differences in base year unit costs, as well as other more minor differences. ONS estimates of output growth are 0.2 percentage points per year higher than the York / NIESR approach over the period 1999/00 to 2002/03. Comparing the methods and sources used by the York / NIESR model with those currently used by the ONS:

- their use of different unit costs is estimated to add 0.6 percentage points to output growth;
- their use of HES rather than Reference Costs to measure activity is estimated to remove 0.5 percentage points from output growth; and
- a number of other, smaller differences are estimated to remove a further 0.3 percentage points from output growth.

4.16 Note that the two methodologies do not give systematically higher or lower growth estimates. The York / NIESR methodology gives higher growth figures for the last two years, but the reverse for the previous three.

Table 2:

Quantity growth in NHS output - illustration of differences between the ONS and York / NIESR estimates based on different sources and methods

England — Percentages

	1999/00	2000/01	2001/02	2002/03	2003/04	Average annual growth 98/99-03/04
ONS: Quantity growth in NHS output	3.4	2.9	4.4	3.7	4.3	3.8
York / NIESR project: Quantity growth in NHS output	2.6	2.1	3.9	5.1	4.4	3.6

Source: ONS, York / NIESR

5 Quality of NHS output

5.1 The *Atkinson Review* recognised that measuring NHS output simply on the basis of countable activities and cost-based weights ignores the quality of these activities and the contribution they make to valuable outcomes. This section summarises the recommendations made in the *Atkinson Review* for measuring the quality of NHS output, and then describes research commissioned and produced by DH for quality adjusting NHS output. A number of indicators have been developed and the individual impacts they have on NHS output growth are reported where it is possible to do so. The indicators represent the main quality adjustment factors to be considered, but the list should not be regarded as exhaustive, and they are still limited in terms of the data that are available to populate them.

5.2 The quality adjustment indicators covered in this section come from recently published research by York / NIESR on: survival rates, health effects, life expectancy and waiting times; and from additional research carried out by DH on: health gain from the use of statins to treat CHD, improved outcomes from primary medical care, survival rates from myocardial infarction, and patient experience. A further adjustment for changing value of health, proposed in the *Atkinson Review* and by DH is discussed.

5.3 The intention in this section is to consider the consequences of this research for the NHS output and productivity figures if these various adjustments are made. It is intended to set the stage for further public discussion on these methods, data and results. ONS, working with DH, will be holding consultation seminars on these issues in 2006.

The Atkinson Framework

5.4 The *Atkinson Review* set out five principles to be applied in the measurement of government output. One of these stated that the output of the government sector should be measured in a way that is adjusted for quality. More specifically, paragraph 4.25 in the *Atkinson Review* stated there are at least three different ways to approach the measurement of quality in the National Accounts:

- first, differentiate the services, with the aim of arriving at categories that can be regarded as homogenous. A quality change is then captured by changes in the proportions of different categories;
- second, define the volume measures in terms of the degree of success; and
- third, the volume measure may be based on the level of activity but the contribution to outcomes introduced in the form of a quality adjustment. The volume measure would be 'marked up or down' by a percentage reflecting indicators of success and the contribution of the service to that success.

5.5 The first aspect of quality change is covered in section 4 on measuring NHS output. In particular, the number of categories covered has increased from 16 to, first, 1,700 in 2004 and to around 1,900 since July 2005. The second and third aspects of quality change in NHS output are covered in this section, and can be linked to some of the health outcomes presented in section 3.

5.6 A further principle set out in the *Atkinson Review*, Principle C, suggested that account should be taken of the fact that the output of public services becomes increasingly valuable in material terms in an economy with rising real income. This

is set forth as a general principle but elsewhere the *Atkinson Review* makes clear that this should apply to Health, as to other services.

5.7 While the *Atkinson Review* regarded an adjustment on this account as important, it also recognised that such an adjustment was not yet universally accepted and should therefore be used with caution, pending further debate.

Subsequent work

5.8 Since publication of the *Atkinson Review Final Report* in January 2005, there have been major advances in measuring the quality of NHS output. In particular, two research publications have moved the agenda forward:

- *Developing new approaches to measuring NHS output and productivity,* a paper published jointly by CHE at the University of York and NIESR on 7 December 2005; and
- *Healthcare Output and Productivity: Accounting for Quality Change,* a paper by DH, published on 7 December 2005, which includes information from the report above.

5.9 ONS has worked closely with DH, the University of York and NIESR on quality adjustment issues, but at the same time maintained an independent view of the new research findings.

5.10 Both studies are explicitly consistent with the broad framework recommended by the *Atkinson Review*. They are therefore broadly based on the proposition that the task is to measure the contribution of the NHS to improved health outcomes as a result of its activities. Higher quality, in its various manifestations, obviously produces greater health gains and benefits for patients. The exact ways in which the various dimensions come together and can be captured in a quality adjusted index of output are set out in the two research publications.

The York / NIESR Study

5.11 The York / NIESR work essentially recognises a cluster of interacting factors in arriving at an overall quality adjustment:

- taking account of improving survival rates for patients;
- taking account of improving health gains for patients;
- adjusting for the fact that both better survival and health gain will depend upon the life expectancy distribution of the patients concerned. Younger patients will enjoy the benefits for longer on average than older ones; and
- allowance for changes in waiting times. Patients enjoy gains more quickly if waiting times are shorter.

5.12 The following sections discuss each of these elements in more detail, as well as noting the comments on them from the DH publication. The adjustments proposed by York / NIESR (and DH) relate to the financial years 1999/2000 to 2003/04. For simplicity, ONS has incorporated these adjustments to the 2000 to 2004 calendar years, respectively, without adjustment.

Survival rates

5.13 Improved survival as a result of NHS interventions must obviously be considered as a quality adjustment factor, as this is a key health outcome. Several observations are relevant when using survival rates as a quality adjustment factor:

- for some health conditions, death may be an expected outcome of hospital admissions, for example, patients with terminal conditions being admitted for palliative care as they approach the end of their lives;
- by contrast, for some health conditions, death may take place but was not expected and is therefore considered avoidable. For example, most patients admitted with acute appendicitis survive, but few die; and
- for other health conditions, patients at high risk of death are admitted to hospital and the outcome will depend, in part, on the preventative treatment, for example, by major heart surgery or from successful cancer treatments.

So survival rates are, in principle, relevant as an indicator of quality mainly in the areas of avoidable deaths.

5.14 The York / NIESR research uses data on deaths within 30 days of admission, by hospital, which is produced by the National Centre for Health Outcomes Development. The 30 days cut off point is used on the basis that any period greater than 30 days makes it more difficult to attribute survival directly to NHS interventions. While the York / NIESR work makes adjustment for the fact that some health conditions have a higher death rate, the use of routine survival data means it was not possible to consider separately the impacts of avoidable deaths and for patients reaching the end of their natural life.

5.15 The DH publication agrees with the York / NIESR work, that in principle, survival rate is a valid quality adjustment for health care output but points out that this indicator still requires further development as follows:

- adjustment is needed for changes in case mix, in particular age of patient, severity of diagnosis, comorbidity and other risk factors;
- emergency admissions have been rising quickly in recent years with a shift towards 'zero day' admissions which allow observation and treatment planning. These admissions alter the denominator for survival rates, as there may be more 'low risk' admissions for patients who would previously have been assessed in Accident and Emergency departments without admission, or perhaps in primary care;
- changes in the place of death over time need to be considered, for example, if more patients choose to move to a hospice or a nursing home, this may affect comparisons of survival rates between years; and
- more consideration should be given to the balance between 'avoidable or preventable' and other deaths.

5.16 On this last point, there is no consensus on how to measure levels of avoidable and premature death. ONS is currently in the process of developing national indicators for measuring premature and avoidable mortality, details of which could be included in future productivity articles. (For further details see: www.statistics.gov.uk/about/Consultations/mortality.asp)

Health effects

5.17 The extent to which NHS activities improve the health of patients relative to the situation when no treatment is provided is an important but complex quality adjustment issue. Quality adjustment of NHS output using health effects would, ideally, make use of data collected on the health status of patients before and after all the treatment interventions included in the NHS cost weighted output index. Unfortunately such a comprehensive dataset does not exist. However, York / NIESR has been able to demonstrate the impact of using data available for 29 individual procedures. A list of the 29 individual procedures that were used by York / NIESR is provided in *Sources and Methods.* These procedures cover around $2^{1}/_{2}$ per cent of total NHS expenditure.

5.18 Health benefits data have been taken from two sources: measures of 'before and after' change in health status after treatment in BUPA hospitals, and research studies. Health benefits data are based on a simple scale between 0 and 1, where 0 represents the worst possible health state, 1 represents perfect health, following treatment for a health condition. For example, York / NIESR use a well known health measurement tool, the Short Form 36, to show that health status changes from 0.7 to 0.8 following surgery for hysterectomy. It is this type of change in health status that is used for the 29 individual procedures in *Sources and Methods.* The researchers acknowledge the limitations of their data and recommend further data collection.

5.19 The DH publication broadly agrees with the York / NIESR approach and recognises the data limitations for measuring health effects, but makes the following comments:

- it might be valid initially to use a quality adjustment based on health effects for a small number of high volume treatments, while continuing to work towards wider coverage;
- the health benefit of treatment is, in principle, a comparison between health status for the rest of the patient's life after treatment, with their health status if they had not received treatment. This needs further consideration, particularly as York / NIESR currently use only a three month period for measuring treatment effects;
- 'before and after' measures alone are not enough to estimate health gain from treatment, particularly if the 'after' treatment measure is short term. When treating serious health conditions, for example, it is also appropriate to consider longer term life expectancy e.g. successful treatment of an early cancer patient could add 20 years to life expectancy, whereas for some patients whose treatment is unsuccessful, death might be typically three months after treatment interventions; and
- the impact of treatment on patients treated under BUPA may not be the same as those who are treated under the NHS.

Adjustment for life expectancy

5.20 As outlined in section 3, the extension of life that is due to NHS activities is a key health outcome. York / NIESR adjusts their estimates for survival and health effects by taking into account life expectancy, factoring in an adjustment for age of patients at the time of treatment. Quality adjustment using life expectancy reflects the fact that older patients have less time to benefit from treatment. A discounting approach

is used giving most weight to health benefits in the near future, and progressively less to health benefits in later time periods. Health benefits are assumed to be sustained for the rest of the patient's life.

5.21 The DH publication agrees with the proposals from York / NIESR but adds the following:

- there are examples (e.g. chronic disease with repeated short hospital episodes) where the duration of treatment benefit is shorter than the remaining years of the patient's life. This needs to be considered further; and
- in agreement with York / NIESR, it would be preferable to use condition-specific and age-specific survival rates, rather than rely on a general life expectancy adjustment.

Waiting times

5.22 The NHS has established targets for waiting times with the aim of cutting the number of people on long waiting lists. These targets have also been built into the Performance Assessment Framework. Table 3 presents waiting time information for English inpatients and outpatients. This table shows fairly substantial decreases in the number of people experiencing long inpatient and outpatient waiting times since 1998.

5.23 The maximum waiting times for both inpatient and outpatient treatment has decreased, with the median wait for outpatient treatment falling from around 15 weeks in 1998 to 8.5 weeks in March 2005. Waiting times are an important component of the quality of care so the measure of NHS output should take them into account.

Table 3:

NHS inpatient and outpatient waiting times

England — Thousands

Number of people waiting	Mar-98	Mar-99	Mar-00	Mar-01	Mar-02	Mar-03	Mar-04	Mar-05
For inpatient treatment:								
0-5 months	900	784	760	752	783	786	811	768
6-8 months	192	146	138	130	141	136	80	41
9-11 months	118	84	78	72	75	53	<1	<1
12 months plus	67	47	48	41	22	<1	<1	<1
For first outpatient appointment:								
13-25 weeks	196	292	263	200	191	120	40	30 [1]
26 weeks plus	101	144	130	80	1	<1	<1	n/a [1]

1. From Q1 2004/05 figures for 26 weeks plus are not collected separately. Figures are collected for 21 plus

Source: DH

5.24 Waiting times for treatment have potentially two impacts relevant to the quality adjustment of NHS output. First, the experience of waiting may reduce health gains as the benefits of treatment to patients are deferred. Second, the waiting may not actually affect health outcomes but nevertheless the patient may find the experience associated with waiting stressful. Some of this effect has already been captured by the York / NIESR estimates, but it should be noted that the evidence base to assess and measure the two impacts more generally is weak.

5.25 The York / NIESR work concentrates on the first impact, that is, the impact that waiting times have on reducing health gains. A discount factor of 1.5 per cent per year is used to reflect the fact that distant health gains are less valuable to people; and the researchers also incorporate a 'charge for waiting' which is the equivalent of an interest payment during the waiting period, and one that increases with the length of time the patient has to wait.

5.26 The DH publication broadly supports the work of York / NIESR but has some concerns with the overall approach. In particular, the York / NIESR formula for waiting times needs to be understood in a wider context. For example, most patients who need elective treatment do not wait long; most hospital patients are admitted without ever being on a waiting list; and most NHS care takes place outside hospital. In addition, the DH publication questions whether the 'health gains' approach used by York / NIESR currently captures the wider patient experience associated with waiting for treatment.

5.27 Taking account of all of the elements in the York / NIESR cluster (survival rates, health effects – both adjusted for life expectancy and waiting times) increases NHS output growth by an average of 0.17 percentage points per year during the period 1999/2000 to 2003/04.

The DH Publication

5.28 Subject to the comments summarised above, DH accept the York / NIESR analysis. The DH publication sets out other areas for which they have developed additional adjustments:

- improved health outcomes from the use of statins to treat CHD;
- improved outcomes from primary medical care;
- better survival rates as a result of higher quality treatment of myocardial infarction; and
- improving (non-clinical) patient experience.

The DH figures come from examples of methods considered appropriate for quality adjustment and DH have plans to develop these further. The following sections discuss the DH quality adjustments in turn.

Health gain from using statins to treat CHD

5.29 The *Atkinson Review* recommended that ONS and the health departments should consider identifying treatments where marginal valuation and cost weights are very different, and explore the difference in output growth resulting from use of estimated value weights instead of cost weights. In the first instance, and considering the data available, the DH publication identifies the use of statins to treat CHD as one such example.

5.30 The National Service Framework for health recommends statin therapy for patients with evidence of occlusive arterial diseases, including CHD and stroke. Statins reduce cholesterol which can block arteries, and so reduce the risk of heart attacks, strokes, and the onset of angina (DH 2005a). In 2004, around 2.6 million patients took statins, at a cost of £738m (around 1 per cent of total NHS expenditure). The evidence on health gain from statins is outlined in more detail in a technical paper (DH 2005b).

5.31 The DH publication follows the recommendation made by the *Atkinson Review*. Instead of using cost weights, the publication proposes using value weights based on added life years as a direct result of statin therapy.

5.32 Paragraph 7.14 from the DH publication summarises the approach used to measure NHS output growth for statins:

> 'TP2 estimates that statin therapy in 2003 added 77,000 life years, compared with no therapy, for the 1.9 million patients who took the drug. It estimates that each prescription has a marginal benefit of 0.0038 life years. If each life year is valued at £30,000, the value of each prescription is £115. This compares with £27 as the unit cost used in the current output index. TP2 also argues that the marginal value has not changed over time (i.e. there is no evidence that prescriptions are being given to patients with less chance of benefiting). Using £115 instead of £27 as the weight for statins increases overall NHS output growth by, on average, 0.81 per cent a year'.

5.33 The increase in output growth estimated by the DH publication is clearly dependent on the value placed on each life year, currently estimated to be around £30,000. But this is a figure used in health economics and does not seem an unreasonable estimate.

5.34 Using value weights instead of cost weights for statins increases NHS output growth by an annual average of 0.81 percentage points during 1999 to 2004.

Improved outcomes from primary medical care

5.35 The DH publication proposes an adjustment for changing quality of primary medical care (excluding prescribed drugs) which accounts for around 12 per cent of the NHS cost weighted activity index in 2003/4. Data for a full quality adjustment based on primary medical care outcomes are still developing (DH 2005c). However, DH were able to use data on improvements in blood pressure and cholesterol control from the QRESEARCH[2] database which holds information on over three million registered patients. Those data showed:

- a 23 per cent average annual increase in cholesterol control for patients with known CHD between January 2002 and October 2004; and
- blood pressure control for patients with CHD improved by an annual rate of 11 per cent, and for patients with hypertension, by 22 per cent, over the same period.

5.36 DH 2005c sets out a general methodology for quality adjustment based on primary medical care outcomes. The approach adopted suggests that outcome indicators are weighted by the prevalence of the condition. For example, 14 per cent of the QRESEARCH patients have either CHD or hypertension or both, so would carry a weight of 14 per cent. The paper assumes there is no change in quality of care for patients with other conditions, and also applies downward weighting to allow for the fact that patients with CHD also visit the GP for treatment for other conditions.

---

[2]QRESEARCH is now one of the largest aggregated general practice databases in the world. Version 8 of the database has over 30 million person years of observation from 489 practices spread throughout the UK with representation in every Strategic Health Authority. The database is updated every quarter.

5.37 Based on DH calculations (see table 3, p43 in the main DH publication for detail), quality adjustment based on data currently available for primary medical care increases overall NHS output growth by 0.16 percentage points per year for the two years for which data are available (2002/03 to 2004/04). Further work will be required to develop this illustrative measure and to expand on the NHS activities included in primary medical care.

Longer survival rates from myocardial infarction

5.38 The DH publication also makes use of data available on hospital episodes for patients admitted to hospital with myocardial infarction (MI), together with death certificates up to 5 years later for any cause. The longer term survival data expands on the analysis carried out by York / NIESR (where the survival period was restricted to the 30 day period) for this condition following hospital admission. Over the period 1998/99 to 2002/03, mortality rates, adjusted for age and sex, for patients admitted with MI in 1998/99, fell on average 3.2 per cent per year. Over the longer survival period it is possible that other factors contributed to this, for example, the clinical threshold for defining a case as MI, or the threshold for hospital admission for MI, may have changed. However, the DH publication also points out that success in treating MI is consistent with changes in clinical practice promoted in the National Service Framework.

5.39 Using additional survival benefit for patients treated with MI adds 0.01 percentage points per year to total NHS output. This adjustment is small because NHS spending on MI is small in comparison to total NHS spending. Further work is required to see if this level of adjustment could be applied more generally across the CHD programme.

Patient experience

5.40 Recommendation 8.5(i) from the *Atkinson Review* stated that ONS and DH 'should explore whether measures of quality change over time could be based on the national patient survey programme which measures aspects of patient experience'. The National Patient Experience Survey Programme was established under the 2000 NHS Plan (DH 2000), and NHS organisations are required to carry out local surveys each year, also changing the service areas that are covered each year. So far there have been two surveys in four different areas of NHS activity: inpatients, accident & emergency, outpatients and primary care.

5.41 The survey asks recent patients to reply to a range of questions about their experience of the health care they have received. Questions are mapped to 5 domains: access and waiting; safe, high quality co-ordinated care; better information, more choice; building closer relationships; and clean, friendly, comfortable place to be. A further DH Technical Paper (DH 2005d) provides detail on the use of these domains and how they are used for quality adjustment purposes.

5.42 There are two time points available in the survey for each of the four different areas of NHS activity, but with a missing year for three out of the four areas (there are only consecutive years for primary care). These areas cover around half the NHS cost weighted activity index. After combining domain scores and accounting for data for missing years, the quality adjustment for patient experience increases total NHS output growth by 0.17 percentage points per year during 2001/02 and 2003/04.

When averaged over a five year period 1999/00 to 2003/04 this becomes 0.07 percentage ponts, assuming there is no change in patient experience for the first three years.

5.43 Interpreting patient experience surveys is not straightforward, for example, it is difficult to fully assess how far responses actually reflect changes in the quality of NHS care. Such surveys will always contain some elements of bias, levels of expectation rather than experience, general beliefs, and so on.

Value of health adjustment based on real earnings growth

5.44 As noted earlier in paragraph 5.6, Principle C in the *Atkinson Report* stated:

> 'Account should be taken of the complementarity between public and private output, allowing for the increased real value of public services in an economy with rising real GDP'.

5.45 In the context of health, paragraph 4.38 from the *Atkinson Report* states:

> 'In the case of health, rising real wage rates means that we attach a higher valuation to days lost through sickness absence. An extra week at work today is worth more than forty years ago. The same effect may apply more generally. The literature on Quality Adjusted Life Years has considered how the financial value to be attached should be adjusted over time. The answer given by Gravelle and Smith (2001) is that it should grow at approximately 1.5 per cent per year in real terms'.

5.46 However, at the same time, the *Atkinson Report* recommended caution in implementing Principle C as it may be considered controversial. ONS will be working with DH to consult on this point specifically, in the context of wider discussion on improving the measurement of NHS output. Until consultation has taken place, this paper therefore presents estimates of NHS output and productivity growth with and without an adjustment for real earnings growth. In line with the

Table 4:

Estimated impact on growth of NHS output from various methods of quality adjustment, proposed by the York / NIESR project, DH, and the *Atkinson Review*

England	Percentage points
	Average impact on growth per year
York / NIESR effects	+0.17
DH proposals:	
Value for statins	+0.81
Improved blood pressure control[1]	+0.05
Heart attack survival	+0.01
Patient experience[1]	+0.07
Annual increase in value of health	+1.5
Total DH effect[2]	+2.51
Overall quality adustment	+2.68

1 Results from the two most recent years have been averaged over five years.
2 The total is greater than the sum of individual adjustments because of cumulative effects.

Source: DH

Atkinson Review recommendation, for those estimates that include the adjustment, NHS output growth is adjusted to reflect real earnings growth of 1.5 per cent per year.

5.47 ONS followed the same procedure in the *Public Service Productivity: Education* article published in October 2005. Again as a basis for further discussion, estimates both with and without the real earnings adjustment are presented.

Summary of the quality adjustment impacts

5.48 Table 4 (see previous page) provides a summary of the impacts on growth of NHS output using the York / NIESR, DH and *Atkinson Review* adjustment indicators, and the estimated total impact on NHS output growth. In this table, the value of health effect is shown separately.

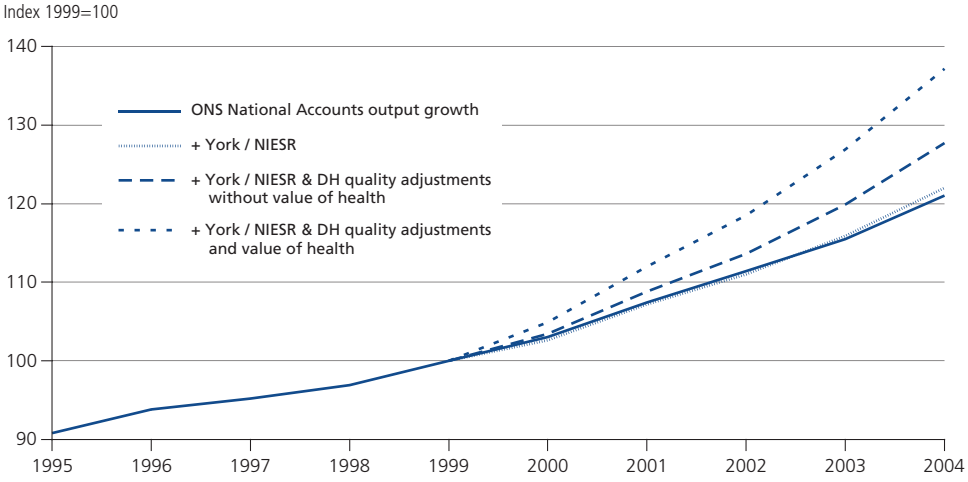
5.49 The total impacts on NHS output growth from using these quality adjustment factors are also shown in figure 7. From 1999 to 2004, growth in NHS output is estimated to be:

- 3.9 per cent per year on average without quality adjustment;
- 5.0 per cent per year on average with quality adjustment but excluding the value of health adjustment; and
- 6.5 per cent per year on average including both quality and value of health adjustments.

Figure 7:

NHS output growth without quality adjustment, 1995 to 2004 and with quality adjustment, 1999 to 2004

United Kingdom



Source: ONS

6 NHS inputs in the National Accounts at current prices

6.1 This section presents estimates of expenditure on NHS inputs over time. This forms the starting point for estimating the volume of NHS inputs. NHS inputs are the resources used in the production of NHS activities and output that contribute to NHS outcomes. NHS inputs cover, for example, medical staff (labour), prescription drugs and electricity (procurement), and hospitals (capital). A key part of this section is to present the latest estimates of NHS expenditure taking into account any revisions planned to be made to previous *Blue Book* estimates. In this section, revisions to NHS expenditure include an adjustment to intermediate consumption expenditure, updating some estimates based on planned spending with actual spending, and an adjustment required for Pension Increase Payments in 1995.

6.2 The National Accounts provide information on general government final consumption expenditure (GGFCE) on health which can be converted to volume measures by taking out changes in pay and prices over time. This section presents information on GGFCE on NHS inputs at current year prices. Section 7 provides an account of how current price inputs are converted in volumes.

6.3 Different types of inputs contribute in different ways to health care production. This section and section 7 distinguish between labour, intermediate consumption and capital consumption. Labour covers NHS staff; intermediate consumption, also termed procurement, involves the purchase of goods and services that are used up in the production process. For example, the NHS buys drugs, pays for electricity and buys services from private sector health companies.

6.4 The NHS also buys capital assets that can be used repeatedly or continuously over the longer term, such as buildings, machinery, and vehicles. Such capital assets are distinguished from intermediate consumption because they contribute in a different way to the production of NHS output. Whereas intermediate consumption items are used up in producing NHS output in any given year, capital assets last over a number of years. The amount used up of these capital assets over a year in the production process is called capital consumption.

Changes to expenditure for measuring productivity

6.5 *Correction to NHS Trusts intermediate consumption expenditure used in National Accounts.* From 1999 onwards, estimates published in *Blue Book 2005* for intermediate consumption for the health function were under recorded by between £0.8 and £1.2 billion a year. This will be corrected in *Blue Book 2006.* It is only the functional breakdown of intermediate consumption that is affected by this revision; the overall consumption total that forms part of key public sector finance series is unaffected.

6.6 *Revisions to provisional estimates. Blue Book 2005* includes an estimate for some NHS expenditure in 2004 which was based on planned figures. This estimate has subsequently been revised with outturn (or actual) data and incorporated into the latest quarterly National Accounts. The health series is published annually in *Blue Book.* The revised estimates have been used in the productivity calculations and are presented in this article.

6.7 *Pension Increase Payments.* The pension scheme for NHS Trust staff, as well as some others in the NHS, is only notionally funded. Prior to 2003/04, actual employer contributions to the scheme did not include adjustments for inflation. *Blue Book 2005* estimates of NHS expenditure include an inflation adjustment in order to

reflect true labour costs, but this inflation adjustment has been made to calendar year estimates from only 1996 onwards. For this article, an extra adjustment has been made to the *Blue Book 2005* estimate for 1995 to create a consistent series.

6.8 Table 5 presents estimates of labour, intermediate consumption and capital consumption at current year prices, taking into account the above changes and the latest available information, and as such, differ slightly from those currently published in the National Accounts.

Table 5:

Expenditure on NHS inputs: labour, intermediate consumption and capital consumption, current prices

United Kingdom £million

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Labour	22,245	23,056	24,025	24,838	26,096	28,099	30,927	33,975	35,405	38,672
Intermediate Consumption	15,853	17,591	17,608	19,611	22,703	23,550	25,535	27,765	32,947	36,601
Capital Consumption	1,227	1,319	1,366	1,387	1,455	1,587	1,570	1,648	1,729	1,784
Total	39,325	41,966	42,999	45,836	50,254	53,236	58,032	63,388	70,081	77,057

Source: ONS

6.9 Taking into account these revisions and other minor changes, table 6 compares total current price GGFCE on NHS inputs used in this article with the estimates used in the first *Public Service Productivity: Health* article.

Table 6:

Expenditure on NHS inputs: comparison of estimates in this article compared with the first *Public Service Productivity: Health* article, current prices

United Kingdom £million

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
This article	39,325	41,966	42,999	45,836	50,254	53,236	58,032	63,388	70,081	77,057
October 2004	39,508	42,282	43,369	46,185	51,155	54,880	59,098	65,089	71,194	-
Difference	-183	-316	-370	-349	-901	-1,644	-1,066	-1,701	-1,113	-

Source: ONS

7 Measuring the volume of NHS inputs

7.1 Measurement of NHS productivity is based on dividing the volume of NHS output by a volume measure for NHS inputs. This section presents the methodology on how expenditure on NHS inputs is converted into a volume measure, and the resulting estimates. Two approaches are presented:

- the first approach – the 'indirect approach' - deflates NHS expenditure by adjusting labour and procurement expenditure by pay and price indices respectively. Capital expenditure is adjusted by taking into account changes in the rental value of capital; and
- a new 'direct approach' is also used to convert expenditure on NHS staff into a volume measure by adjusting for hours worked and taking into account differences in earnings. York / NIESR carried out an alternative methodology using a different source of information on NHS labour and also considered skill mix. The estimates are very similar to those in this section, so are not reported here.

7.2 Use of these two methods is consistent with the recommendations of the *Atkinson Review*. Principle F noted that 'labour inputs should be compiled using both direct and indirect methods, compared and reconciled'. The first health productivity article presented estimates of labour inputs based only on an indirect method, that is, deflated expenditure on NHS labour. This article also presents estimates based on direct methods.

Deflating NHS Labour inputs using information on pay (indirect method)

7.3 The National Accounts convention requires a Paasche Price Index when deflating current price expenditure. The deflators used in the first *Public Service Productivity: Health* article for removing the price effect from some expenditure on NHS labour (predominantly hospital and community health staff) have been improved. The previous deflators were similar to a Laspeyres Price Index, but used current price expenditure weights rather than quantity weights. The new deflator, constructed using the same raw data, is a Paasche Price Index using quantity weights. Table 7 presents the new and old deflators (the latter have been updated using the latest available information to show differences over the 1995-2004 time period).

Table 7:

Comparison of the deflators used for removing the price effect from expenditure on hospital and community health staff: deflators consistent with those used in the first *Public Service Productivity: Health* article and the improved deflators used in this article

England

Index 1999=100 Percentages

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average annual growth 1995-2004
This article	85.9	88.6	91.0	94.3	100.0	106.6	114.1	120.3	126.4	132.6	*4.9*
October 2004 article	84.9	88.0	90.2	93.9	100.0	107.0	116.1	122.5	130.6	139.3	*5.7*

Source: ONS

7.4 Using the Paasche Price Index consistent with the National Accounts, cost inflation of some NHS staff is rising less quickly than previously estimated, by just under 1 per cent per year on average.

Counting NHS Labour inputs using numbers of staff and hours worked (direct method)

7.5 The OECD manual *Measuring Productivity* recommends the number of hours worked, with suitable differentiation by skill, as the preferable measure of the quantity of labour inputs into production. This is preferred to numbers of people employed, as the contribution provided by full-time employees differs from that of part-time employees according to the number of hours worked. *Measuring Productivity* points out that "...an hour worked by a highly experienced surgeon and an hour worked by a newly hired teenager at a fast food restaurant..." should be differentiated for productivity analysis, but although desirable, this is difficult.

7.6 ONS has compiled an exploratory direct measure in accordance with the OECD manual based on available NHS sources relating to staff levels and earnings differentials by grade of staff.

7.7 Table 8 presents the estimates from both using the indirect and direct methods. Both show the growth in the volume of NHS labour to be at or just over 3 per cent per year, on average, with the indirect method showing the higher growth of the two.

7.8 *Sources and Methods*, provides detail on the relative advantages and disadvantages of the approaches to measurement of NHS labour inputs.

Table 8:

Change in NHS labour inputs using direct and indirect methods

England

Index 1999=100 — Percentages

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average annual change 1995-2004
ONS indirect method	94.5	95.7	96.4	97.7	100.0	102.7	108.1	114.3	119.1	127.2	*3.4*
ONS direct method	94.7	95.8	96.4	97.7	100.0	102.2	106.2	111.8	117.4	123.1	*3.0*

Source: ONS

Intermediate consumption: prescription drugs

7.9 As discussed in the first *Public Service Productivity: Health* article, the identification of a suitable price deflator for expenditure on drugs dispensed outside hospitals has been problematic. DH has made a key change to its analysis so that it now links the prices of branded and generic drugs. This means that when branded drugs fall out of patent and generic drugs come onto the market that may be cheaper, this fall in cost for similar drugs is counted as part of the price change. Previously, this effect was not included as part of the price effect. A consistent series calculated in this new way would constitute an appropriate price deflator for expenditure on prescription drugs.

7.10 The new analysis has so far only been carried out for two years, 2003 and 2004, and not for previous years. ONS and DH will be looking into extending the new analysis back over time. According to the new analysis, the price of prescription drugs fell in both years, by 0.5 per cent from 2002 to 2003, and by 3.4 per cent from 2003 to 2004.

7.11 For previous years, two deflators are presented as for the first *Public Service Productivity: Health* article, reflecting uncertainty about the effect on one overall price change of branded drugs coming off patent prior to 2003. These are an index of average costs per item and a Paasche Price Index, both taken from the DH analysis of change in the net ingredient costs of prescription drugs. Table 9 presents the two alternatives. The two methods produce very different results for annual average price changes. This differential is reflected in the range of productivity estimates provided in this article, and in more detail in *Sources and Methods*.

Table 9:

Alternative estimates of change in price of prescription drugs

England

Index 1999=100 Percentages

	1995	1996	1997	1998	1999	2000	2001	2002	Average annual price change 1995-2002
Index of average cost per item	77.9	82.7	87.4	91.7	100.0	101.3	104.3	111.1	*5.2*
Paasche Price Index, separately accounting for branded and generic drugs	99.5	99.6	99.9	97.3	100.0	97.4	94.4	94.1	*-0.8*

Source: ONS

7.12 Table 10 shows the results of adding the estimates of price change from the new analysis for the years 2003 and 2004 to each of the alternative estimates of price change for years prior to 2003, to arrive at a time series for the whole 1995 to 2004 period.

Table 10:

Estimates of change in price of prescription drugs

England

Index 1999=100 Percentages

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average annual price change 1995-2004
Index of average cost per item	77.9	82.7	87.4	91.7	100.0	101.3	104.3	111.1	110.5	106.8	*3.6*
Paasche Price Index	99.5	99.6	99.9	97.3	100.0	97.4	94.4	94.1	93.6	90.4	*-1.1*

Source: ONS

Intermediate consumption: hospitals and community health services

7.13 For the National Accounts, health expenditure on intermediate consumption at current prices is available from the detailed accounting data maintained by HM Treasury and the health administrations. Changes in the volume of intermediate consumption are calculated by deflating the total current price expenditure figures using suitable deflators. For this article, these deflators only relate to the NHS in England and not to the whole of the UK.

7.14 ONS has improved the method for calculating the deflator used to remove the price effect from expenditure goods and services bought by hospital and community health services. The method for linking the monthly growth is now the same as that conventionally used in the National Accounts.

7.15 The York / NIESR project noted that the cost of capital items should not feature in the measure of price change for procurement items, and has excluded those capital items from the calculation of the respective deflator. This constitutes an improvement to methods, which ONS has adopted. Table 11 presents the new and old deflators (the latter has been updated using the latest available information to show differences over the 1995-2004 time period).

7.16 Otherwise, the sources and methods for measuring the changes in the volume of NHS procurement are as used in the first *Public Service Productivity: Health* article, and are detailed in *Sources and Methods.*

Table 11:

Comparison of the deflators used for removing the price effect from expenditure on goods and services purchased by hospital and community health services: deflators consistent with those used in the first *Public Service Productivity: Health* article and the improved deflators used in this article, 1995 to 2004

England

Index 1999=100 Percentages

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average annual growth 1995-2004
This article	98.1	99.0	99.7	99.2	100.0	99.5	99.0	100.3	102.4	104.2	*0.7*
October 2004 article	94.1	95.7	96.6	97.9	100.0	99.8	99.3	100.1	101.9	103.1	*1.0*

Source: ONS

Capital

7.17 The National Accounts provide estimates of capital depreciation, which have been used by ONS as a measure of change in the volume of capital inputs. The *Atkinson Review*, by contrast, suggested that a better measure would be capital services. Moreover, for the purposes of understanding productivity, *Measuring Productivity* states 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. Capital services can be thought of as the flow of productive services from the capital stock, for example the shelter and heating provided by an office building. The price of capital services can be thought of as the rental price: offices in general do have rental prices, but this is not the case for many other types of capital. Where no rental prices exist, such prices need to be estimated.

7.18 ONS published experimental estimates of capital services for the whole economy in November 2005 (ONS 2005b). This did not include a distinct set of estimates for public service health. They did provide information on health and social work at the level of the total economy, therefore including private sector health (for example, private hospitals) and private sector social care (for example, residential homes for the elderly) as well as public sector hospitals and other facilities.

7.19 Table 12 presents the volume indices for capital consumption and for capital services. Care should be taken in interpreting these estimates, as the capital consumption figures are not strictly a measure of the use of capital by the NHS, and the capital services figures are not limited in coverage to the NHS.

Table 12:

Alternative measures of capital inputs to the NHS

United Kingdom

Index 1999=100 Percentages

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average annual change
Capital consumption	86.8	91.3	94.9	96.1	100.0	108.3	105.1	109.6	114.0	115.8	*3.3*
Capital services	85.7	88.6	89.9	94.4	100.0	105.4	108.9	115.8	120.0	124.8	*4.3*

Source: ONS

Total NHS inputs (labour, intermediate consumption and capital)

7.20 Table 13 presents the estimates of change in NHS inputs which constitute the highest and lowest growth over the period 1995 to 2004 using the different sources, methods and assumptions. The estimates show that inputs have been increasing by an annual average of between 3.9 and 4.6 per cent. Growth during the period 1999 to 2004, the years for which quality adjustments to output are available, are higher: 4.8 and 5.5 per cent.

Table 13:

Growth in NHS inputs using a range of estimates of change based on different combinations of sources, methods and assumptions

United Kingdom

Index 1999=100 Percentages

											Average annual change	
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	1995-2004	1999-2004
Lowest growth in NHS inputs based on drugs deflated using cost of all items, capital consumption, and direct labour method	89.5	93.0	92.9	96.2	100.0	102.3	107.1	112.0	120.0	126.4	*3.9*	*4.8*
Highest growth in NHS inputs based on drugs deflated by Paasche Price Index, capital services and indirect labour method	87.4	91.2	91.4	95.5	100.0	102.8	109.1	115.3	123.0	130.8	*4.6*	*5.5*

Source: ONS

7.21 The estimates of change in inputs 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 inputs from capital using estimates of capital consumption.

7.22 The estimates of change in inputs which constitute the highest growth over the period 1995 to 2004 are based on measuring:

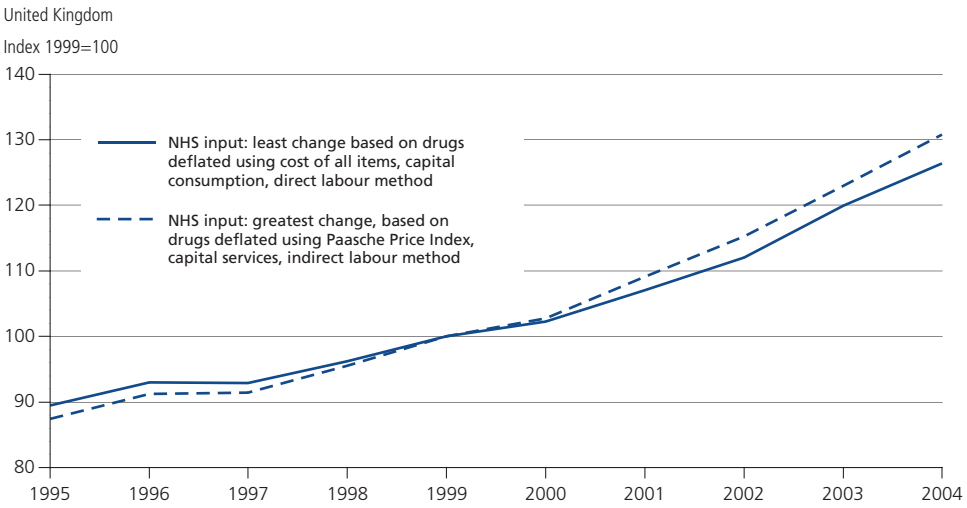
- the volume of growth in labour using the indirect approach (deflating expenditure on labour using price indices);
- the volume of growth in intermediate consumption including a Paasche Price Index for prescription drugs; and
- the volume of inputs from capital using estimates of capital services of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

7.23 All other combinations of sources, assumptions and methods fall within the range presented by these highest and lowest series.

7.24 Figure 8 presents these estimates of greatest and least change in the volume of NHS inputs.

Figure 8

Estimates of greatest and least change in the volume of NHS inputs, 1995 to 2004



Source: ONS

8 NHS productivity

8.1 This section presents estimates of productivity based on the information already presented in sections 4 through to 7 on NHS output and inputs. Productivity is defined as the ratio of NHS output to NHS inputs. More important is how this ratio has changed over time. Clearly, the results will depend on which of the methodologies and resulting series discussed above are used. Not surprisingly, estimates of the change over time in NHS productivity are sensitive to the sources and methods used.

8.2 There are a range of estimates for both NHS inputs and output growth which means there are several estimates for NHS productivity. In this section, three sets of productivity figures are presented. These sets are the range of estimates of NHS productivity based on:

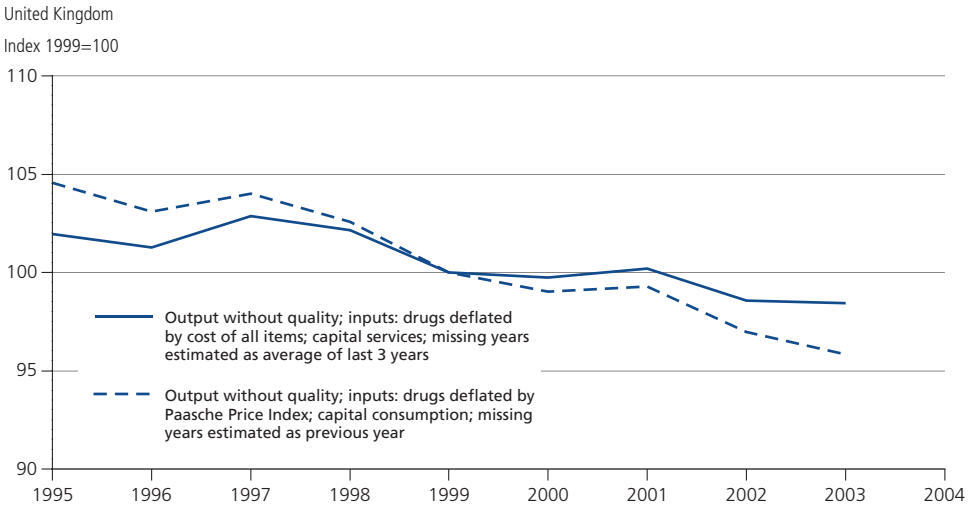
- output without adjustment for quality change or the value of health, and the greatest and least rises in NHS inputs;
- output with adjustment for quality change but no adjustment for the value of health, and the greatest and least rises in NHS inputs; and
- output with adjustment for both quality change and the value of health, and the greatest and least rises in NHS inputs.

Set 1: NHS productivity excluding quality change in NHS output and making no allowance for increasing value of health

8.3 In the first *Public Service Productivity: Health* article, ONS estimated that NHS productivity (taking no account of changing quality) fell by an annual average of between 0 and 1 per cent during the period 1995 to 2003 as presented in figure 9. These estimates were rounded to the nearest whole number. This was based on estimates of NHS output having increased by around 3.1 per cent per year and NHS inputs having increased by between 3.5 and 4.2 per cent. It has always been clear that not taking account of quality change is unsatisfactory.

Figure 9:

NHS productivity excluding quality change for NHS output, 1995 to 2003, as published in October 2004

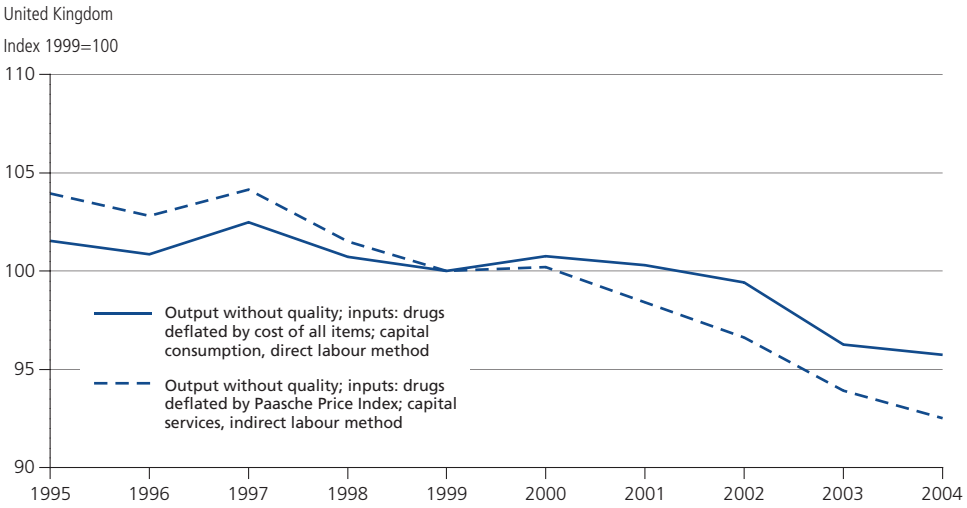


Source: ONS

8.4 Improvements have now been made to the ONS estimate of NHS output growth (not taking into account quality change) as described in section 4, and to the ONS estimates of NHS inputs as described in sections 6 and 7. The latest ONS estimate is that for the years 1995 to 2004, NHS productivity (not taking into account quality change for NHS output) has been falling by an average of between 0.6 and 1.3 per cent per year. This is based on NHS output growing by 3.2 per cent per year and NHS inputs growing by between 3.9 and 4.6 per cent per year. Figure 10 shows the latest range of NHS productivity estimates (excluding quality change for NHS output).

Figure 10:

New estimate of NHS productivity, excluding quality change for NHS output, 1995 to 2004



Source: ONS

8.5 These estimates are subject to a number of limitations. It remains unsatisfactory to take no account of quality change. Further, the output figures are based on a subset of activities in the NHS for England and Northern Ireland. The input figures are also not yet fully developed, with the deflators based on information relating only to changes in price in England.

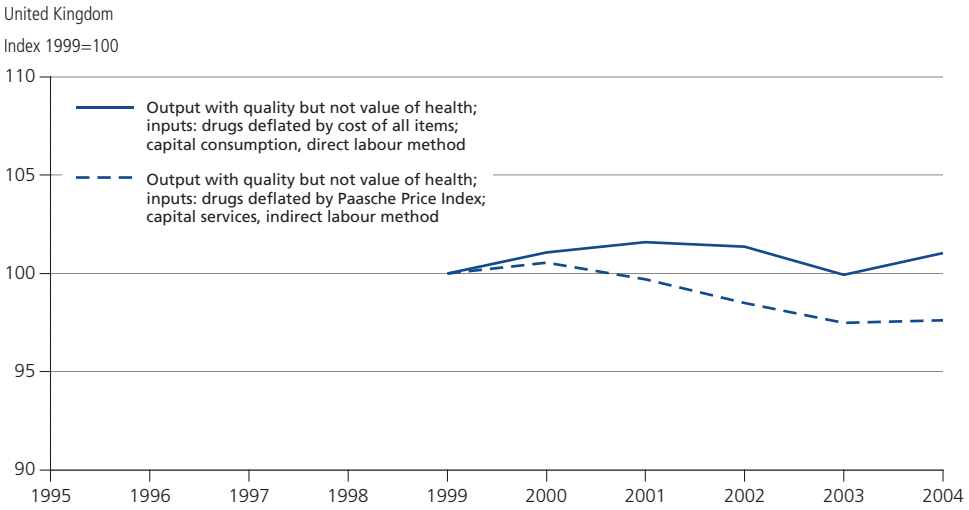
8.6 Part of the difference between the annual average changes in figures on this basis and those presented in this article compared with the first *Public Service Productivity: Health* article is due to the addition of an extra year in the analysis. The annual average fall for the same period for which estimates were published in October 2004, that is 1995 to 2003, using the latest sources and methods, is estimated to have been between 0.7 and 1.3 per cent. The remainder of the difference is due to rounding differences as well as to improvements in the sources and methods described in sections 4, 6 and 7.

Set 2: NHS productivity including quality change in NHS output but no allowance for increasing value of health

8.7 The combined effect from adding the quality adjustments proposed in the York / NIESR and DH publications, but with no allowance for increasing value of health, add an annual average of around 1.1 percentage points to output growth during the period 1999 to 2004. NHS productivity under these conditions is estimated to have either increased by an average of 0.2 per cent per year, or fallen by an average of 0.5 per cent per year during this period. This is based on output growing by an average of 5.0 per cent per year and inputs growing by an average of between 4.8 and 5.5 per cent per year. Figure 11 presents estimates of NHS productivity on this basis and using the estimates of greatest and least change in NHS inputs as presented in section 7.

Figure 11:

NHS productivity based on output including quality change in NHS output but no allowance for increasing value of health, 1999 to 2004



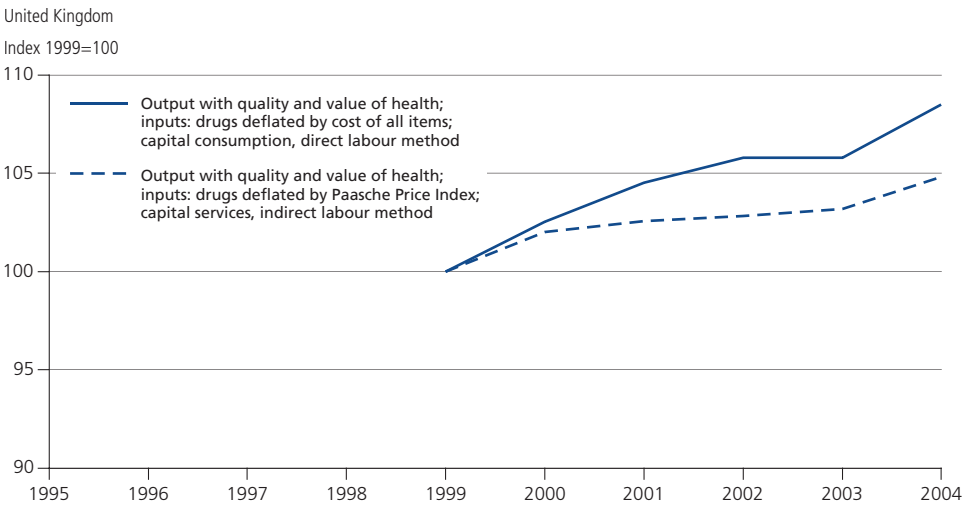
Source: ONS

Set 3: NHS productivity including quality change in NHS output and also allowance for increasing value of health

8.8 The combined effect from adding the quality adjustments proposed in the York / NIESR and DH publications, including an adjustment for the increasing value of health as recommended by the *Atkinson Review* of 1.5 per cent per year, adds an annual average of 2.6 percentage points to total NHS output growth during the period 1999 to 2004. NHS productivity under these conditions is estimated to have increased by an average of between 0.9 and 1.6 per cent per year during this period. This is based on output growing by an average of around 6.5 per cent per year and inputs growing by an average of between 4.8 and 5.5 per cent per year. Figure 12 presents estimates of NHS productivity on this basis and using the estimates of greatest and least change in NHS inputs as presented in section 7.

Figure 12:

NHS productivity including quality change in NHS output and allowance for increasing value of health, 1999 to 2004



Source: ONS

9 Triangulation

9.1 The productivity figures that appear in this article are based on the best data available from the National Accounts, DH, ONS and the wider academic community. As more data become available, estimates of NHS productivity will be updated accordingly. However, estimating NHS productivity (and productivity for public services more generally) is a complex process and under constant development. It is therefore sensible to examine alternative information that helps understand productivity estimates in a wider context, as recommended by the *Atkinson Review*.

9.2 Principle H in the Report recommended:

'Independent corroborative evidence should be sought on government productivity, as part of a process of 'triangulation', recognising the limitations in reducing productivity to a single number'.

9.3 The *Atkinson Review* distinguishes between three levels at which the process of triangulation could be conducted (see paragraphs 4.66 to 4.71 for more detail):

- at the first level, ONS should be 'looking at the data' to see if productivity statistics, using estimates of NHS output and input, are coherent with other evidence;
- at the second level, the ONS should make an explicit attempt to relate the output and input indicators to departmental performance measures, for example, a systematic examination of the relation between direct output indicators and the Public Service Agreement targets; and
- the 'third and most ambitious level', would be to initiate a government productivity measurement programme, drawing experience from the United States. The Report suggests that it would not be necessary to collect anything like the high number of output indicators used in the US programme for there to be a major improvement in the information available on public sector performance.

9.4 In this section, triangulation evidence is presented at the 'first level', on the following:

- average length of stay in hospital;
- elective day case rates;
- emergency readmissions; and
- public attitudes to health care.

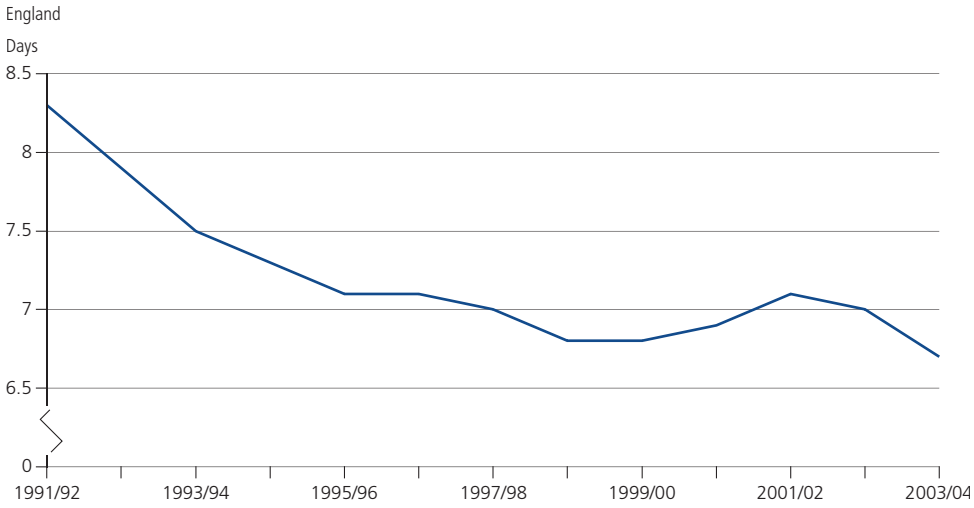
Average length of stay

9.5 Figure 13 shows that the average length of stay in hospital in England reduced from just over 8 days at the beginning of the 1990s to around 7 days by the mid 1990s. Since then, the average length of stay has hovered around the 7 day mark, with the latest information showing a small reduction to just below 7 days.

9.6 As length of stay in hospital is a major driver of costs in the NHS, the decline since 1991/92 (apart from the small rise in 2001/02) would be consistent with rising productivity, particularly if the freeing up of hospital beds allows more patients to be treated. The undulation over the period since 1999/2000, however, would be more consistent with relatively stable productivity experience over this more recent period.

Figure 13:

Average length of stay, 1991/92 to 2003/04



Source: HES, Health and Social Care Information Centre

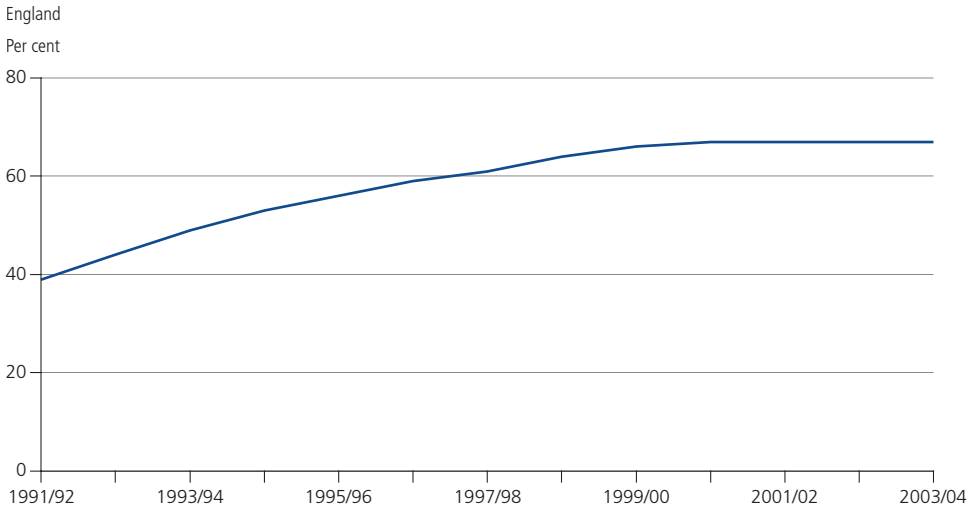
Elective day case rates

9.7 Day case surgery is the admission of patients into hospital for a selective planned surgical procedure, with discharge from hospital occurring on the same day. The Healthcare Commission has identified 25 types of operations for which hospitals should be able to treat 75 per cent of patients as day cases (HSJ 2005).

9.8 The elective day case rate in England, as presented in figure 14, has risen since the 1990s from 39 per cent to 67 per cent in 2003/04. This increase has been most prominent in the over 75 age group where day cases have increased by 41 per cent since the 1990s. As with the average length of stay, the day case rate has been levelling off, albeit slightly later, to around 66 or 67 per cent from the end of the 1990s. This levelling off may be due to some less severe cases being dealt with in outpatient settings or by General Practitioners in primary care.

Figure 14:

Elective day case rate, 1991/92 to 2003/04



Source: HES, Health and Social Care Information Centre

9.9 The number of day cases performed varies geographically, between 40 – 83 per cent, with only 12 per cent of NHS Trusts reaching the Health Commission's quota of treating 75 per cent of their collection of operations as day cases. Variations between procedures within a single NHS Trust also exist. This wide range in performance leaves considerable scope for improvement (BMJ 2005b), which leaves open the possibility that over time day case rates could continue to rise.

9.10 Increasing the day case rate helps to reduce costs to the NHS, as well as having a part in providing timely treatment; reducing the risk of cross infection; and reducing the number of procedures cancelled (BMJ 2005b). Treatment by day case surgery is also seen to have a positive quality of life aspect for the patient. This is because the procedure is likely to have a shorter waiting time; patients can return home the same day, which means an earlier return to normal activities; and patients can potentially receive care better suited to their needs.

9.11 The increase in elective day case rates since 1991/92 would therefore be consistent with the view that NHS productivity is rising, though again at relatively modest rates in the recent past.

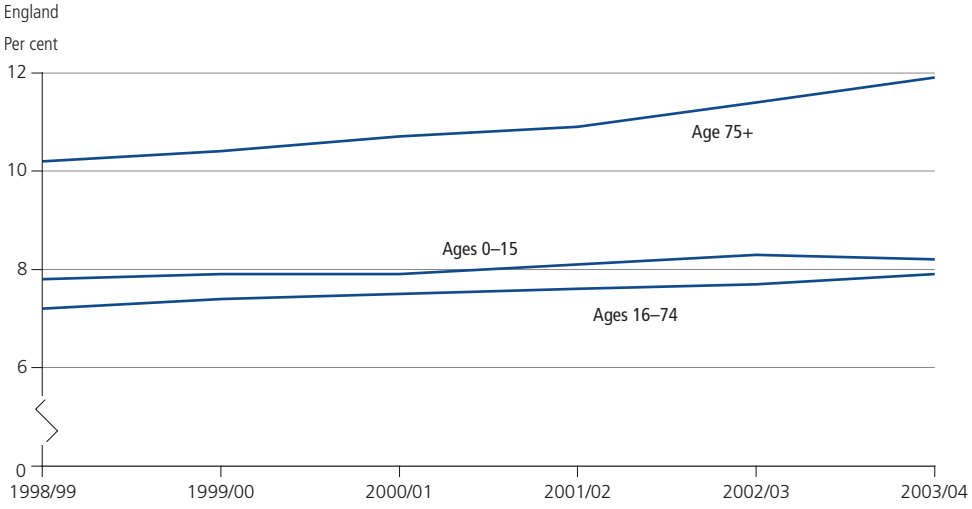
Emergency readmissions

9.12 It is important to look at changes in indicators like average length of stay and day case rates in conjunction with other indicators, such as readmission rates. Emergency readmissions are unlikely to be part of the patient's originally planned treatment and some may be potentially avoidable (NCHOD 2005).

9.13 Readmission rates are often used in health care systems as a measure of the quality of care received by patients (HSJ 2004), but as it is a developing indicator, currently spanning only 6 years, the results should be interpreted with caution. Various factors could contribute to the quality of care received by the patient, for example, whether or not the treatment takes place in hospital, whether it includes an overnight stay, the length of the overnight stay, the type and level of aftercare, and so on.

Figure 15:

Emergency readmissions within 28 days of discharge, by age group, 1998/99 to 2003/04



Source: HES NCHOD

9.14 Figure 15 shows that the rate of people readmitted into hospital within 28 days after discharge increased across all age bands between 1998/99 and 2003/04. The age band for people 75 and over has the highest rate for emergency readmissions, and this age group also has the highest rate of increase for this time period. DH is looking into how best to analyse readmission rates, including looking at improving the quality of the indicator itself as well as what could have contributed to this increase in readmission rates.

9.15 In general, it is difficult to make a firm judgement on the implications for productivity in the absence of further data. Ideally, in the future, it would be useful to link the data on readmission rates with other indicators, such as those for average length of stay in hospital and elective day case rates.

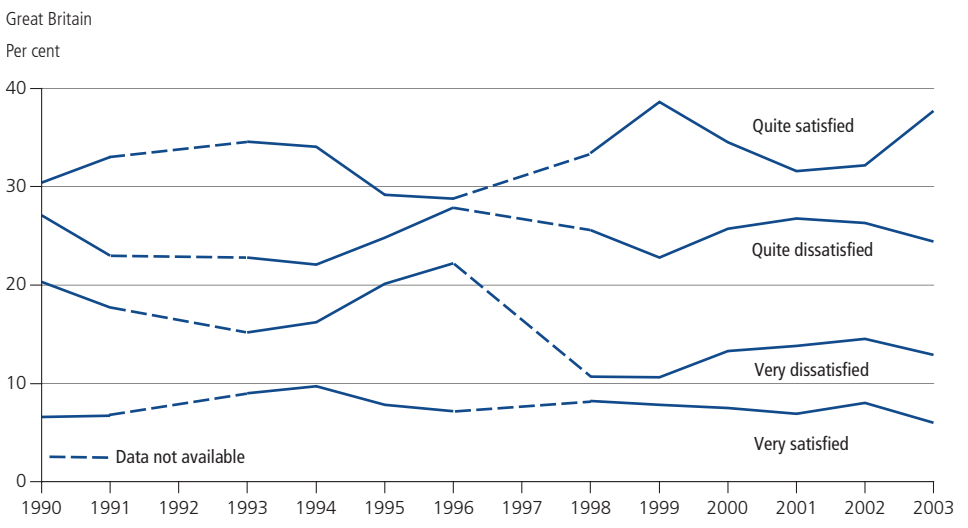
General public attitudes to health care

9.16 The British Social Attitudes Survey (NatCen 2005a, NatCen 2005b) produces some key findings on public attitudes to health care, with respondents being questioned on how satisfied or dissatisfied they are with the NHS. When interpreting BSAS data it should be noted that unlike patient experience surveys, public attitude surveys are not necessarily linked directly to patient experience and could be affected by public perceptions of the standard of quality expected from the NHS, and the performance of the Government in general. For this reason the comparison between the two different measures should not be over stated.

9.17 Figure 16 illustrates that public satisfaction with the NHS has fluctuated over time, with 1996 showing the highest level of dissatisfaction with the NHS over the period considered. Even so, 'quite satisfied with the NHS' has remained the highest public response. In 2003, when respondents were asked for their overall satisfaction with the NHS, more people were satisfied with the NHS than dissatisfied (44 and 37 per cent respectively). In the same year, the respondents who were satisfied with the NHS were more likely to be those in the older age groups who have had direct personal experience of using NHS services (NatCen 2005a). These figures cannot, of course, be directly compared to those from the National Patient Experience Survey Programme, but they do provide further context.

Figure 16:

Trends in public attitudes to health care, 1990 to 2003



Source: NatCen; British Social Attitudes survey

9.18 This section on triangulation has presented a limited amount of information as context to the productivity estimates. As more evidence becomes available, future productivity articles will be updated in order to paint a wider picture of NHS productivity.

10 Next steps

10.1 This article significantly improves on the methodology and resulting estimates of NHS productivity presented in the first health productivity article published in October 2004, in particular:

- more information is provided on health outcomes;
- NHS output growth has been adjusted to incorporate quality for the first time;
- the methodology to estimate the volume of NHS inputs has been improved;
- a range of NHS productivity estimates are presented, clearly identifying the impact of different estimates of NHS output and inputs; and
- more corroborative information is provided to support productivity estimates.

10.2 To underpin and drive forward further improvement with as wide a professional consensus as possible, ONS will be working with DH in setting up consultation seminars that will bring together experts in the health field to discuss key issues. For example, wider consultation will be required on: the proposed quality adjustment indicators; using value weights instead of cost weights for statins; and in particular, adjusting the value of health in line with real earnings growth in the economy. A similar process of consultation will be taking place on methodology for measuring productivity in the education sector and for other public services.

10.3 While there has been much progress made in this productivity article, a number of developments are still required. ONS will be working with DH, the Devolved Administrations and other experts to further improve NHS productivity estimates. The development agenda will include the following:

- expanding the coverage of NHS activities used to measure NHS output, factoring in more data from the Devolved Administrations where it is possible to do so;
- improvements in measuring NHS output from primary care using data from computerised General Practitioner research databases;
- treatment of prescription drugs, and what value is added by the NHS;
- consideration of the best source for NHS activity estimate (for example, Reference Costs versus HES) and the best source for unit costs to weight these activity estimates;
- further developments in the quality adjustment of NHS output, taking into account the latest research available;
- further developments in the use of value weights rather than cost weights for NHS activities;
- further advances in measuring NHS inputs, in particular, developing better direct measures of labour input; and
- the use of wider evidence to support estimates of NHS productivity, building in the latest research available.

11 References

Atkinson 2005 *Atkinson Review of measurement of government output and productivity for the National Accounts: Interim Report,* July 2004, available via www.statistics.gov.uk/about/methodology_by_theme/atkinson/

BMJ 1994 Chouillet A, Bell C M J and Hiscox J *Management of breast cancer in South East England* Journal 308 available at www.bmj.bmjjournals.com

BMJ 2000 Blanks R G, Moss S M, McGahan C, Quinn M J and Babb P J *Effect of NHS breast screening programme on mortality from breast cancer in England and Wales, 1990 -8: comparison of observed with predicted mortality* Journal 321 available at www.bmj.bmjjournals.com

BMJ 2005a Unal B, Critchley J A and Capewell S *Modelling the decline in coronary heart disease deaths in England and Wales, 1981 – 2000: comparing contributions from primary prevention and secondary prevention* Journal 331 available at www.bmj.bmjjournals.com

BMJ 2005b Dr Foster *Trends in day surgery rates* British Medical Journal 10 November 2005

Cancer Research UK 2002 *Fact sheet: Specific cancer: lung cancer*

DfES 2005, *Measuring government education output in the National Accounts,* DfES, October 2005, available at www.dfes.gov.uk/research/data/uploadfiles/RW45.pdf

DH 2000 *The NHS Plan,* Department of Health, July 2000, available at www.dh.gov.uk/assetRoot/04/05/57/83/04055783.pdf

DH 2005a *Healthcare output and productivity: Accounting for quality change* Department of Health, December 2005, available at www.dh.gov.uk/assetRoot/04/12/42/67/04124267.pdf

DH 2005b Technical paper 2: Use of statins and calculation of value weight, available at www.dh.gov.uk/assetRoot/04/12/42/69/04124269.pdf

DH 2005c Technical paper 3: Using the GP contract quality and outcomes framework for quality adjustment, available at www.dh.gov.uk/assetRoot/04/12/42/70/04124270.pdf

DH 2005d Technical paper 7: Quality adjustment based on patient experience surveys, available at www.dh.gov.uk/assetRoot/04/12/42/74/04124274.pdf

Eurostat 2001 *Handbook on price and volume measures in national accounts* Office for Official Publications of the European Communities, May 2001, available at www.epp.eurostat.cec.eu.int/cache/ITY_OFFPUB/KS-41-01-543/EN/KS-41-01-543-EN.PDF

Gravelle 2001 *Discounting for health effects in cost-benefit and cost-effectiveness analysis,* Health Economics, volume 10, pp 19-28

HSJ 2004 Dr Foster *Readmission rates: Understanding readmission patterns helps pinpoint why patients return to hospital'* Health Service Journal 19 September 2004

HSJ 2005 *Day-case rates,* Health Service Journal 29 September 2005

MacFarlane A and Mugford M 2000 *Birth Counts: statistics of pregnancy and childbirth. Second edition* TSO: London

NatCen 2005a *Trends in Attitudes to Healthcare 1983 to 2003* Report based on results from the British Social Attitudes survey

NatCen 2005b *British social attitudes* Two terms of New Labour: the public's reaction

NCHOD 2005 *Compendium Indicators: Emergency readmission rate within 28 days of discharge from hospital* available at www.nchod.nhs.uk

OECD 2001 *Measuring Productivity* Organisation for Economic Co-operation and Development, 2001, available at www.oecd.org/dataoecd/59/29/2352458.pdf

ONS 2003 Clare Griffiths and Anita Brock *Twentieth Century Mortality Trends in England and Wales* HSQ 18 available at www.statistics.gov.uk/cci/article.asp?ID=500

ONS 2004a *Public Service Productivity: Health,* Office for National Statistics, October 2004, available at www.statistics.gov.uk/CCI/article.asp?ID=1030&Pos=2&ColRank=1&Rank=224

ONS 2004b *Cigarette smoking* available at www.statistics.gov.uk/cci/nugget.asp?id=866

ONS 2004c *Public Service Productivity: Education,* Office for National Statistics, October 2005, available at www.statistics.gov.uk/articles/nojournal/PSProductivityEducation.pdf

ONS 2005a *United Kingdom National Accounts The Blue Book 2005,* Office for National Statistics, various years to 2004, available at www.statistics.gov.uk/downloads/theme_economy/BB2005.pdf

ONS 2005b *Estimates of the volume of capital services* Office for National Statistics, November 2005, available at www.statistics.gov.uk/articles/economic_trends/ET624_Wallis.pdf

ONS 2006 *Sources and methods for Public Service Productivity: Health article,* Office for National Statistics, February 2005, available at www.statistics.gov.uk/about/data/methodology/specific/publicsector/output/health.asp

OPCS 1995 *The health of our children – Decennial supplement series DS no 11*

York 2005 *Developing new approaches to measuring NHS output and productivity,* York University and National Institute of Economic and Social Research, available at www.york.ac.uk/inst/che/publications/rp.htm

12 Glossary

Blue Book (BB): The short name for the annual publication United Kingdom National Accounts The Blue Book.

Capital: Capital assets are those which contribute to the productive process over periods longer than a year.

CHD: Coronary heart disease.

CHE: Centre for Health Economics, at the University of York.

Devolved Administrations (DA): Scottish Executive for Scotland, the Welsh Assembly Government for Wales and the Northern Ireland Civil Service.

Deflation: The technique used to change figures from nominal terms (current prices) into real terms (constant prices or volume terms).

DH: Department of Health.

Healthy life expectancy: Partitions total life expectancy into years free of health-related problems or good health.

Hospital episode statistics (HES): The national statistical data warehouse for England of the care provided by NHS hospitals and for NHS hospital patients treated elsewhere.

Inputs: Resources used by the NHS.

Intermediate consumption: The consumption of goods and services in the production process.

Labour: The people employed or otherwise contracted to work (in the NHS).

Life expectancy: Provides an estimation of longevity.

Myocardial infarction: Heart attack

National Accounts (NA): The economic accounts of the nation. They detail the production processes, the sector accounts showing, for example, the income, expenditure, saving and financial transactions and balance sheets of each sector, and estimates of gross domestic product.

NHS: National Health Service.

NIESR: National Institute for Economic and Social Research.

Productivity: Defined as the ratio of a volume measure of output to a volume measure of input.

Primary prevention: An apparently healthy person reduces the risk of being diagnosed with a health condition by reducing the risk factors associated with the condition e.g. reducing the risk factors associated with coronary heart disease prior to being diagnosed with it.

Public Service Agreement (PSA): An agreement between a government department and the Treasury, as part of the Spending Review, including objectives and targets.

ONS: Office for National Statistics.

Output: What is produced (by the NHS) in combining various inputs to achieve overall outcomes.

QA Panel: Quality Assurance Panels set up to review UKCeMGA's productivity articles.

Reference Costs: Libraries of unit costs for a broad range of NHS treatments and clinical procedures since 1998.

Secondary prevention: A person who has been diagnosed with a health condition reduces the chances of the condition worsening by reducing the risk factors associated with the condition.

Statins: Drugs designed to reduce cholestrol, which can block arteries, and so reduce the risk of heart attacks.

www.statistics.gov.uk

ISBN 1 85774 622 8