

18 October 2004

Major step towards measuring health service productivity

The Office for National Statistics is today publishing the first of an ongoing series of articles relating to the productivity of key public services. The first of these relates to the health service and is attached, and is also available on the National Statistics website.

Launching the series, National Statistician Len Cook said:

"The performance of public services is of major public policy interest. These articles bring together the aspects of public sector productivity we know we can measure. The analyses in the reports will develop as our understanding of the data sources becomes more comprehensive and our analytical techniques evolve.

"This article provides a common basis for extending the authoritative measurement and assessment of the productivity of the health service from the National Accounts. We have been able to use the much extended range of information that is now available about health care costs and activity. The selection of measures themselves has been by ONS and they are based on our understanding of the best information available to use.

"Measures of productivity need to be interpreted with care. There are no simple or unique answers. The information presented in this article helps assess the performance of the health service. But it cannot be, and is not intended to be, a comprehensive assessment. There remain a great variety of relevant considerations that are not measured now.

"For many uses, productivity measures will not provide a complete picture. We expect to continue to improve the reliability of these estimates over time. But the limitations of measurement in this area are such that we may never have what might be regarded as definitive statistics. This is why we have sought to explain their limitations, as far as we know them. They do not measure shifts in the distribution of health care, or changes in the quality of such care. Nor do they recognise shifts in the characteristics of the population served by the health service.

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"Given what we have done before, these estimates and analysis published today are a major step forward and we look forward to a constructive discussion about them."

Also published today is a related article entitled 'Measuring government health services output in the UK national accounts: the new methodology and further analysis'.

BACKGROUND NOTES

1. The article on health service productivity is available on the National Statistics website at: <http://www.statistics.gov.uk/cci/article.asp?id=987>
2. The methodology article is available on the National Statistics website at: <http://www.statistics.gov.uk/cci/article.asp?id=988>
3. In view of the public and political interest in statistics on government output and productivity the National Statistician has written to Professor David Rhind, chairman of the Statistics Commission, explaining the background to and handling of ONS's work in this area. The letter is available at: http://www.statistics.gov.uk/about/other_letters/david_rhind_15oct04.asp
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Public Service Productivity

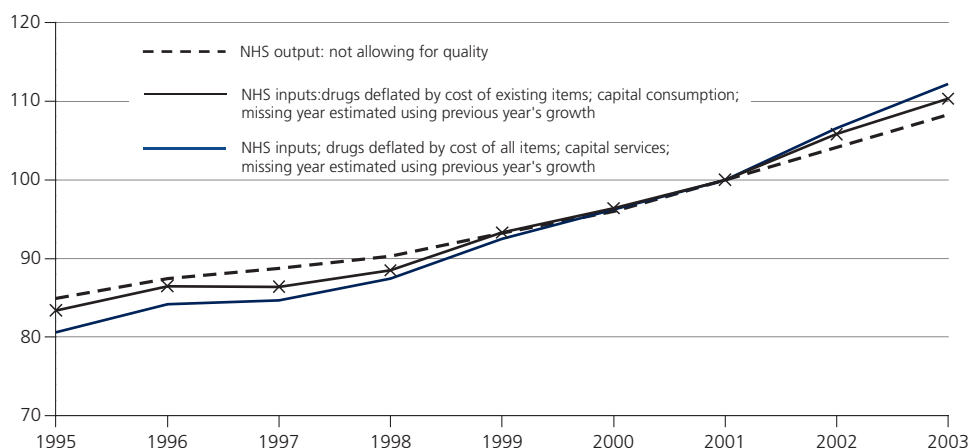
Health

1 Executive summary

- 1.1** This article estimates the change in productivity of public expenditure on health using National Accounts data from 1995 to 2003, in the context of wider information about health spending, outputs, outcomes and measurement issues. It is the first in a new series of articles on Public Service Productivity.
- 1.2** It is important to bear in mind that 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, including sanitation conditions, housing, diet and so on. They are also affected by changing demographics, including effects from an ageing population and population movements.
- 1.3** NHS productivity is the ratio of NHS outputs to NHS inputs, after separating out the impact of pay and price increases. There is a single central estimate of change in the quantity of NHS output, but this is not the case for NHS inputs. Chart 1 presents NHS output, along with the NHS inputs estimates showing the greatest and least rises. Over the period from 1995 to 2003, NHS output (not allowing for quality change) has grown by 28 per cent and NHS inputs have grown by between 32 and 39 per cent.

Chart 1

NHS output not allowing for quality change and series showing the greatest and least rises in NHS inputs from 1995 to 2003 (2001=100), UK

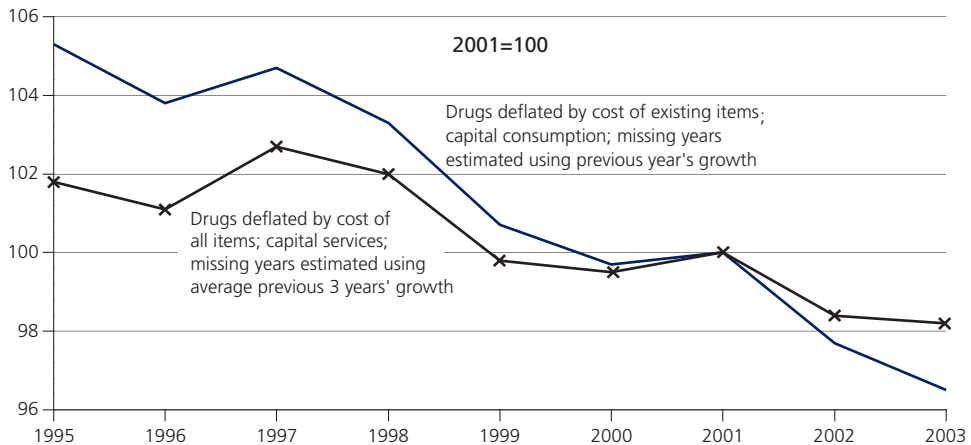


Source: ONS

1.4 There is no single central estimate of productivity change, reflecting different ways of estimating the quantity of NHS inputs. A range of estimates is presented, showing the average annual change in NHS productivity to be between -1 and 0 per cent over the period 1995-2003. Chart 2 presents the series with the greatest and least falls. The uncertainty reflects the limitations of measurement.

Chart 2

NHS productivity not allowing for quality change: series showing the greatest and least falls in productivity from 1995–2003, UK



1.5 There is further uncertainty, which is not captured in the figures. A number of shortcomings associated with the sources and methods used in compiling output figures have been identified as part of the development work to conform with the international guidelines and by the Atkinson Review of Measurement of Government Output and Productivity for the National Accounts. The most important of these are:

- (i) the output estimates do not capture quality change;
- (ii) data on GP contacts are derived from a household survey which does not provide accurate estimates of growth from one year to the next;
- (iii) notwithstanding the wider coverage introduced by the new methodology in June 2004, the output estimates are still based on a subset of activities carried out by the NHS in England, and growth in these may not be representative of all activities;
- (iv) the output estimates are calculated using information from the NHS in England as a proxy for the UK;
- (v) 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.

1.6 The NHS output figures used in the article are based on the National Accounts as published in June 2004, which incorporated an improved measurement method. NHS input figures are taken from NHS and Government accounts. Both of these series incorporate the latest available information and best practice in methodology.

There are therefore some differences between the figures in this article and the figures from the National Accounts as published in June 2004. A more complete description of sources and methods is provided in sections 5, 6 and 7.

- 1.7** The article shows the effect of taking into account information subsequent to the last published National Accounts figures for health spending as well improvements to the methodology for deflation since earlier publications by ONS. In both of these cases, it is possible to say with confidence that they produce higher quality productivity estimates.
- 1.8** But there is still uncertainty about three aspects of the estimates of NHS outputs, namely:
 - (i) the basis for estimating the latest periods for which information is not yet available;
 - (ii) the deflator for expenditure on prescription drugs; and
 - (iii) the use of capital consumption or capital services as the measure of input from capital.
- 1.9** The article sets out alternatives for each of these aspects of input measurements, and presents a subset of the eight possible combinations. The series with the greatest and least changes in productivity are presented in chart 2.
- 1.10** Other variant assumptions explore the impact of treating expenditure on staff training and research as 'quasi capital'. These are not presented in chart 1 as ONS does not yet consider them to be improvements ready to be incorporated.
- 1.11** From 1995 to 2003, health output, in the new measure introduced in June 2004, grew by 29 per cent. Using later and better information, the increase in output was around 28 per cent. Health inputs, in the published National Accounts, grew by 86 per cent at current prices. Using later and better information, the increase in inputs at current prices was 80 per cent.
- 1.12** The cumulative pay and price deflator from 1995 to 2003 would have been 31 per cent on the simpler deflation method used by ONS for figures published in *Economic Trends*. Improved methods give a cumulative pay and price deflator of 28 per cent to 37 per cent, depending on the assumptions used. This leads to estimates of change in the quantity of inputs of 32 to 39 per cent. The estimated cumulative change in productivity over the nine years ranges between -8 and -3 per cent, or on average between -1 and 0 per cent per year.
- 1.13** The Interim Report of the Atkinson Review of Measurement of Government Output and Productivity for the National Accounts, published in July 2004, advised that independent corroborative evidence should be sought on government productivity, as part of a process of 'triangulation'. The article presents a limited set of such information, providing some context for interpreting the estimates of productivity change.
- 1.14** The intention is to make further improvements in methods for measuring health outputs, inputs, deflators and productivity and to analyse a wider range of 'triangulation' information about healthcare in future articles.

2 Purpose and structure of this article

- 2.1** This is the first in a new series of articles that explore public service productivity within the context of National Accounts, painting a more detailed picture of public service output and productivity than the National Accounts themselves. More precisely, the focus is on productivity associated with the money spent by the public sector, including central and local government, in providing services to the public. 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), and government purchases from the private sector are included (for example, the NHS contracts with private companies to provide, say, hip replacement and cataract operations). For brevity, this article refers to this as National Health Service (NHS) productivity.
- 2.2** ONS has drawn this material together from a wide range of sources, complemented by expert advice¹, 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.
- 2.3** 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 has published *Measuring Productivity* (OECD, 2001) and Eurostat has published the *Handbook on price and volume measures in national accounts* (Eurostat, 2001). This article notes the degree of conformity with this international guidance.
- 2.4** Health is the subject of the first in this series, on the grounds that health constitutes the largest single item of public expenditure (social security has a larger share of overall public service expenditure, but the majority of this is payment of benefits rather than government providing goods and services).
- 2.5** The ONS has published aggregate estimates of government inputs in the *National Accounts Income and Expenditure Blue Book* (ONS 2004a) and inputs, outputs and implied productivity in past articles in *Economic Trends* (ONS 2003a). These estimates form the basis for this article, and are complemented by some other sources of information. As this series is developed, the ONS will draw further on information available more generally, including for example material in the various reports published by government and associated institutions such as the Healthcare Commission and OFSTED, and in studies conducted by academic institutions.
- 2.6** At this early stage of examining NHS productivity, there has been a focus on data that are already available to ONS. 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. The data sources and methods for this article are discussed in more detail in a separate paper(ONS 2004b).

¹ Writing this article has benefited from the advice of a Quality Assurance Board, chaired by John Pullinger, Executive Director of Economic and Social Reporting at ONS. Members of the Board were John Fox, Director of Statistics at the Department of Health, Peter Goldblatt, Director of Health & Care Division at ONS, Joe Grice, Executive Director of the Atkinson Review Team, Graham Jenkinson, Director of National Income and Expenditure Division at ONS, Peter Smith, University of York and Prabhat Vaze, Chief Economist at ONS. ONS gratefully acknowledges this help and assistance, and takes final responsibility for the contents of the article.

- 2.7** Annual information is presented in this article, as in the 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; publication of quarterly figures would depend on fitness for purpose.
- 2.8** A final introductory word in any article on productivity must stress the inherent difficulties associated with the measurement of productivity, particularly in the public sector: the international community recognises the significant analytical input needed to make progress in this area. This opening article on health, therefore, sets the scene in terms of the availability of statistical information and presents this information in a structured way. Future NHS productivity articles will begin to bring sources together in a way that continually improves understanding of NHS productivity.
- 2.9** The rest of this article is as follows:
- section 3 sets out the health system context for productivity measurement, touching on related aspects of health system analysis, namely efficiency, equity, economy and effectiveness;
 - section 4 briefly considers health outcomes, as these are the measures that in part the health system is targeting;
 - sections 5 and 6 discuss the compilation of each of the two components of the productivity calculation in turn, namely output and input;
 - section 7 discusses the compilation of productivity;
 - section 8 describes the Department of Health’s ‘experimental’ cost efficiency growth measure;
 - section 9 briefly describes the measurement of quality in the context of NHS productivity;
 - section 10 presents a limited range of information as part of a process of “triangulation”; and
 - section 11 reiterates the next steps to be taken in developing NHS productivity analysis.

3 Background to measuring productivity in health and related issues

- 3.1** A central stated aim of most health systems is a variant of ‘improving and maintaining the health of the population served’. Indeed, the World Health Organisation (WHO, 2000) states that “Better health is of course the *raison d’être* of a health system.” In pursuing this aim, health systems carry out a very large variety of activities, including prevention, diagnosis, prescribing, complex surgery, ongoing care given to those whose health is maintained or at least whose chronic disease is managed and so on. These activities are delivered in a variety of settings, including general practice and hospitals. Pharmacists provide prescriptions and over the counter medicines. Midwives and other health professionals can provide care in people’s own homes. These are just a few examples.
- 3.2** There is a great deal of important activity that otherwise supports health systems, including policy development, management, standard setting, HR, finance, IT, capital investment, research and development, education and training and so on. These activities do not deliver direct care for patients, but nevertheless are essential for the effective functioning of the health system.
- 3.3** In order to be described as technically efficient, a health system would either maximise what it produces (including the activities described in the examples above) given the resources it uses (staff, equipment and purchases of goods and services), or minimise the use of those resources given what it produces.
- 3.4** Productivity is defined as the ratio of outputs over inputs, which are measured as consistently as possible. More precisely, it is the ratio of the quantity of outputs over the quantity of inputs. The measurement unit in the National Accounts, and therefore productivity calculations, is money. It is therefore important to distinguish between price and quantity changes. Productivity measurement is concerned with quantity and not price change.
- 3.5** The Eurostat Handbook on price and volume measurement acknowledges the practical difficulty in defining a unit of output and distinguishing output from outcome. The Handbook does however illustrate the distinction, stating “For hospital services, the output is the amount of care received by a patient [and] life expectancy [is a measure of health outcomes.]”
- 3.6** There are other related topics of interest, some of which are mentioned here in order to help distinguish these from productivity, but which are not the subject of this article. These are allocative efficiency, equity, economy and effectiveness.
- A health system that was *allocatively efficient* would obtain the most welfare from available resources; no different combination of activities (for example more heart surgery and less palliative care) could lead to better health status.
 - One widely accepted notion of *equity* is the desire to provide the same access to the activities made available by the health system to all sub-groups of the population.
 - A health system is being *economical* if it minimises its current price expenditure whilst maximising the extent to which it improves and maintains the health of the population it serves.

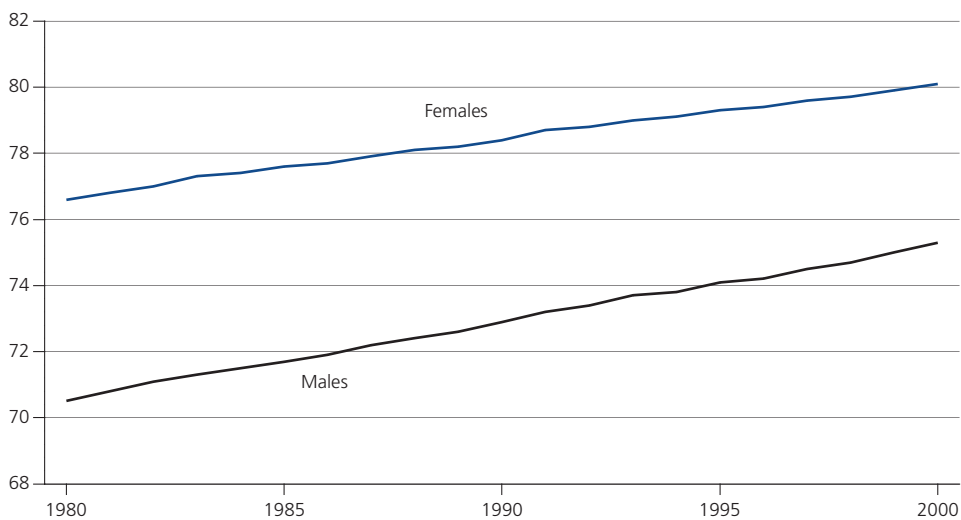
- The extent to which the health of the population is improved and / or maintained by the health system is *effectiveness* and can be measured by the outcomes of the activities provided by the health system in relation to the outputs it delivers.
- 3.7** Aspects of these aims are not necessarily mutually exclusive. For example, the introduction of some new activity may lead to an improvement in both technical efficiency (and therefore productivity) and effectiveness: laparoscopy (key hole surgery) requires fewer inputs and produces better outcomes than the more traumatic surgery it replaces.
- 3.8** But in other cases, it may not be possible to achieve all of these aims simultaneously. For example, ensuring ready access to accident and emergency services for people in remote parts of the country for the sake of equity might suggest the setting up of several small facilities spread geographically, but maximising effectiveness, efficiency and economy might suggest a single large facility.
- 3.9** Efficiency, equity, economy and effectiveness can be analysed at various levels, from an individual hospital, through different trusts and geographic areas, to the whole system. This article is concerned with productivity at the level of the whole NHS although as noted earlier the material assembled in this article is limited in coverage, both geographically and in terms of activities.

4 Health outcomes

- 4.1** As an important aim of health systems is to improve and maintain the health of the population served, this section sets out some information on health outcomes as it is these that the health system is targeting. Health outcomes are influenced by many factors: increasing life expectancy and the lowering of the mortality rate, for example, are not solely, or even mainly, due to the activities of the National Health Service. Smoking, housing, sanitation conditions, the environment, diet, demographics, socio-economic status, education levels and so on also play their part. Nevertheless, in order to understand more fully the productivity of the NHS, it is useful to consider the outcomes that NHS activities are designed to support. The following is a brief review of certain health outcomes and is not intended to be comprehensive.
- 4.2** ONS, health administrations and other authorities publish a range of health statistics, which can provide contextual information on health productivity. Life expectancy is a widely used indicator of health status, and changes in life expectancy for each sex over time are shown in chart 3. Over the period for which figures are presented, there has been an increase in life expectancy at birth for both males and females.

Chart 3

Expectation of life at birth by sex in years, UK

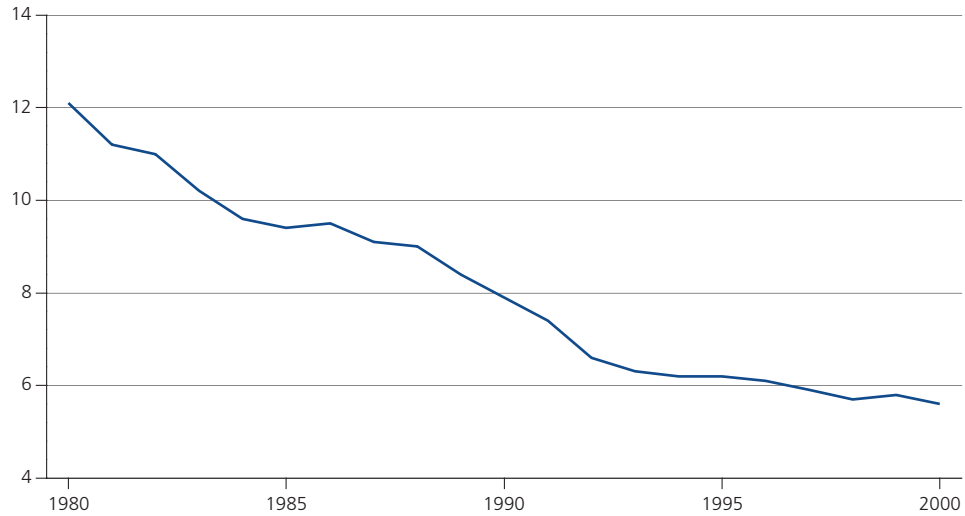


Source: Government Actuary's Department

- 4.3** Chart 4 shows infant mortality up to 2001. Since the second world war, an increasing proportion of newly borns have survived the first year of life. The reduction in infant mortality contributes to longer life expectancy.
- 4.4** Chart 5 presents standardised mortality rates for the major causes of death by sex.
- 4.5** Whilst circulatory diseases (including both heart disease and stroke) have remained the most common cause of death in the UK they have also shown the greatest decline. Cancers are the second most common cause of death, and there have been reductions in mortality from cancer over the last two decades or so.
- 4.6** It is not clear exactly how far the NHS has contributed to each of these improved outcomes, and how far they are due to higher incomes, better housing and other changes. It is clear, though, that some important outcomes have been improving.

Chart 4

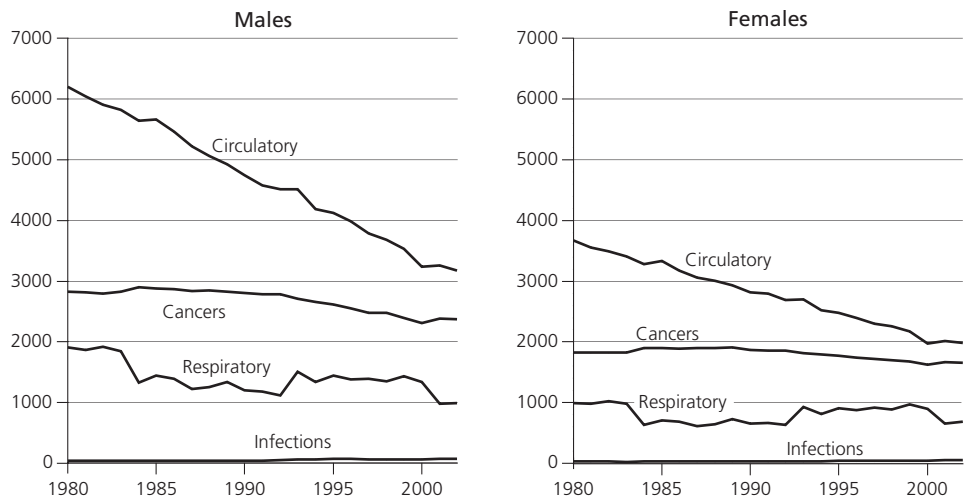
Infant mortality (deaths within one year of birth per thousand live births), UK



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

Chart 5

Standardised mortality rates (per million population) by sex and major cause, UK



Source: ONS

4.7 The next sections deal with output, input and productivity in turn, using the term ‘NHS’ as defined earlier. Whatever the time period chosen for productivity analysis - the National Accounts for example provide information for calendar years and calendar quarters - there is a need to ensure consistency in coverage in both the output and the input measures. The output measure should only include output that is generated in the time period, and similarly the input measures should only include inputs that contribute to output within the period.

5 NHS Output in the National Accounts

- 5.1** The methodology used in compiling NHS output estimates for the National Accounts since 30 June 2004 distinguishes between different types of detailed activity and it captures the majority of, but not all, NHS activities in England. The method does not include quality change as part of output, although it is clear in principle it should. The method also presumes that output change in Wales, Scotland and Northern Ireland is the same as for England.
- 5.2** The methodology for measuring change in NHS output is based on a number of different sources: the Department of Health's National Schedule of 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 1,700 NHS activity types. The Department of Health estimates that around three quarters by value of all NHS activity in England is covered by the aggregate measure.
- 5.3** Box 1 describes recent improvements to the methodology for NHS output measurement, and a separately published article (ONS 2004c) provides further detail on sources and methods. Table 1 shows quantity growth in NHS output alongside the share of NHS output in Gross Domestic Product.
- 5.4** The NHS output estimates used in this article, and presented in table 1, incorporate further small improvements to sources and methods, reflecting the latest available figures and best practice. Cumulative growth is now considered to be 27.6 per cent compared with 28.6 per cent previously. These will be considered for inclusion in the National Accounts in due course, in accordance with the National Accounts Revisions Policy. These improvements are:
- (i) the method for weighting together prescription drugs and dental output with other output is now based solely on public expenditure on these items; previously there were based on total expenditure including patient expenditure on prescription charges and on dental treatment; and
 - (ii) the method for linking the series produced using the new and previous methodologies (the former provides figures from the second financial quarter in 1995) now incorporates an appropriate treatment for the different seasonal patterns in the two series.

Table 1

Quantity growth (chained volume measure per cent and as an index 2001=100) in NHS output and share in Gross Domestic Product of NHS output (per cent), UK

	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total growth 1995–2003
Quantity growth in NHS output (%)	-	2.9	1.5	1.8	3.2	3.0	4.2	4.1	4.1	27.6
Quantity of NHS output (2001=100)	84.9	87.4	88.7	90.3	93.2	96.2	100.0	104.1	108.3	27.6
Share of NHS output in Gross Domestic Product (%)	5.9	5.9	5.8	5.7	5.8	5.7	5.8	6.0	6.1	-

Source: ONS

- 5.5 An ideal measure of NHS output would be one that captured the incremental value added of all NHS activities to patient welfare. Current methods do not fully achieve this aim; in particular, the measures only cover around three quarters of NHS output, relate to England and not to Wales, Scotland and Northern Ireland, and take no account of changes in quality of services.

Box 1

Recent improvements in NHS output measurement in the National Accounts

In 1998, the methodology moved away from a standard assumption that outputs can be estimated as the sum of input costs (that is, assuming no productivity change), and ONS began estimating the quantity of NHS outputs directly.

Before the most recent publication of National Accounts estimates on 30 June 2004, NHS output was estimated as the weighted sum of a subset of representative NHS activities. These activities were included in the calculation at a high level of aggregation, using the average costs at this high level of aggregation as weights. This methodology was limited in a number of respects:

- Very limited disaggregation and detail. Only 16 separate categories of NHS activities made up the index, the major ones being hospital inpatients and day cases, ambulance journeys, consultations with and prescribing by family doctors and district nurse visits. The value of the index was taken as the weighted average of these 16 activity indicators. The weighting was determined by the costs to the NHS of each category; an inpatient treatment, for instance, contributed 14 times as much to output as did each outpatient treatment. On the other hand, within each of the 16 categories, all activities carried the same weight. There was no distinction made, for example, between a complex and necessarily resource intensive transplant operation and a routine cataract operation costing only a small fraction of that.
- Some NHS activities were not included at all, for example, NHS Direct and the new Walk-in Centres.
- Only annual estimates were available from this approach, and these were available after a substantial delay. The latest available estimates calculated in this way relate to the financial year 2001/02.
- The data were not audited.

The new methodology used from 30 June 2004 overcomes a number of these limitations. Change in health output is now derived using a much larger number of individual activity series reflecting the availability of increased detail in the unit cost and activity data from the NHS. There are clear advantages in being able to calculate the overall contribution to output from the detailed activities undertaken and their associated costs, rather than doing so from broad averages. The new methodology moved from 16 to over 1,700 different treatment types in measuring output change. These range from a GP prescribed drug valued at less than £10 to a bone marrow transplant costing £99,000. Each activity in this wide range will thus now be weighted by its cost in measuring its contribution to total output, in accordance with the international guidance and more general National Accounts practice.

The main new data source is the NHS Reference Costs used in NHS funding which, unlike the previous sources, are fully reconcilable with accounts audited by the Audit Commission.

A separately published article (ONS 2004c) provides further details.

- 5.6** Further work is under way to improve the methodology. The Atkinson Review of Measurement of Government Output and Productivity in the National Accounts, commissioned by the National Statistician, is due to report in January 2005. An Interim Report, setting out the emerging direction for the Review, was published in July 2004. This endorsed the method described above and confirmed the desire for the method to encompass quantity measures related to the whole of the UK and to include data on the change in quality of services. York University and the National Institute of Economic and Social Research (NIESR) are working jointly on a Department of Health commissioned project to improve measurement of NHS productivity, with a report due later in 2005.
- 5.7** Box 2 lists the minority, about a quarter, of NHS activity in England not yet covered by the output methodology. Information on those activities listed *in italics* is expected to be available for inclusion in data relating to 2003/4 onwards. This will increase coverage to an estimated 80-85 per cent by expenditure of NHS activity. Information on those activities that are shown *in light italics* is expected to be available for inclusion in data relating to 2004/5 onwards. Subject to quality assessment of the new information, these activities will be included in the calculation of future NHS output estimates.

Box 2

NHS activity in England not covered by current methodology.

- Air Ambulance;
- Chemotherapy for Non-Solid State Tumours;
- *Clinical Measurement Tests*;
- Community Cystic Fibrosis;
- *Community Medical Services*;
- *Community Nursing Services*;
- *Community Rehabilitation Teams*;
- Community Residential Homes;
- Complementary Treatments;
- *Cystic Fibrosis*;
- *Day Care Facilities*;
- *Day Case Ward Attenders*;
- Decontamination Units;
- Domiciliary Visits (other than maternity and mental health);
- Emergency Dental Services;
- Extra Corporeal Membrane Oxygenation;
- Fetal Medicine;
- HM Prison Related Health Service;
- Home Equipment Loans;
- Hospice Movement;
- Hospital At Home / Early Discharge;
- *Intensive Care Retrieval Units*
- Mental Health Counselling and Therapy (excluding services provided in hospital and day centres);
- National Screening Programmes;
- Needle Exchange Schemes;
- Nursing Homes;
- One Stop Shops / Rapid Diagnostic Packages;
- IVF and Other Fertility Treatments;
- Learning Disability Services;
- *Outpatient Ward Attenders*;
- Parentcraft Classes / Services;
- Personal Dental Services Pilots;
- Plasma Exchange Schemes;
- Psychotherapy;
- *Radiotherapy*;
- *Regular Day Night Admissions*;
- Section 28a Homes;
- Services for the Physically Disabled;
- Specialist Services for the Deaf;
- Spinal Care Packages in the Community;
- *Therapy Services*;
- *Transplants*;
- Welfare Foods;
- Wheel Chair Services.

Source: Department of Health

6 NHS Inputs in the National Accounts

6.1 Different types of input contribute in different ways to health care production, and hence this section distinguishes between labour, intermediate consumption and capital. Table 2 presents estimates of these components at current prices. These estimates incorporate the latest available information, and as such differ slightly from those published in the National Accounts (see paragraph 6.3 and 6.32).

Table 2

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

£m	1995	1996	1997	1998	1999	2000	2001	2002	2003
Labour	22,469	23,336	24,333	25,124	27,133	29,180	30,388	31,769	32,463
Intermediate consumption	15,901	17,652	17,687	19,676	22,567	24,082	27,315	31,752	37,101
Capital consumption	1,138	1,294	1,349	1,385	1,455	1,618	1,395	1,568	1,630
Total	39,508	42,282	43,369	46,185	51,155	54,880	59,098	65,089	71,194

Source: ONS

Labour

6.2 For the National Accounts, public expenditure on labour at current prices for the health function is available from the detailed accounting data maintained by HM Treasury and the health administrations. Changes in the quantity of this labour are calculated by deflating the current price expenditure figures using suitable labour cost deflators, although for this article, these deflators only relate to the NHS in England and not to the whole of the UK.

6.3 The National Accounts include an estimate for one component of NHS current price labour costs which is expected to be revised, subject to the National Accounts Revisions Policy. The pension scheme for NHS Trust staff, as well as some others in the NHS, is unfunded. Prior to 2003/4, actual employer contributions to the scheme did not include adjustments for inflation. The National Accounts include an inflation adjustment in order to reflect true labour costs. A review of this adjustment has concluded that the valuation could be improved upon and figures in this article include revised estimates from the new valuation method. From 2003/4, responsibility for actual payment has rested with health administrations, and figures from 2003/4 onwards are already calculated on the basis of the improved valuation method.

6.4 In previous articles, the labour costs of the whole of the NHS in the UK have been deflated using the Department of Health's Pay Costs Index. This index is a weighted average of increases in unit staff costs for each of the staff groups within Hospital and Community Health Services in the NHS in England. These deflated estimates are not currently part of National Accounts.

6.5 ONS has reviewed the availability of more suitable deflators for pay costs in the whole of the NHS in England. The salary component of General Practitioners' remuneration have been deflated according to an index of average notional salary as reported by the Review Body on Doctors' and Dentists' Remuneration. Expenditure on dentists (fees to dentists, which also cover their practice expenses) have been deflated using the Department of Health's index of dental fees. Expenditure on pharmacists have been deflated using the Department of Health's index of pharmaceutical fees. Expenditure on opticians have been deflated using the Department of Health's index of sight test fees. The remainder of labour costs continue to be deflated by the Pay Costs Index.

Table 3

Deflators for compiling volume measures of NHS labour inputs (2001=100), and associated share of current price expenditure by the NHS on labour (per cent)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Hospital and Community Health Services- pay	73.2	75.8	77.9	81.2	86.4	92.6	100	105.8	111.1
- expenditure share (%)	80	80	80	80	80	81	81	82	83
General Medical pay	76.2	78.3	81.2	84.3	92.5	96.2	100	108	117.6
- expenditure share (%)	10	10	10	10	10	10	10	9	9
Dental	80.1	82.8	85.6	89.9	93.3	96.4	100	103.7	107.1
- expenditure share (%)	5	5	5	5	5	4	4	4	4
Ophthalmic	83.8	85.6	87.9	90.8	93.6	96.4	100	104	107.5
- expenditure share (%)	1	1	1	1	1	1	1	1	1
Pharmaceutical	83.6	86.1	88.3	90.8	93.7	96.6	100	103.6	107.1
- expenditure share (%)	4	4	4	4	4	3	3	3	3
Department of Health paybill	73.2	75.8	77.9	81.2	86.4	92.6	100	105.8	111.1
- expenditure share (%)	1	1	1	1	1	1	1	0	0

Source: ONS, DH

- 6.6** The relative shares in total expenditure for each component as reported by the Department of Health are used to weight the deflators together to produce an aggregate index.
- 6.7** Table 3 compares the deflators, and presents the shares of labour costs to which each of these deflators relates.
- 6.8** As the deflators measure price change in the particular groups of labour employed in the NHS, ONS considers the use of these deflators to be an improvement over using only the Hospital and Community Health Services Pay Costs Index.
- 6.9** The OECD's 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.
- 6.10** *Measuring Productivity* goes on to note that the price of labour is compensation per hour. Compensation is defined to cover all the costs of employment, that is wages and salaries plus employers' contributions to social security payments and other such costs. Compensation is also the preferred weight to be used to enable addition of the quantity of labour for each of the different skill groups.
- 6.11** ONS has been developing improved measures of labour input for its whole economy labour productivity measures. In the new measures, quantity measures of labour inputs are published as number of workers employed, numbers of jobs and hours actually worked (ONS 2004d). The hours series is based on the total number of actual hours worked as reported in the Labour Force Survey (LFS). This analysis includes a decomposition by industry based on the number of employees according

to business surveys and hours worked according to the LFS. ONS will be looking into applying a similar methodology for NHS employment, in order to examine NHS productivity. The Department of Health is examining methodologies that would produce quarterly as well as annual estimates of employment.

- 6.12** Although there is no single source of NHS employment statistics across the UK, further information is available on labour input in the NHS : each constituent part of the UK has devolved responsibility for health, and health administrations collect their own workforce statistics.
- 6.13** The Department of Health recently published *Staff in the NHS 2003* (DH 2003), which reported NHS employment in England in 2003 to be 1.3 million people employed full or part time. The Department of Health’s means for adjusting for difference in numbers of hours worked is to count the number of “whole time equivalents”, which is based on contracted, rather than actual hours, worked. Hours worked beyond contracted full time (paid or unpaid) are not included in the measure. On such a basis, the Department of Health reports that just over 1 million whole time equivalents were employed in 2003.
- 6.14** These figures include all the different types of staff employed in the NHS in England as well as GPs and their practice staff, but not General Dental Service dentists or their staff. The latter is a relatively small group that does not affect the figures in the table. The total can be broken down into three groups with different levels of responsibility for the delivery of health services. Professionally qualified clinical staff, which includes doctors and their practice staff, nurses and allied health professions. Support to clinical staff, including nursing assistants and health care assistants. Infrastructure support, which includes clerical and administrative staff. The residual covers classification unknown, Direct patient Care, Administration & Clerical and “Other”. Table 4 presents NHS staff numbers over the period 1995 to 2003 in terms of whole time equivalents.
- 6.15** Total NHS employment in England was 22 percent higher in 2003 compared with 1995, counted as whole time equivalents. The group with the largest rise was ‘support to clinical staff’, with a 31 percent increase. ‘Professionally qualified clinical staff’ also saw a large increase over the period (23 percent).
- 6.16** The *Annual Abstract of Statistics* (ONS 2004e) pulls together information on NHS employment in England, Wales and Scotland, and publishes this as a workforce summary for Great Britain. The *Annual Abstract* also separately reports information on NHS employment in Northern Ireland, although the breakdown by type of staff differs markedly from that for Great Britain, and hence the separation.

Table 4

NHS staff in England: whole time equivalents

Thousands	1995	1996	1997	1998	1999	2000	2001	2002	2003
Professionally qualified clinical staff	427	434	437	443	451	461	477	502	525
Support to Clinical Staff	211	215	215	220	227	235	249	263	277
NHS infrastructure support	150	144	142	140	142	144	150	158	168
Other	54	55	53	53	54	53	55	56	57
Total	842	848	846	855	874	893	931	978	1,027

Source: Department of Health

The breakdown for Great Britain also differs from that reported by the Department of Health in *Staff in the NHS 2003*. The latest *Annual Abstract*, that for 2004, includes the number of people employed in the NHS up to and including what is labelled 2002: in practice, this typically relates to a single count of staff performed in September of each year.

- 6.17** The Labour Force Survey is another source of information on employment in the NHS. This is on the whole a household survey, but it also covers nurses living in NHS-provided communal accommodation. It asks about number of hours worked, which may allow for a better understanding of the relationship with numbers of people employed rather than the concept of whole time equivalent. The LFS also collects information on earnings.
- 6.18** Future health productivity articles will report on related work to reconcile the various sets of figures available on employment by the NHS and discuss their potential use in a direct quantity measure of labour input.

Intermediate consumption

- 6.19** 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.
- 6.20** For the National Accounts, public service expenditure on intermediate consumption at current prices for the health function is available from the detailed accounting data maintained by HM Treasury and the health administrations. Changes in the quantity 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.
- 6.21** The *National Accounts Blue Book 2004* includes an estimate for some NHS expenditure in 2003 based on planned figures, which is expected to be revised in December 2004, subject to the National Accounts Revisions Policy. An improved estimate has since become available, which has therefore been used in the productivity calculations.
- 6.22** In previous articles, expenditure on intermediate consumption by the whole of the NHS in the UK has been deflated using the Department of Health's Hospital and Community Health Services' Health Service Costs Index. This is an average of increases in unit costs for the goods and services bought by Hospital and Community Health Services in the NHS in England, weighted by the costs of the different types of goods and services purchased.
- 6.23** ONS has been carrying out research into the availability of more suitable deflators for expenditure on intermediate consumption in the whole of the NHS in England. The Health Service Costs Index has been retained as the most appropriate deflator for the purchases of hospital and community health services. The expenses component of General Practitioners' remuneration can be deflated according to an index of average notional expenses as reported by the Review Body on Doctors' and Dentists' Remuneration. As this deflator measures price change in a particular type of intermediate consumption paid for by the NHS, ONS considers the use of this deflator to be an improvement over using only the Hospital and Community Health Services Health Service Costs Index.

6.24 Expenditure on drugs dispensed outside hospitals can be deflated using information from the Department of Health's study of change in the net ingredient cost of prescription drugs. However, it is not clear which component of the change in the overall prescription drugs bill is a suitable deflator for current expenditure. One option would be to take the increase in the average cost per item, which comprises the effects of entries and exits of new and old drugs, changes in the quantity of drug per prescription, changes in the distribution of prescribed drugs and changes in the price of existing items. Another option would be to exclude all but the last of these changes.

6.25 ONS and the Department of Health will be carrying out further work to identify which components of change in the net ingredient cost are price effects and which are quantity or volume effects. For this article, both options are presented as alternative ways of deflating expenditure on prescription drugs.

6.26 Table 5 compares the deflators for intermediate consumption, including the two options for deflating expenditure on prescription drugs, and presents the shares of expenditure on intermediate consumption to which each of these deflators relates.

Table 5

Deflators for compiling volume measures of NHS intermediate consumption (2001=100), and associated share of current price expenditure by the NHS (per cent)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Hospital and Community Health Services - non pay	94.8	96.3	97.2	98.5	100.7	100.4	100	100.8	102.6
- expenditure share (%)	64	62	62	64	67	66	64	65	65
General Medical - non pay	91.4	94.6	96.6	97.5	101.8	102.5	100	97.6	95.4
- expenditure share (%)	7	7	7	6	6	6	6	5	4
Prescription drugs (cost of existing items)	105.8	106	104.1	105.5	104.1	101	100	99.6	99.1
- expenditure share (%)	25	27	28	27	25	25	27	27	26
Prescription drugs (cost of all items)	74.5	78.8	82.9	89.5	92.3	94.7	100	104.7	109.1
- expenditure share (%)	25	27	28	27	25	25	27	27	26
Welfare foods	92.5	95.5	95.5	96.8	97.1	96.8	100	100.7	102
- expenditure share (%)	2	2	2	2	1	1	0	0	1
European Economic Area costs	94.8	96.3	97.2	98.5	100.7	100.4	100	100.8	102.6
- expenditure share (%)	0	0	0	0	0	1	1	1	1
Other central health and miscellaneous	94.8	96.3	97.2	98.5	100.7	100.4	100	100.8	102.6
- expenditure share (%)	1	1	1	1	1	1	2	1	2
Department of health - non pay	94.8	96.3	97.2	98.5	100.7	100.4	100	100.8	102.6
- expenditure share (%)	1	1	1	1	1	1	1	1	1

Source: ONS, DH

Capital

- 6.27** The NHS buys goods and services that can be used repeatedly or continuously over the longer term, such as buildings, machinery, and vehicles. Such goods and services 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 items last over a number of years. Including the entire value of capital investment in the year in which the item was purchased would not reflect the contribution to NHS output over the item's lifetime.
- 6.28** The National Accounts are primarily concerned with the wealth aspects of capital, that is the capital stock measure, included in the non-financial balance sheets, and the capital consumption measure, which is the difference between net and gross domestic product and which constitutes a measure for accruing the cost of capital items over their lifetime. Estimates of capital consumption for public services also take a role in estimating the value of output for public services at current prices: such output is estimated as the sum of input costs at current prices.
- 6.29** For the purposes of understanding productivity, *Measuring Productivity* states that the quantity of capital input to production is 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, heating etc provided by an office building. The price of the 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.
- 6.30** ONS published experimental estimates of capital services for the whole economy in November 2003 (ONS 2003b). These figures did not provide a distinct set of figures 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. Table 6 presents the annual growth rates in the quantity index of capital services for the years 1991-2002 for total economy health and social care industries. Care should be taken in interpreting these estimates, as the growth in the quantity index of capital services in public service health may differ.
- 6.31** ONS is examining the feasibility of extending the capital services analysis in order to arrive at figures for public sector health. For now, the capital consumption estimates are used as the measure of capital inputs into NHS production.
- 6.32** One difficulty with the improved deflation method is that some of the data series needed are only available with lag. For some components of expenditure on NHS inputs for example, no estimate for 2003 is yet available. Where this is the case, the 2003 figure has been estimated by assuming the same growth rate from 2002 as for 2001 to 2002. An alternative method has been tested, namely taking the average growth over the preceding three years. This has only a small effect which is not separately shown in this section, but the impact on productivity change is discussed in the next section.

Table 6

Year-on-year growth in quantity index of capital services for total economy capital services (per cent), health and social work

Per cent												
Growth in year to	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	8.5	6.3	4.1	3.8	4.1	3.1	1.1	3.1	4.5	4.2	3.0	4.4

Source: ONS

6.33 Table 7 presents a range of estimates of the quantity of NHS inputs, calculated by deflating the current price expenditure on NHS inputs using different sources, methods and assumptions as explained throughout this section.

Table 7

Quantity of NHS inputs, range of estimates of change based on different combinations of sources, methods and assumptions, 1995-2003, 2001=100, UK

	1995	1996	1997	1998	1999	2000	2001	2002	2003	Percentage change 1995-2003
1 Simple deflation method; BB2004 figures <i>See paragraph 7.5</i>	79.2	82.8	83.3	86.2	91.4	95.4	100.0	107.1	115.4	46
2 Simple deflation method; revised BB2004 figures <i>See paragraph 7.6</i>	79.7	83.3	83.9	86.8	92.1	95.9	100.0	106.9	112.6	41
3 Improved deflation method; cost of existing items; revised BB2004 figures (shown in chart 1) <i>See paragraphs 6.35 and 7.7</i>	80.6	84.2	84.7	87.4	92.5	96.2	100.0	106.6	112.2	39
4 Improved deflation method; cost of all items; revised BB2004 figures <i>See paragraphs 7.7 and 7.8</i>	83.4	86.7	86.7	88.9	93.7	96.9	100.0	106.0	111.0	33
5 Improved deflation method; cost of all items; revised BB2004 figures; estimating missing years using average previous 3 years' growth <i>See paragraph 7.9</i>	83.4	86.7	86.7	88.9	93.7	96.9	100.0	106.0	110.4	32
6 Improved deflation method; cost of existing items; revised BB2004 figures, capital services <i>See paragraphs 7.11 and 7.12</i>	80.7	84.0	84.4	87.1	92.2	95.7	100.0	106.4	112.1	39
7 Improved deflation method; cost of all items; revised BB2004 figures, capital services <i>See paragraphs 7.11 to 7.13</i>	83.4	86.5	86.4	88.5	93.3	96.4	100.0	105.8	110.9	33
8 Improved deflation method; cost of all items; revised BB2004 figures, capital services, estimating missing years using average previous 3 years' growth (shown in chart 1) <i>See paragraphs 6.36 and 7.14</i>	83.4	86.5	86.4	88.5	93.3	96.4	100.0	105.8	110.3	32
9 Improved deflation method; cost of all items; revised BB2004 figures, excluding R&D and E&T. <i>See paragraphs 7.15 to 7.19</i>	-	-	87.0	89.1	93.9	97.1	100.0	105.7	110.7	-
10 Improved deflation method; cost of all items; revised BB2004 figures, capital services, excluding R&D and E&T. <i>See paragraphs 7.15 to 7.19</i>	-	-	86.7	88.8	93.6	96.6	100.0	105.6	110.5	-

Source: ONS

- 6.34** The estimates of NHS inputs in rows 1 and 2 are shown for illustration purposes only; they are not considered fit for purpose but are shown to illustrate the impact of using the latest information and an improved deflation method. All other series use the improved deflation method and the latest available information.
- 6.35** The NHS input series showing the highest rise is in row 3, and this appears in chart 1. Expenditure on prescription drugs is deflated using an index of the change in cost of existing items. Where missing, the latest year is estimated using the previous year's growth rate. Capital inputs are estimated using capital consumption estimates. This shows that the quantity of NHS inputs has risen over the period 1995 to 2003 by 39 per cent.
- 6.36** The NHS input series showing the lowest rise is in row 8, and this appears in chart 1. Expenditure on prescription drugs is deflated using an index of the change in the average cost of all drugs. Where missing, the latest year is estimated using the average three years' growth rate. Capital inputs are estimated using capital services estimates. This shows that the quantity of NHS inputs has risen over the period 1995 to 2003 by 32 per cent.
- 6.37** For details of the series in other rows, see section 7 on NHS productivity: the rows in table 7 are consistent with those in table 8 and paragraphs 7.4 to 7.18 provide further explanation of the contents of both tables.

7 Productivity Calculations

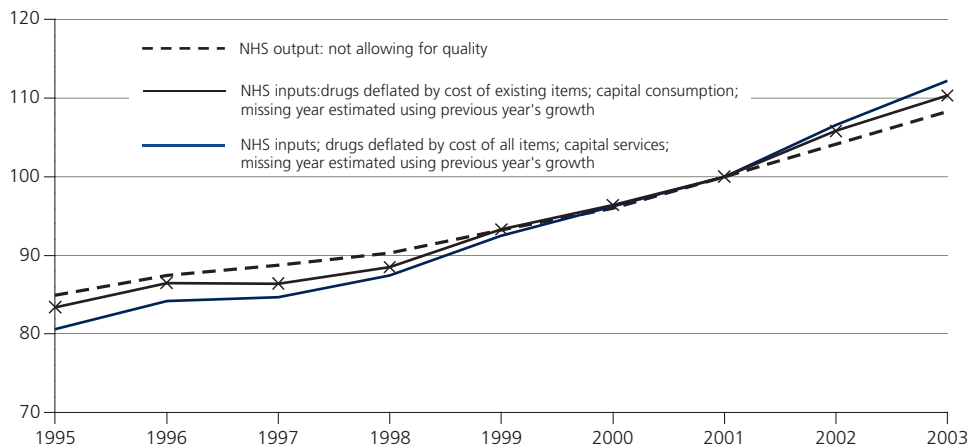
7.1 This section presents estimates of productivity based on the information already presented in sections 5 and 6 on NHS outputs and inputs. As has been stated earlier in this article, productivity is defined to be the ratio of quantity of output to quantity of inputs. Whilst there is a single series on NHS outputs that feeds into the numerator of the productivity ratio, there are a number of permutations of NHS inputs which feed into the denominator of the productivity ratio. As this section will demonstrate, estimates of the change over time in NHS productivity are sensitive to the sources and methods used and assumptions made in calculating NHS inputs.

7.2 Chart 1 (repeated from the Executive summary here) presents NHS output (not allowing for quality change), along with the NHS inputs estimates showing the greatest and least rises, as explained in sections 5 and 6. Over the period from 1995 to 2003, NHS outputs (not allowing for quality change) has grown by 28 per cent and NHS inputs have grown by between 32 and 39 per cent.

7.3 These estimates should be interpreted with care. The output figures are based on a subset of activities in the English NHS and do not include changes in the quality of NHS output (see section 5 on NHS output). The inputs figures are also not ideal, as direct quantity measures would be preferred, and the existing method involving measurement of current price expenditure and using indices to deflate to quantity measures for England only needs improvement (see section 6 on NHS inputs).

Chart 1 (repeated from Executive summary)

NHS output not allowing for quality change and series showing the greatest and least rises in NHS inputs from 1995 to 2003 (2001=100), UK



Source: ONS

7.4 Table 8 presents a range of estimates of change in productivity based on a set of different data sources, methods and assumptions. All of these series use the later estimates of NHS output as discussed in paragraph 5.4.

Table 8

NHS productivity, range of estimates of change based on different combinations of sources, methods and assumptions, 1995-2003, 2001=100, UK

	1995	1996	1997	1998	1999	2000	2001	2002	2003	Percentage change 1995-2003
1 Simple deflation method; BB2004 figures <i>See paragraph 7.5</i>	107.2	105.6	106.5	104.8	101.9	100.6	100.0	97.2	93.9	-12
2 Simple deflation method; revised BB2004 figures <i>See paragraph 7.6</i>	106.6	104.9	105.8	104.0	101.2	100.1	100.0	97.4	96.2	-10
3 Improved deflation method; cost of existing items; revised BB2004 figures (shown in chart 2) <i>See paragraph 7.7</i>	105.3	103.8	104.7	103.3	100.7	99.7	100.0	97.7	96.5	-8
4 Improved deflation method; cost of all items; revised BB2004 figures <i>See paragraphs 7.7 and 7.8</i>	101.8	100.8	102.3	101.6	99.4	99.0	100.0	98.2	97.6	-4
5 Improved deflation method; cost of all items; revised BB2004 figures; estimating missing years using average previous 3 years' growth. <i>See paragraph 7.9</i>	101.8	100.8	102.3	101.6	99.4	99.0	100.0	98.2	98.1	-4
6 Improved deflation method; cost of existing items; revised BB2004 figures, capital services <i>See paragraphs 7.11 and 7.12</i>	105.2	104.1	105.1	103.7	101.1	100.2	100.0	97.8	96.6	-8
7 Improved deflation method; cost of all items; revised BB2004 figures, capital services <i>See paragraphs 7.11 to 7.13</i>	101.8	101.1	102.7	102.0	99.8	95.5	100.0	98.4	97.7	-4
8 Improved deflation method; cost of all items; revised BB2004 figures, capital services; estimating missing years using average previous 3 years' growth (shown in chart 2) <i>See paragraph 7.14</i>	101.8	101.1	102.7	102.0	99.8	95.5	100.0	98.4	98.2	-3
9 Improved deflation method; cost of all items; revised BB2004 figures, excluding R&D and E&T. <i>See paragraphs 7.15 to 7.19</i>	-	-	102.0	101.3	99.2	98.9	100.0	98.4	97.9	-
10 Improved deflation method; cost of all items; revised BB2004 figures, capital services, excluding R&D and E&T. <i>See paragraphs 7.15 to 7.19</i>	-	-	102.3	101.7	99.5	99.4	100.0	98.6	98.0	-

Source: ONS

Row 1

7.5 Row 1, entitled “NHS productivity: simple deflation method; BB2004 figures”, presents the change in productivity using figures on current price NHS inputs from the *National Accounts Blue Book 2004*. It also uses the same methodology for deflating expenditure on NHS inputs as in previous *Economic Trends* articles (that is, a combination of the Department of Health’s Pay Costs Index and its Health Service Costs Index). This shows that NHS productivity in 2003 was 12 per cent lower than in 1995, although the fall was broken by a rise in 1997. ONS does not consider this series to be fit for purpose given that it does not use the latest sources and methods, but is presented here to illustrate the impact of improvements.

Row 2

7.6 As stated in paragraphs 6.3 and 6.21, better information on expenditure on NHS inputs has become available since publication of the *National Accounts Blue Book 2004*. Row 2, entitled “NHS productivity: simple deflation method; revised BB2004 figures”, presents the change in productivity using the latest information on expenditure on NHS inputs and the same methodology for deflating NHS inputs as in previous *Economic Trends* articles. This shows that NHS productivity in 2003 was 10 per cent lower than in 1995, although the fall was broken by a rise in 1997. ONS does not consider this series to be fit for purpose given that it does not use the latest deflation methods, but is presented here to illustrate the impact of improvements.

Rows 3 (shown in chart 1) and 4

7.7 Taking on board an improved set of deflators for NHS labour costs as described in paragraphs 6.5-6.8 and for intermediate consumption as described in paragraphs 6.23-6.26 gives two NHS productivity series, due to there being two alternative options for deflating NHS expenditure on prescription drugs. Row 3, entitled “NHS productivity: improved deflation method; cost of existing items; revised BB2004 figures”, presents productivity change using the price deflator for existing items. This shows that NHS productivity in 2003 was 8 per cent lower than in 1995, although the fall was broken by rises in 1997 and 2001. This series is shown in Chart 1, as it shows the greatest fall in NHS productivity.

7.8 Row 4, entitled “NHS productivity: improved deflation method (cost of all items); revised BB2004 figures”, presents productivity change using as the deflator for prescription drugs the increase in the average cost per item, which comprises the effects of entries and exits of new and old drugs, changes in the quantity of drug per prescription, changes in the distribution of prescribed drugs and changes in the price of existing items. This shows that NHS productivity in 2003 was 4 per cent lower than in 1995, although the fall was broken by rises in 1997 and 2001. Comparing the high and low points in this series, NHS productivity in 2003 was 5 per cent lower than in 1997.

Row 5

7.9 As mentioned in paragraph 6.32, NHS productivity is sensitive to the way in which data for missing years is estimated. The productivity series discussed in previous paragraphs have been compiled by estimating the missing years using the same growth rate as the previous year. An alternative method has been tested, which uses the average growth over the previous three years. The effect on productivity change from this change can be seen by comparing Row 4 (described in paragraph 7.7) with Row 5 entitled “NHS productivity: improved deflation method (cost of all items); revised BB2004 figures; estimating missing years using average previous 3 years’ growth”. The latter series is calculated exactly as the series in Row 4 except for the change in method for estimating data for missing years. Naturally, only the figure for 2003 changes. This shows that NHS productivity in 2003 was 4 per cent lower than in 1995, although the fall was broken by rises in 1997 and 2001. Comparing the high and low points in this series, NHS productivity in 2003 was also 4 per cent lower than in 1997.

7.10 ONS has carried out similar tests for other combinations of data sources, methods and assumptions, and the impact on the change in productivity series is similar: using growth over the preceding three years rather than only the last year to estimate missing data for some of the components of expenditure on NHS inputs reduces the fall in productivity by around 0.5 points.

Rows 6 and 7

7.11 To illustrate the possible effect of moving to a volume measure of capital services, Rows 6 and 7 use the measure of capital services presented in paragraphs 6.29 to 6.31 rather than the capital consumption measure that has been used in all the productivity series so far presented in the table. Row 6 is entitled “NHS productivity: improved deflation method; cost of existing items, revised BB2004 figures, capital services” and Row 7 “NHS productivity: improved deflation method; cost of existing items; revised BB2004 figures, capital services”. Both use revised Blue Book 2004 figures and the improved deflation methodology.

7.12 This measure of capital services is not ideal, as it covers both the public and private sectors, and also covers social work as well as health. If it were reasonable to assume that changes in the volume of capital services in this measure were similar to those in a measure that only related to NHS output, these series show fairly flat productivity followed by falling productivity over the period from 1995 to 2003. Row 6 with the “cost of existing items” option shows that NHS productivity in 2003 was 8 per cent lower than in 1995, the high and low points in this series.

7.13 Row 7 with the “cost of all items” option, shows that NHS productivity in 2003 was 4 per cent lower than in 1995. Comparing the high and low points in this series, NHS productivity in 2003 was 5 per cent lower than in 1997.

Row 8 (shown in chart 1)

7.14 Row 8 is the series that combines the elements that result in the least fall in NHS productivity, and is shown in chart 1. The series is entitled “NHS productivity: improved deflation method; cost of all items; revised BB2004 figures, capital services, estimating missing years using average previous 3 years’ growth”. This shows that NHS productivity in 2003 was 3 per cent lower than in 1995, although the series does rise and fall. Comparing the high and low points in this series, NHS productivity in 2003 was 4 per cent lower than in 1997.

Rows 9 and 10

7.15 In the NHS inputs section, a distinction was between goods and services that are used up in health care production and those that have a longer duration (capital) was made. Capital spending is based on accounting definitions as currently used in NHS accounts and the National Accounts. For the purposes of understanding productivity, some items of expenditure classified as either labour or intermediate consumption have characteristics in common with those of capital items and could be reclassified.

7.16 For example, expenditure on Research and Development (R&D) does not usually contribute to producing output immediately, but is aimed at increasing future output. From a productivity perspective, it might be useful to subtract the input costs from NHS expenditure. Another example is education and training of staff,

which can be seen as an investment in human capital where the contribution to output accrues over the remainder of the NHS career of the trained staff. Estimates of expenditure on R&D and education and training in the NHS are compiled as part of ONS' work to estimate total UK health expenditure (ONS 2003c). Note, however, that estimates are only available back to 1997, and not 1995 as for the other series presented in this article.

- 7.17** Subtracting these costs from NHS expenditure leads to the series presented in the rows 9 and 10 entitled “NHS productivity: improved deflation method; cost of all items; revised BB2004 figures, excluding R&D and E&T “ and “NHS productivity: improved deflation method; cost of all items; revised BB2004 figures, capital services, excluding R&D and E&T” respectively. Only two series are presented here to illustrate the impact on productivity, both of which use revised Blue Book 2004 figures and the improved deflation method. Neither series presents the impact on the “cost of existing items” option for deflating expenditure on prescription drugs as the impact is similar. The difference between the two series is that row 9 uses the capital consumption measure whereas row 10 uses the capital services measure.
- 7.18** As shown in row 9, when the quantity of inputs from capital is measured by capital consumption and the costs of NHS R&D and E&T are excluded, NHS productivity in 2003 was 4 per cent lower than in 1997, the first and highest point in the series. As shown in row 10, when the quantity of inputs from capital is measured by capital services and the costs of NHS R&D and E&T are excluded, NHS productivity in 2003 was also 4 per cent lower than in 1997, again the first and highest point in the series. In both of these series, the fall is not steady, with a rise in 2001.
- 7.19** R&D and education and training still consume resources, and the volume of these resources should be included in a volume measure of NHS inputs. Further work is needed to develop measures of the volume of NHS inputs relating to R&D and education and training.
- 7.20** In this article, the intention is not to be definitive about which types of current expenditure might be treated as a long term input into the production of public service health. ONS is continuing to investigate how to treat expenditure on NHS inputs from the perspective of measuring NHS productivity. Other components also being considered include maintenance and refurbishment, software and capitalisation thresholds.

8 The Department of Health's 'experimental' NHS cost efficiency growth measure

- 8.1 The Department of Health has been investigating the construction of an "NHS Cost Efficiency Growth Measure", which uses many of the same data sources that have been discussed in this article. Box 3 contains a brief description from the Department of Health on their experimental measure.

Box 3

The Department of Health's 'experimental' NHS cost efficiency growth measure: note by the Department of Health

The Department of Health wish to replace their previous measure of cost efficiency growth, the Cost Weighted Efficiency Index. The refined measure of NHS output growth, recently adopted by ONS, is a useful foundation for the improved measurement of cost efficiency growth. However, crucially it does not account for changes in NHS quality.

To assess value for money (VfM) improvements, DH has developed a new 'experimental' NHS cost efficiency growth measure. This 'experimental' measure suggests that in 2002/3 VfM increased by around 0.4 per cent due to cost efficiency improvements. This is calculated as the inverse of NHS unit cost growth after adjustment for:

- Changes in the mix of NHS services provided;
- Input cost inflation;
- Expenditure on improving NHS quality.

For the first time, DH is including the impact of changes in NHS quality in NHS cost efficiency growth measurement. Taking quality into account is complex; there will be scope for further improvements over time. DH have therefore labelled this measure 'experimental' since it represents only a first step in improving VfM measurement.

Adjusting for estimated expenditure on quality improvements rather than adjusting for quality improvements is not ideal as spending on improving quality is not guaranteed to deliver equivalent quality gains. DH is currently developing a sister measure to the cost efficiency growth measure, which will indicate the extent to which quality gains are actually delivered; and in the longer-term a more sophisticated all-round measure is being developed. In the shorter-term, the complexities of accounting for quality change will impinge on the precision of the cost efficiency growth measure. The experimental cost efficiency growth measure, which takes some account of quality changes, is a better estimate of what is happening in the NHS than a measure which takes no account of quality change.

Further developments will allow increasingly precise estimates of NHS productivity and VfM growth. DH will use the 'experimental' cost efficiency growth measure only until it can act on the findings of the productivity measurement research it has commissioned from University of York Centre for Health Economics/National Institute for Economic and Social Research, and on recommendations of the Atkinson Review.

The new measure has been reviewed by several leading academic experts; and when regarded as an *interim* measure it is seen as an improvement over existing measures and reasonable for use in assessing VfM growth in the short term.

For further details of DH's experimental NHS cost efficiency growth measure, see www.dh.gov.uk/publications

9 Quality

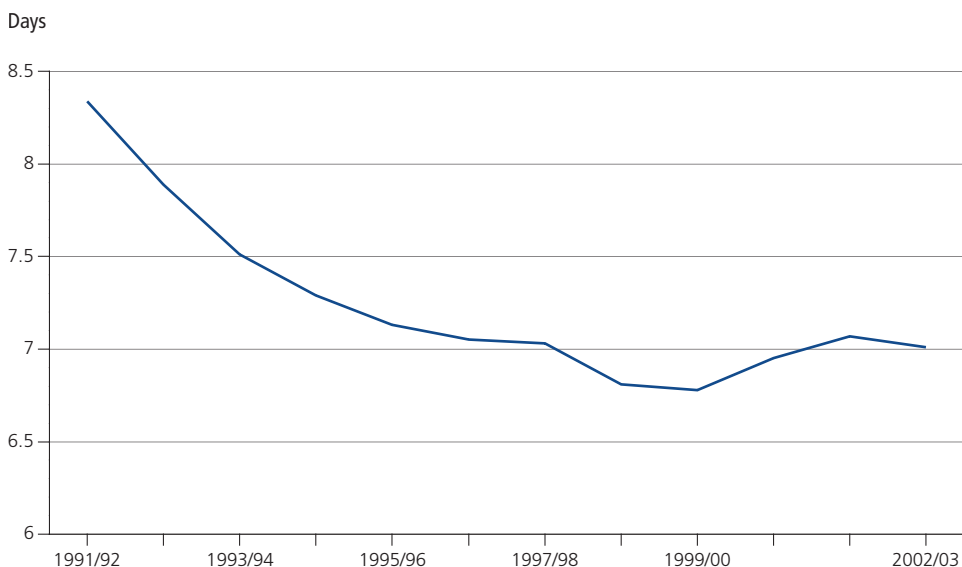
- 9.1** As stated in the health outcomes section, it is clear that some important health outcomes from NHS activity - expectation of life at birth, infant mortality and mortality rates are presented in three charts - have been improving but not all of the outcomes are attributable to the NHS. The interim report from the Atkinson Review of the Measurement of Government Output and Productivity for the National Accounts (Atkinson 2004) states clearly that measurement of output should include quality change:
- improved health outcomes may be related directly to improved quality of service provided by the NHS, for example in terms of changes in NHS practice leading to earlier identification of cancer and heart conditions, if this then leads to improved survival and life expectancy. This should be, but is not currently, included as part of NHS output.
 - NHS output measures in the National Account also need to take into account any data where the quality of service provided by the NHS has decreased, for example there were rises in outpatient waiting times at the end of the 1990s (DH 2004b). Changes in average waiting times would also need to be considered alongside to get a rounded picture of quality related to waiting times.
- 9.2** The Atkinson Interim Report also notes other domains of quality that should be considered, including quicker access to treatment, improved patient experience, and prevention of illness. It may also be appropriate for the measure of NHS output to rise in line with wider economic growth, that is, as the value of an added year's healthy life expectancy increases.
- 9.3** In principle, the National Accounts do seek to capture quality improvements in output. Health system quality is a complex notion, but there is a growing international understanding of what it means. For example, WHO discusses it under two broad headings in the World Health Report (WHO 2000): health outcomes and responsiveness (the latter embracing notions of respect for dignity; confidentiality; autonomy; prompt attention; quality of amenities; access to social support; choice).
- 9.4** Future articles will present further information on aspects of the quality of NHS output in order to explore the impact on NHS productivity. A key consideration of this work will be to consider the extent to which identified quality measures provide a balanced picture of quality change across the entire NHS.

10 Triangulation

- 10.1** The productivity figures that appear in this article are the best estimates currently available from the National Accounts and other sources as investigated so far by ONS. As explained in this article, the methodology for compiling those estimates has been improving over the last few years, and work is continuing to improve the estimates further.
- 10.2** Triangulation aims to help users understand the productivity figures in a wider sense using information to paint a picture of productivity in the NHS that has not been used in compiling the NHS productivity figures themselves. This may change in the future, as the methodology is reviewed and improved. Until then, this extra information is presented as context to the NHS productivity figures. Identification of this information for this first article has been limited by time and resource constraints. Over time, and as ONS receives commentary on the content of these articles, other information sources will be identified and investigated.
- 10.3** Chart 5 presents information on the average length of stay for England over the period 1991/92 through 2002/03.
- 10.4** The chart shows that the average length of stay 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. If reductions in the use of more expensive inpatient resources were due to improvements in clinical practice (a reduction in the need for people to stay in hospital so long with no negative effect on patient outcomes), then such a trend could be equated with higher productivity.
- 10.5** The elective day case rate in England, as presented in chart 6, has risen over a similar time period. 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 cases being dealt with in outpatient settings or by General Practitioners in Primary Care.

Chart 5

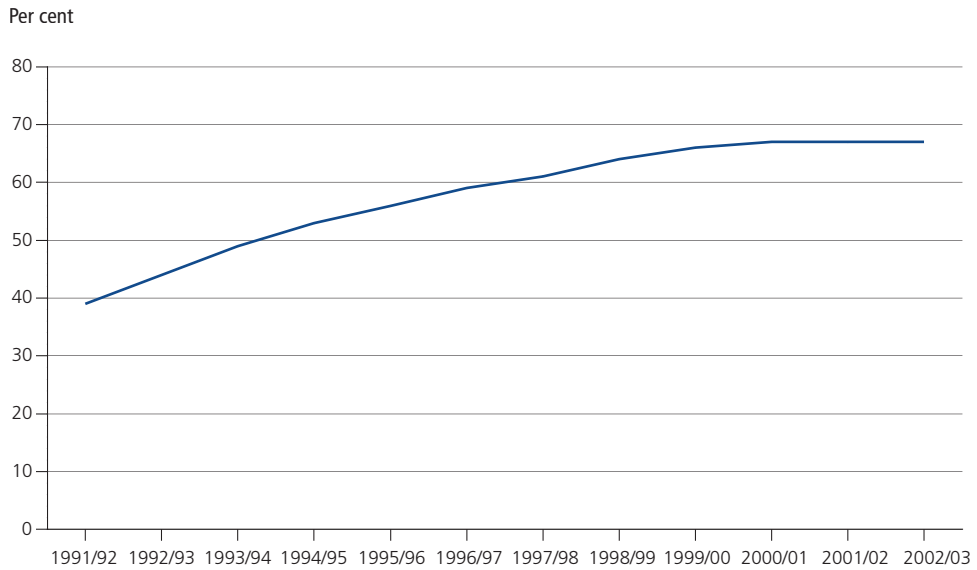
Average length of stay, England



Source: Department of Health

Chart 6

Elective day case rate, England



Source: Department of Health

10.6 Changes in the average length of stay should be looked at in conjunction with other indicators, such as readmission rates, to see whether the earlier discharge of patients is adversely affecting their recovery. The latest information available at the England level appears in *NHS Performance Indicators*, (DH 2002), showing a 1 per cent increase in emergency re-admissions between 1999 and 2000. However, the same report shows that deaths within 30 days of both elective and non-elective surgery have both fallen (from 593 to 567 per 100,000 elective patients and from 3,093 to 2,938 per 100,000 non-elective patients).

10.7 Table 8 presents waiting times information for English inpatients and outpatients, reproduced from the *Chief Executive's Report to the NHS*. This shows fairly substantial decreases in numbers experiencing long inpatient and outpatient waiting times. Waiting times are an important component of the quality of care and an ideal measure of output would take them into account. However, it might be more appropriate to use mean or median waiting times. Currently, NHS output measures do not incorporate information on such quality change.

Table 8

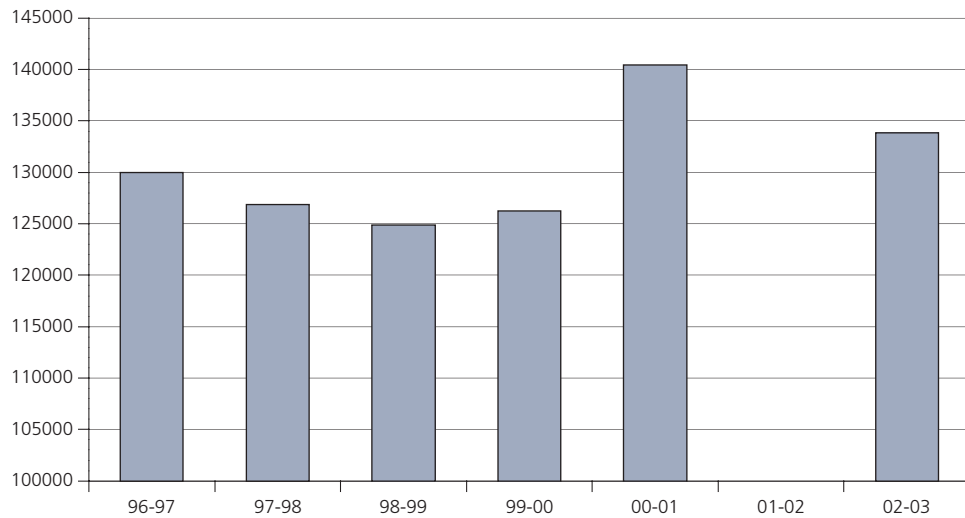
English NHS inpatient and outpatient waiting times

Thousands						
Number of people waiting:	Mar-98	Mar-99	Mar-00	Mar-02	Mar-02	Mar-03
For inpatient treatment						
6-8 months	192	146	138	130	141	136
9-11 months	118	84	78	72	75	53
12 months plus	67	47	48	41	22	<1
For first outpatient appointment						
13-25 weeks	196	292	263	200	191	N/A
26 weeks plus	101	144	130	80	1	N/A

Source: Department of Health

Chart 7

NHS written complaints, 1996/97–2002/03



Source: Department of Health

10.8 Chart 7 presents information on the quantity of NHS written complaints over the period 1997/98 - 2002/03, although note that there is no information presented for 2001/02 and that the horizontal axis begins at 100,000. Changes in the number of written complaints may be associated with patient satisfaction with the NHS, but may also be influenced by awareness of complaints procedures or of the likelihood of the complaint having an impact.

10.9 The chart shows that there were reductions in the number of written complaints over the period 1996/97 through 1998/99. A small upward change in 1999/00 was followed by a large increase the next year of 11 per cent and a decline again in 2002/03.

10.10 This section on triangulation has presented only a limited amount of information as context to the productivity estimates. Future articles will include other information that has been investigated by ONS to paint a wider picture of NHS productivity.

11 Next steps

11.1 This article has presented a first analysis of NHS productivity based on the National Accounts and has explained the limitations of the estimates due to the sources and methods used and assumptions made. In particular:

- NHS output has been calculated using a new improved methodology and better source data
- NHS inputs have been calculated using the latest information available on current price expenditure
- the sources and methods for deflating the current price expenditure have been improved
- the article has presented alternatives for the treatment of some of the components of NHS inputs eg prescription drugs
- NHS productivity has been presented as a range of alternatives based on different sources, methods and assumptions

11.2 Work is continuing to improve measurement of NHS inputs, output and productivity; in particular the recommendations and conclusions from the Atkinson Review of the Measurement of Government Output and Productivity for the National Accounts are awaited.

11.3 In the immediate future, the next article in this series to focus on health will report on:

- development of the deflators used with the current price NHS input expenditure figures and the offsets to NHS inputs;
- further research into corroborating information to improve the triangulation section (proposals from readers are welcome); and
- a report on developments following the publication of final report of the Atkinson Review.

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