



MEASURING HEALTH OUTPUT,  
PRODUCTIVITY AND EQUITY:  
FUTURE CHALLENGES

Professor Tony Atkinson

15th Annual Lecture 2009

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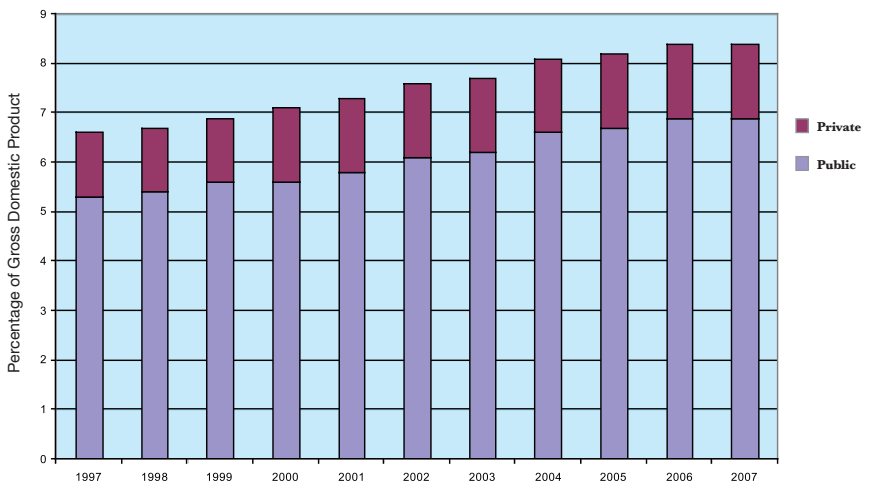
Office of Health Economics  
12 Whitehall London SW1A 2DY UK  
Tel: +44 (0)20 7747 8850  
[www.ohe.org](http://www.ohe.org)

I am most grateful to Adrian Towse and the Office for Health Economics for the invitation to present this lecture, and for their assistance in preparing it for publication. In giving this annual lecture, I am following a highly distinguished line of speakers, a number of whom have significantly influenced my thinking about the issues addressed in this year's lecture. I would also like to take the opportunity of acknowledging how much this lecture, and health economics in general, owes to the research carried out by the remarkable group of economists who have been working on this subject at the University of York for nearly half a century. After the lecture, there was a lively discussion, and I have tried, in preparing the text for publication, to respond to the valuable points that were made by the audience. Finally, I should like to thank the members of the Office for National Statistics with whom I have worked on the measurement of public spending. The UK Centre for the Measurement of Government Activity (UKCeMGA), led by Joe Grice and Aileen Simkins, has made a major contribution to the development of the measurement of health output and productivity, and has established the UK as one of the world leaders in this field. I am most grateful for all their help.

## Introduction

Over the past ten years, the UK has seen a very substantial rise in healthcare spending. According to the Review carried out by Sir Derek Wanless and colleagues, “the five years since 2002 have witnessed unprecedented levels of government investment in the NHS. ... Over that period, real spending on the NHS has risen by nearly 50 per cent. ... the proportion of the United Kingdom’s gross domestic product (GDP) devoted to health care spending has grown to ... within striking distance of the European Union average” (Wanless, 2007, page xviii). This increase in spending is illustrated in Figure 1. Spending includes both public and private but it is evident that the public part is the main area of expansion, and that this has increased by more than 1.5 percentage points of GDP, which is a highly significant change over this period.

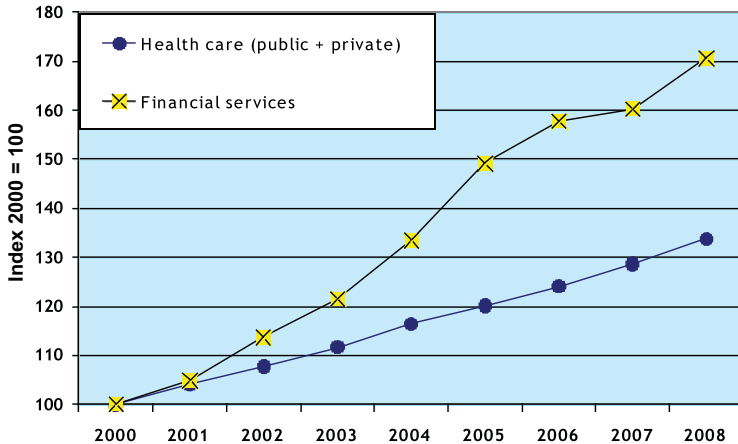
**Figure 1: UK Spending on Health Care as % Gross Domestic Product 1997-2007**



Source: UKCeMGA, 2009, Table 3.

Health spending has risen faster than national output. Households in Britain are consuming, privately or through the NHS (most of it through the NHS), considerably more healthcare. The line marked by circles in Figure 2 shows the rise in the real spending on health care (i.e. adjusted for the increase in its cost) in the form of an index number equal to 100 in the year 2000. This shows that, in 2008, UK health consumption expenditure at 133.7 was a third higher than 8 years earlier. But this rise has to be placed in perspective. Some other elements of household consumption expenditure have also risen, and, indeed, risen faster. The line marked by crosses in Figure 2 shows the growth in another important category: the consumption of financial services. Again this is shown as an index number equal to 100 in the year 2000. This means that the graph cannot be used to compare the levels of spending (more was spent on health in all years), but it shows their relative *growth*. When I first drew this graph I was surprised to discover how much faster the UK consumption of financial services has risen: by over two-thirds over the same period. The rate of increase is *double* that of health care. This is a parallel to which I shall make reference at a number of points.

**Figure 2: Growth of Volume of Individual Consumption in the UK: Health Care and Financial Services Compared**



Source: UK National Accounts 2009, Table 6.5.

My lecture is concerned with the consequences in terms of measured health output of this increased spending, and the challenges faced as the UK looks to a future where such rapid growth in public spending is unlikely to be possible. The lecture falls into three parts. I start by explaining how I came to be concerned about the measurement of health output and productivity, since I approached the issue from slightly a different angle from that which many of you in the audience may expect: from consideration of the national accounts and the measurement of national output (Gross Domestic Product). National accounts are not a subject that excites many people, but they are a rather crucial part of our economic management. Keynes encouraged the development of national accounts during the Second World War as being central to economic management and today they are widely used as a yardstick for evaluating economic performance. And the health sector represents, as is clear from Figure 1, a significant part of national output.

Concern about the measurement of the output of the government sector as part of the national accounts led the Office for National Statistics (ONS) to ask me to carry out a Review in 2004-5. The second section of this lecture looks at the main recommendations of the Review and the subsequent developments, with particular reference to the measurement of output and productivity in the health service.

The third section of the lecture looks to some of the future issues. How is productivity in the health care sector likely to develop in the medium term? How should policymakers think about future levels of spending? What may follow from the increasing concerns about health equity (not just the total of health output but *who* benefits)?

## 1. Health Spending and Political Arithmetic

National accounts may appear a subject far removed from medicine. However, the first person who tried to measure national income in this country - William Petty, later Sir William - was appointed Professor of Anatomy at Oxford in 1650 and later became Physician General for the Parliamentary Army of Ireland. He was a man of parts, being also appointed Professor of Music at Gresham College, and subsequently establishing his name as one of the first statisticians. He in fact referred to his subject as “political arithmetick”. Petty describes the purpose of his estimates of national income as being “to show the uses of knowing the true state of the people, land, stock, trade etc. That the King’s subjects are not in so bad a condition, as discontented men would make them”. He went on to say “the [observations] that men eat, drink and laugh as they used to, have encouraged me to try if I could also comfort others, being satisfied myself, that the interest and affairs of England are in no deplorable condition”.

Petty’s description of what he meant by political arithmetic captures two elements of the use of statistics, one good and one bad. The good element was his desire to ensure that the statistics which he created should either correspond to common observation or, if they did not correspond, the reasons for the divergence should be explicable. I share this view: statistics should be grounded firmly in reality. The bad element is the use of statistics for political ends. According to Wikipedia, “Petty’s only statistical technique is the use of simple averages. He would not be a statistician by today’s standards. ... To obtain the population of all England he would multiply the population of London by 8. Such a simple use of estimation could have easily been abused and Petty was accused more than once of doctoring the figures for the Crown.” Such criticisms have been made not just by Wikipedia, but also by distinguished economic historians such as Phyllis Deane who says that Petty “was not above manipulating his data in ways that would justify his polemical arguments” (1968, page 67). The political element is just as present today, and one of the themes of this lecture is the need to protect official statistics from political influence.

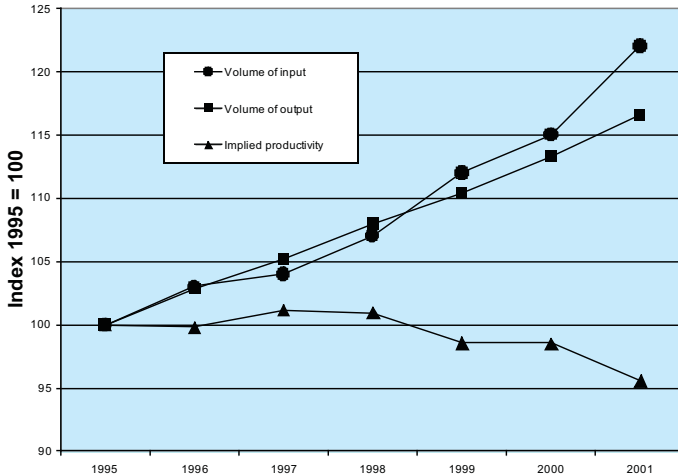
### *Health inputs and outputs*

Today’s economy is much more complex than that of the mid-seventeenth century, not least on account of the much larger role of the government sector. This complexity poses problems for those constructing national accounts, and nowhere is this clearer than in the case of health care.

Figure 3 shows the measures of inputs and outputs into the National Health Service, as they were estimated in the national accounts published in 2003. Two points should be noted about these figures. First, they are volume series expressed in real terms: that is they are adjusted by deflators for changes in wages and prices. The series for inputs, for example, shows what happened as a result of increases in the number of people employed, drugs prescribed, kilowatt hours of energy used, etc. Increased salaries for doctors, for example, show up in the deflator (index of costs) used to convert money amounts into volume terms. So if £100 million is being spent on the health care one year and £121 million the next, but costs have risen by 10 per cent, then the volume of inputs has increased to  $\pounds 121/1.1$  million = £110 million at constant costs. Secondly, the inputs and the outputs are expressed as indices, taking 1995 as 100. This is important to bear in mind when considering productivity, or the output per unit of input. Comparison of the rise in outputs with the rise in inputs allows conclusions to be drawn about the way in which productivity has changed. But nothing can be said about

the *level* of productivity. (For references to attempts to compare levels of health care productivity across countries, see Smith and Goddard, 2009, page 16).

**Figure 3: UK Health Output and Productivity as it looked in 2003**



Source: Economic Trends, July 2003, Pages 33 and 38

The graph shows the situation in the health sector as it looked in 2003 when I was asked to do the Review of the Measurement of Government Output and Productivity for the National Accounts. You can see immediately that the picture it painted was one that attracted the attention of both Government and Opposition. The volume of measured output had been rising steadily, but it had not increased speed when inputs had accelerated after 1997. As a result, there was a fall in productivity (ratio of output to input).

The failure of measured output to rise commensurately with the rise in inputs led many to ask whether this was an artefact of the statistical methods used to construct the figures or represented a genuine decline in productivity. Hence the establishment of the Review, to be carried out by an outside academic, supported by an outstanding team within the ONS led by Joe Grice and Aileen Simkins.

***Reviewing the national accounts measures of health output***

What did we discover? We began with the history: how ONS had got to where it was. Twenty years ago, no attempt was made to try and measure the output of the health service or of any government service. Earlier UK measures of output in the 1950s and early 1960s had been abandoned, and the national accounts had returned to the convention that government output was simply proportionate to input, assuming that what you put in you got out. The output=input convention meant that there was no measure of productivity. The productivity line in Figure 3 would on this basis have been simply horizontal. There would have been no political embarrassment but also no measure of output, a situation that was clearly unsatisfactory. After all, the Government sector accounts for over a fifth of our national production.



For this reason the United Nations System of National Accounts (SNA) recommended in 1993 that all countries should seek to measure what their governments were producing. (The SNA is a framework designed to ensure the international comparability of national accounts, revised at intervals, and approved by the UN Statistics Commission.) The recommendations are not mandatory and some countries, including the United States, did not adopt direct output measures, but the European Union statistical office (Eurostat) followed the SNA 1993 approach in the European System of Accounts (ESA 95). Later, under a European Commission Decision of December 2002, implementation of the direct output approach became compulsory for all Member States in the European Union for their national accounts covering 2006 and subsequent years (although Denmark obtained a derogation until 2012 – a point to which I return below).

The UK was one of the first EU Member States to comply with the SNA 1993, and in 1998 the ONS began to publish direct measures of government sector outputs. What did they do? The bases for the indicator of changes in health care output are shown in Table 1. The indicator combined series for 16 categories of treatment, such as inpatient/day cases or GP consultations, weighted according to the cost (at a fixed date) of each of these activities. The result gives a measure of what has happened to the level of output in the health service, relative to a base year. So that if, as a result of putting in more resources more people are treated, then this would show up in increased measured output. I have described the approach adopted for health; analogous procedures were applied to education, the administration of social security, the administration of justice, the fire service, and personal social services. In this way, the new measures covered approaching two-thirds of General Government Final Consumption.

**Table 1: UK Health Output Measure Until 2004 Based on 16 Activity Series (Data Mostly for England Only) Listed Below Together with Weight in Overall Indicator**

Inpatients and day cases	43.2%	Community psychiatric	1.8%
Outpatients, A+E	13.2%	Community learning disability	1.3%
Regular day patients	1.3%	Ambulances	2.0%
Chiropody	0.3%	GP services	8.8%
Family planning	0.2%	GP prescribing	18.8%
Screening	0.2%	Dental	0.2%
Health visiting	0.9%	Dental	4.0%
District nursing	2.8%	Ophthalmic	0.1%

This implementation by ONS of the SNA 1993 approach was an impressive attempt to meet the challenge of providing direct measures of government output. But it was very much a first attempt and there were evident problems. In the case of health care, the 16 categories were not exhaustive: in fact about a quarter of all NHS activities were not

covered by one of the headings. Within those covered, the categories are very broad and span many different activities. Three of the categories – inpatients/day cases, outpatients and GP prescriptions – dominate the calculation, accounting together for three-quarters of the total index of the output of the health service. The first of these (inpatient/day cases) alone accounts for over 40%. Most of the data only related to England, whereas the output measure is being applied to the entire United Kingdom.

The conclusion in 2004 was clear. Something needed to be done to improve the measures of government output and productivity, and this would require additional statistical resources. The Review pointed out that measuring government output was important even to those not concerned with individual services such as the NHS or education or the police. The choice of measures of government output affect the performance indicators for the economy as a whole. To drive this home, we observed that because Britain has pioneered these direct measures of government output, whereas the United States had not yet adopted direct measures (continuing to use the output=input convention), this difference in statistical practice accounted for half of the difference in our measured growth rates. Half of the gap in apparent economic performance was a statistical artefact.

## **2. 2004-5 Review and After**

One common political response to the problems with the new measures of government output was that the ONS should abandon the direct measures of government output and return to assuming that output=input. However, such a backwards step was neither legally possible (given the EU Decision) nor, in the judgment of the Review team, desirable. It would have been irresponsible simply to duck out of the challenge of trying to measure the output of the government sector.

Such a response did however highlight the political nature of the issues with which we were dealing. This was the reason that the Danish Government did not agree to the introduction of direct output measures into their national accounts, and why they sought a derogation. They were concerned about possible political manipulation of the figures, fearing that, as soon as estimates of health output were introduced into national income calculations, the door was open for pressure to be placed on statisticians to produce favourable numbers.

With this in mind, the 2005 Review recommended that the starting point for new measures of government output should be the enunciation of a set of basic principles. Such a set of principles would represent an independent point of reference and thereby provide a degree of protection against political manipulation. Proposed changes in the methods used to construct national output and productivity statistics would have to be assessed against a previously articulated and agreed set of principles.

### ***A Principled Approach***

The principles for the measurement of government output and productivity set out in the Review may be summarised as follows:

- **A:** Government non-market output should, as far as possible, be measured following a procedure parallel to that adopted for market output.

- **B:** Output should in principle be measured in a way that is adjusted for quality.
- **C:** Account should be taken of the complementarity between public and private output.
- **D:** Formal criteria should be established for extending direct output measures to further public services (beyond the two-thirds already covered).
- **E:** Measures should cover the whole of the UK.
- **F:** Measures of inputs should be as extensive as possible, and should include capital services.
- **G:** Criteria should be established for pay and price deflators applied to input spending series.
- **H:** Independent corroborative evidence should be sought on government productivity, as part of a process of “triangulation”.
- **I:** Explicit reference should be made to the margins of error surrounding national accounts estimates.

A number of these principles are unobjectionable, such as Principle E that measures should cover not just England but the whole of the United Kingdom. I referred earlier to the assumption by Sir William Petty that the population of England was eight times that of London. It seems to me that to assume that the output of the health service in the United Kingdom is a simple multiple of that in England is not much better as an assumption. Principle H harks back to the point made earlier about the relation between statistics and common observation. If waiting times are down, and hospital stays are shorter, then one needs to ask why this is not being reflected in higher measured productivity (a question to which there may be good answers). Principle I represents a return to previous practice (see Maurice, 1968, pages 39-42). Other principles need to be fleshed out further, such as Principles D, F and G, and these have formed part of the work programme of the UK Centre for the Measurement of Government Output (UKCeMGA) established within ONS as a result of the Review’s recommendations.

In what follows, I am going to concentrate on principles A and B, and in Section 3 I shall take up – and re-interpret - Principle C.

### ***Measuring non-marketed output***

The Eurostat recommendations that led to direct output measurement being adopted by the European Union were accompanied by the publication of their *Handbook on Price and Volume Measures in National Accounts*, on which the ONS and the Review team drew heavily. The Eurostat *Handbook* distinguishes between inputs, activities, outputs and outcomes. In the case of health care:

**Inputs**                    ***Doctors, nurses, buildings and medicines, etc.***

**Activities**                ***Consultations, operations, prescriptions, etc.***

**Outputs**                  ***Health care***

**Outcome**                ***Health status***

These distinctions are important, but also far from easy to implement. The purpose of the exercise is to replace input measures, and not to replace them simply by indicators of activities. But the measures should be of outputs, not of outcomes. The aim is not to measure the state of the nation's health, but the contribution of healthcare to improving health. A concrete example is provided by NHS campaigns to reduce smoking. The activities involve advertising, individual consultations, etc. The output is the induced change in smoking behaviour and the associated improvements in health status. It is of course quite possible (although one hopes not) that there are activities that produce no output, in this case that no one quits smoking.

Moving from activities of the kind listed in Table 1 to indicators of output is a challenge. It typically involves assumptions and imputations. In this respect, however, health is not so very different from other parts of the economy. Here I return to the parallel with financial services. Financial services like health care employ workers, they have plant, they carry out activities like transferring money, making loans and so on, and they produce an output. What is that output? In part, the output is explicit. Banks charge fees for particular services, like exchanging foreign currency or arranging a mortgage, and the volume of these services can be measured. But the greater part of their services are not paid for in fees but are paid for implicitly in that depositors receive no interest or less interest than borrowers pay.

As a result, this part of the output of the financial services sector cannot be measured directly. Instead, the national accounts use a concept known as FISIM: Financial Intermediation Services Indirectly Measured. As explained by the ONS, “despite its complicated name, the concept of FISIM is a simple one that is taken for granted when doing business with financial institutions. Instead of a direct charge, many services provided by financial institutions are paid for by an interest differential, that is, the institutions pay depositors a lower rate of interest than they charge borrowers. FISIM imputes indirect charges for these services” (Tily and Jenkinson, 2006, page 1). The imputation is based on an assumed “reference” rate of interest that would otherwise have been paid. The adjustment for FISIM is large, adding some 1.7 per cent to measured GDP over the period 1993 to 2006 (Akritidis, 2007, page 33).

In other words, a major part of the measured output of the financial services sector, and a significant part of GDP, is based on an accounting convention. This needs to be borne in mind when considering the NHS. Principle A proposes following a procedure parallel to that applied in the private sector, but in the private sector too output may be difficult to measure. The spotlight tends to be focused on the public sector, but similar questions can be asked about the private service sector.

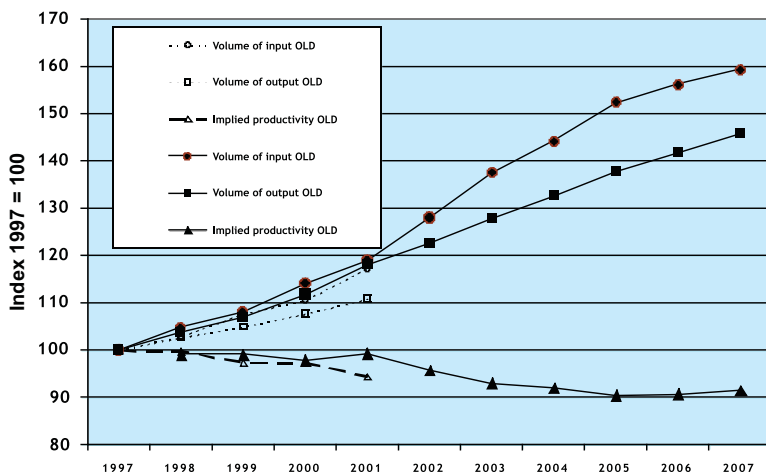
### ***Improvements in measurement since 2005***

I have described the situation as it was when the Review began. Since then there have been very substantial improvements; improvements made possible by research carried out by UKCeMGA and the Department for Health, and by outside researchers such as those at York and the National Institute of Economic and Social Research.

The improvements have addressed a number of the issues raised earlier. Coverage has been widened to include, for example, NHS Direct. Very importantly, the 16 activities shown in Table 1 have been replaced by more than 1,700 treatment types. Distinguishing according to diagnosis groups makes it possible to capture the changes in output pattern: we are no longer treating a person who had a varicose veins procedure in the same way as someone who had a knee replacement. No single component now dominates. There are better measures of GP consultations and prescribing. There are better measures of inputs, including improved deflators for labour, GP prescribed drugs, and capital services. These price deflators are used to convert the cash spending figures into changes in volume. One particularly important instance is that where drugs come out of patent protection and there is a switch to using generic drugs. In that case there may be a substantial change in the price and failure to reflect this step change in the price deflator may lead to an understatement of the growth in the volume of inputs.

The rationale for these changes is that they provide a more comprehensive or richer treatment. Their impact on measured output and productivity was not evident *ex ante*. The effect of using a much more detailed classification depends on the changes that took place in the treatment mix. The extension of coverage depends on whether the previously excluded activities were growing faster or more slowly. The actual impact is shown in Figure 4, covering the period up to 2007. The effect of the changes may be seen in the early years, where the dashed lines and hollow symbols show the old estimates (as in Figure 3). It may be seen that the new estimates are higher for both inputs and outputs. The upward revision for output is larger, causing measured productivity to be higher. The fall in productivity up to 2001 is largely eliminated; however, since 2001 there has been an approximately 10 per cent fall in productivity, as measured output growth failed to keep pace with the increase in measured inputs.

**Figure 4: Effect of New Methods on Measured UK Health Care Output and Productivity**



Source: Data supplied by UKCeMGA

### ***Grappling with quality***

The estimates of health care output and productivity shown in Figure 4 make no allowance for any change in quality. This brings me to Principle B: in the case of government output, just as with private sector output, account should be taken of improvements or worsening of quality. The problem is how to do so in practice.

One approach to measuring quality change is via the differentiation of services. Rather than counting the total number of letters posted, a distinction is made between first class and second class post, and total postal output is a weighted sum, with second class letters getting less weight than first class. If a higher proportion of letters are delivered by second class, then total output rises less than the total number of letters. In the case of health output, such a differentiation has already been made, and I have described above the move from 16 to more than 1,700 categories of treatment. The varicose vein treatment gets a lower weight than the knee replacement. To this extent, the output measures in Figure 4 already include an element of quality improvement.

But differentiation of services cannot capture everything. A second approach to quality measurement is to take account of the degree of success. In the case of the postal service, this approach would mean replacing the number of letters posted with the number of letters delivered within the appropriate time at the right address. Obviously, success is less easily measured in the case of health care, but there has been substantial research in this direction. A number of the teams I have cited have been making estimates, for example, of changes in survival rates, average health gain and other measures which could be used to adjust the number of treatments that have taken place, according to the improvement or the worsening of those survival rates or health. At the same time, these measures relate to particular conditions and it is going to be difficult to generalise that across the whole range of the activities of the NHS. There is moreover the inherent problem of estimating the part of any improvement that can be attributed to the NHS (the issues involved, and possible solutions, are discussed by Chandler, 2009).

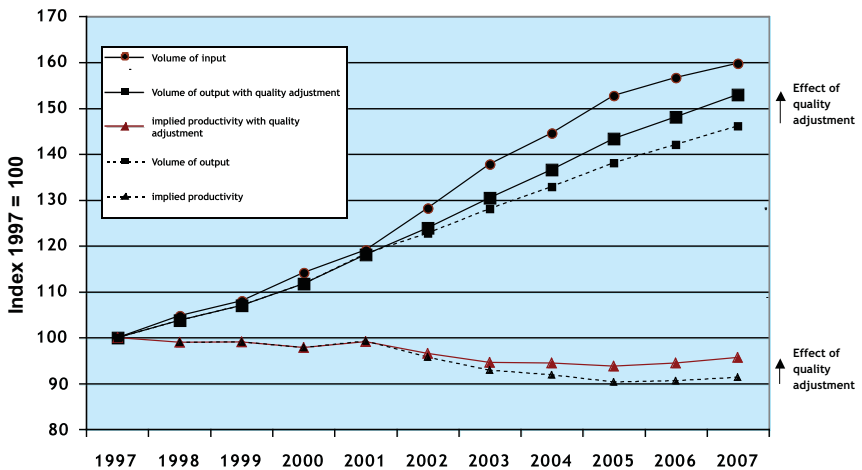
A third approach, which does apply more generally, is that of adjusting for the quality of patient experience and other elements of the overall nature of the service. Again attempts have been made using patient surveys to see how far the service meets user needs.

The difficulties with each of these approaches to quality adjustment are apparent, but I just want to draw attention to one point which warrants further discussion. This concerns the extent to which these elements of quality are additive: whether allowances are to be made under each of these heads and then summed. How far does such a procedure risk double-counting? The risk clearly exists and has been taken into account by the Department of Health (for example, 2007, page 37) and by UKCeMGA (for example, 2008, page 40). The degree of patient satisfaction may reflect the health outcome, which is therefore being counted twice. On the other hand, many of the effects may well be additive. Speed of access to the healthcare may be quite separate from the effectiveness of the treatment. Where the care is largely palliative, the patient experience may be an important – and separate – element in the assessment. These aspects need to be further investigated.

The intrinsic difficulties in adjusting for quality change are not unique to health care output. Quality poses a problem to the measurement of constant price GDP as a whole. Forty years ago, Rita Maurice, when discussing the reliability of different components of household consumption noted that “a special element of uncertainty arises in the estimates at constant prices, namely that limited allowance has been made for changes in quality” (1968, page 187). But the adjustments for quality of government output are particularly sensitive from a political standpoint, and for this reason the report of the Review recommended that a relatively high threshold be set for the implementation of any quality adjustments.

The need for caution is underlined by the potential magnitude of the adjustments. Figure 5 shows the effect of the quality adjustments that have been made by UKCeMGA in the case of health output. With the adjustments, measured output growth is significantly increased and the measured productivity change would now be more like a 5% fall rather than a 10% fall. It is certainly important that the estimates be presented with and without the quality adjustment (as here in Figures 4 and 5).

**Figure 5: Effect of Quality Adjustment on Measured UK Health Care Output and Productivity**



Source: Data supplied by UKCeMGA

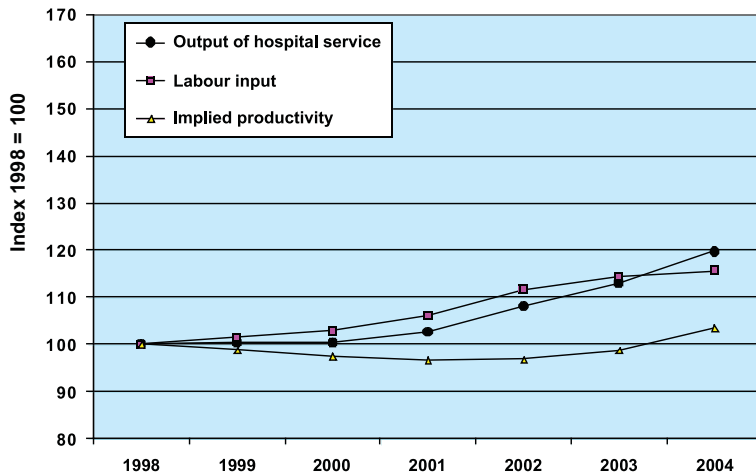
### 3. Future Challenges

What are the implications of this analysis for the future of the NHS? There has been a large increase in health care output since 1997. This output growth has been achieved by a still larger increase in inputs. Even if the UK public finances had not taken a serious turn for the worse, such an increase in inputs could not be sustained. While pledges have been made to protect health care from public spending cuts, the continued growth of health care is going to depend crucially on what happens to productivity. It is with the medium term prospects for productivity that I begin.

**Medium-term prospects for productivity**

Can productivity gains come to the rescue? There are some grounds for optimism. Output may respond with a delay to increased inputs. Training takes time, and new teams may take time to develop efficient working relationships. New facilities may take several years before they are operating at full capacity. The output series in Figures 4 and 5 may therefore continue upwards even if there is a pause in the rise of inputs. The UK may follow the experience of the Netherlands where, according to the estimates of A G Chessa and F J Kleima of Statistics Netherlands for the hospital services, shown in Figure 6, output did indeed continue to rise after the increase in inputs levelled off. (This may of course be associated with the particular Dutch institutions and institutional changes.) Moreover, while technological progress shifts the frontier outwards by improving best practice, there may be larger gains in productivity to be achieved by moving actual practice closer to the frontier. There may be considerable scope for improving productivity by concentrating on the less well-performing.

**Figure 6: Outputs and Labour Productivity in the Netherlands Hospital Health Services**



Source: Chessa and Kleima (2006), Tables 1 and 2

On the other hand, there are also grounds to doubt whether we can expect productivity to go on rising. There may be diminishing returns. I referred earlier to health promotion campaigns to reduce smoking. There can be little doubt that, as the proportion of smokers falls, it becomes progressively more difficult to reduce smoking prevalence. As one seeks to reach more and more recalcitrant smokers who are harder and harder to persuade, there is a smaller reduction per pound of health promotion expenditure. The same may well apply to many medical procedures. The ONS publication on *Trends in avoidable mortality in England and Wales, 1993-2005* shows a steep fall in deaths (before the age of 75) from causes that are considered amenable to medical intervention. It could be that ever-more medical resources are going to be required per quality adjusted life year (QALY) added.



Moreover, the provision of health care is a labour-intensive activity where there are limited possibilities for reducing the human input. Health care is a sector subject to the “Baumol effect”, named after the American economist William J Baumol. The situation is less extreme than Baumol’s original example of a string quartet: the same number of musicians are needed today to play a Beethoven quartet as when it was first performed. But in health care the essential human element means that labour productivity is likely to rise less fast than in other sectors of the economy. The health sector cannot be expected to show the same productivity gains as, for example, telecommunications.

These considerations taken together suggest that, while improved productivity should be a priority for the NHS management, productivity gains cannot be taken for granted and future policy should be planned on the more cautious assumption of zero productivity growth. It may also be that NHS allocation policy involves trading off to some degree the levels of output against questions of equity, which I come to in the final part of this session. Before that, however, I would like to consider the implications of a zero productivity growth rate.

### **Complementarity and Principle C**

If there is no productivity growth in the health sector, while productivity is rising in the rest of the economy (leaving aside string quartets) and this productivity increase is translated into commensurate wage rises, then market forces are going to lead to rising wages in the health sector too, since otherwise the supply of doctors and nurses will – at least in the long-run – dry up. This means in turn a rising cost per unit of activity in the health sector (remember that there is by assumption no improvement in productivity to offset the wage increases). Each unit of health output costs more. What however does this imply? Does the rising “supply price” mean that the NHS should be scaled back?

At this point I would like to return to Principle C of the Review, which referred to the *complementarity* between public and private outputs. This has been rightly criticised for a confusion for which I take full responsibility. The report referred to the fact that, as the private economy, grows, so too does the value of government output. If a university degree adds X per cent to lifetime earnings, then it adds X per cent of a larger number (in real terms) today than a generation ago. The value of a QALY rises over time in real terms. This still seems correct to me, but I now believe that it was a mistake to suggest that this should be attributed to the quantity side of the account. (In defence, I would note that the separation of price and quantity is far from straightforward, and there are some cases – like the fire service – where the original argument is more defensible.)

Rather than modifying the output calculation, therefore, the complementarity principle should be seen as answering the question with which I began this sub-section. The supply price may be rising, as a consequence of the lack of productivity increase, but the complementarity between public and private sectors means that the “demand price” is also rising. Health care is becoming more expensive, but people are willing to pay more for its benefits.

To make this more concrete, let us take a highly stylised example. Suppose healthcare is simply designed to reduce sickness absence. In this hypothetical world, people either work

in the marketed output sector or they work in the health care sector making sure that the first group have a minimal time off work. Wages are the same regardless of the sector of employment. The government is deciding on the size of the health sector labour force (referred to simply as “doctors”). In reaching a decision, the government balances the cost of the health staff against the benefit from the improved work attendance of the rest of the labour force. In this stylised world, the balancing act will give the same answer irrespective of the level of wages. It may be that in 20 years time doctors will be paid more and the people in the labour force will be paid more, but both sides of the equation will rise by the same amount, and it should therefore not change how one thinks about the importance of employment in the health service. The cost of getting people back to work is higher on account of increased pay for doctors, but the benefit from reduced sickness absence in terms of not having to pay replacement workers is higher by the same proportion.

In pursuing this argument, I have gone beyond the measurement of health output to the underlying question of how much a society should spend on the NHS. This is indeed the fundamental issue. My simplified example illustrates the balance that has to be struck between costs and benefits, a balancing act that confronts policymakers in the same way in the real world. The balance struck will be affected by the rate of productivity growth in health care, but it will also be affected by the fact that the financing of the NHS requires tax revenue, and that raising taxes has economic and political costs. At the present time, the fiscal considerations may appear overwhelming, but the longer term requires a cooler judgment. John Marshall, first Chief Justice of the US Supreme Court is often quoted as saying that “the power to tax is the power to destroy”, but the US Supreme Court also ruled that “the power to tax is the one great power upon which the whole national fabric is based. ... It is not only the power to destroy, but it is also the power to keep alive” (Nicol vs Ames, 1899). Of course, higher taxes mean that households have less to spend on private consumption, but the effective choice is not between public and private spending on health but between public spending on health and private spending on other goods and services. Looking backwards, did UK households really want to increase spending on financial services at *twice* the rate of spending on health care?

### **Health equity**

I come in this final part to the last word in my title: equity. My focus has so far been on health output as an aggregate, but society is of course concerned not only with how much output gets produced but also with who benefits from the output. The issue of health equity was a longstanding concern of the sociologist Peter Townsend, who alas died a few days before this lecture, and who was a key member of the committee chaired by Sir Douglas Black that produced the famous Black Report of 1980 on *Inequalities in Health*. The then Government was not receptive, but the Labour Government elected in 1997 established an inquiry led by Sir Donald Acheson that published its findings as *Independent Inquiry into Inequalities in Health* (Acheson, 1998). This led the Department of Health to set national targets for the reduction of health inequalities; and these have been the subject of a recent review *Tackling Health Inequalities 10 Years On* (Department of Health, 2009). The report of the WHO Commission on Social Determinants of Health (Marmot, 2008) was followed by the establishment of a UK Commission chaired by Sir Michael Marmot, with the remit of carrying out a Strategic Review of Health Inequalities in England Post 2010. (I served as a member of this Commission.)

The subject of health equity warrants a lecture in its own right. Here I want to make only two points in the space that remains. The first relates to the term “health inequalities”, which appears in the three titles cited above. The parallel with income or wealth inequalities might suggest concern with the fact that some people enjoy good health and others suffer from poor health – just as some people enjoy comfortable incomes and others are below the poverty line. The parallel between health status and income is however incomplete, and potentially misleading, as I have argued elsewhere (Atkinson, 2009). Indeed it is not simply differences in health status that people have in mind when they use the term “health inequalities”; rather, they are concerned about the fact that health differences are associated in a systematic way with socio-economic status or income level. This association is typically presented in terms of a gradient showing that, on average, health status or life expectancy improves with income or socio-economic position. The Acheson inquiry, for example, reported that in England and Wales in the early 1990s the mortality rate of unskilled men aged 20-64 was almost 3 times as high as that for men in the professional class. This is not just a matter of health differences: that some people die at younger ages than others. Health differences are to a degree inevitable and are not necessarily an indication of injustice. What is unjust is the fact that health is associated with economic or social status. Clarity would therefore be better served if a different term were to be applied to this gradient, and I have suggested elsewhere (Atkinson, 2009a) that the health gradient is referred to as “health inequity”. In statistical terms, I am distinguishing between health *inequalities* (in terms of second moments, the variance of health status) and health *inequity* (positive correlation between health and socio-economic status).

The second point concerns the empirical implementation of equity considerations, an issue addressed by UKCeMGA (Jones, 2008). As is rightly stressed, such considerations do not enter into the national accounts which deal with aggregates, but can legitimately be a concern when measuring productivity. The performance of the NHS has to be judged in the light of its objectives and these include tackling health inequity. Moreover, there is a clear precedent, as noted by UKCeMGA in that the HM Treasury Green Book that provides guidance on the evaluation of spending projects states that “in principle, each monetary cost and benefit should be weighted according to the relative prosperity of those receiving the benefit” (HM Treasury, page).

Pursuing this parallel suggests a way forward. If policymakers are concerned that those in the bottom 20% suffer poorer health than those in the top 20%, then this could be recognised by giving a larger weight to those parts of health output that benefit those in the bottom 20%. In his work on “distributionally-adjusted national income” Amartya Sen has proposed as a modification of national income calculations that incomes be weighted according to the recipient’s rank in the distribution. For example, distinguishing five income groups, the top 20% would get a weight of 1, the next 20% from the top would get a weight of 2, the middle 20% would get a weight of 3, the next 20% a weight of 4, and the bottom 20% would get a weight of 5. Along these lines, it would be possible for ONS in its productivity articles to calculate distributionally-adjusted output of the NHS. In this way, if policy has shifted resources towards services or areas benefiting the more deprived, then this would be reflected in a faster growth of adjusted output.

Such a distributionally-adjusted output measure would require information on the utilisation of the health services by income class or by socio-economic group. The question as to who gains from public spending has long been the subject of debate and research – see for example Le Grand (1982). The estimates of the social wage, based on survey data, by Sefton (2002, Table 7) showed that in 2000/1 the bottom 40 per cent in terms of income received 50 per cent of the benefits from the NHS, a figure that had increased by 1.7 per cent since 1996/7. Applying the rank order weights described above, over this four year period distributionally-adjusted NHS output would have increased by some 1 percentage point more than output measured without such an adjustment.

## Conclusions

This lecture has ranged widely. In time, I have moved from Sir William Petty's seventeenth century political arithmetic to speculations about the evolution of UK health care output over the 2010s and consideration of long-term expenditure planning. In scope, I have concentrated on the health service, but I have dealt with issues relevant to all sectors of the economy, and have drawn a specific parallel with another sector under the spotlight: financial services.

I draw a number of conclusions. The first is that statistics on the output and productivity of the NHS are central to political debate, and I have argued that national statistics need to be provided with as much protection as possible against political manipulation. To this end, agreement on a prior set of principles, of the kind proposed in the Review and outlined in this lecture, seems essential. The principles do of course need to be kept under review, and I have suggested that one of those set out in my Report needs to be reconsidered. But I believe that they have proved to be a solid foundation.

The second conclusion is that there has been major progress in the measurement of UK health output and productivity. The first attempt by the ONS to implement direct output measures was pioneering but limited. The methodological changes introduced in the past 5 years have provided a more comprehensive or richer treatment. Quite a lot remains to be done, and the issue of quality change is one that poses a major statistical challenge – not just to the health sector but to most areas of output and price measurement.

The third conclusion is that in the UK health service in recent years measured output growth failed to keep pace with the increase in measured inputs. The ONS estimates show that productivity, in terms of the relation between outputs and inputs, fell by 10 per cent over the period 1997 to 2007 or by 5 per cent when adjustments are made for quality change. Looking to the future, there are some reasons to expect the volume of output to continue upwards even if there is a pause in the rise of inputs. But in the medium-term there are reasons why health care cannot be expected to yield the same rate of productivity increase as the economy as a whole. Taking these considerations together, future policy should be planned on the cautious assumption of zero productivity growth.

Zero productivity growth implies that, as wages rise, the provision of health care becomes relatively more expensive. At the same time, as identified in the principle of

complementarity between the public and private sectors, the output of the NHS becomes more valuable. The fourth conclusion is that this complementarity needs to be taken into account, not in the measurement of output, but in the determination of the proper level of spending on the NHS. Health care is becoming more expensive, but as society becomes richer as a society people are willing to pay more for its benefits.

The fifth conclusion concerns health equity. The national accounts do not take into consideration issues of distribution. However, health equity is an important objective of the NHS and when assessing its performance distributionally-adjusted measures of output need to be explored.

In this respect, and throughout the lecture, I have tried to emphasise that health policy and the measurement of the performance of the NHS should be seen as part of wider social and economic concerns.

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