

OPI-ESRC Seminar Series on Health Services Productivity

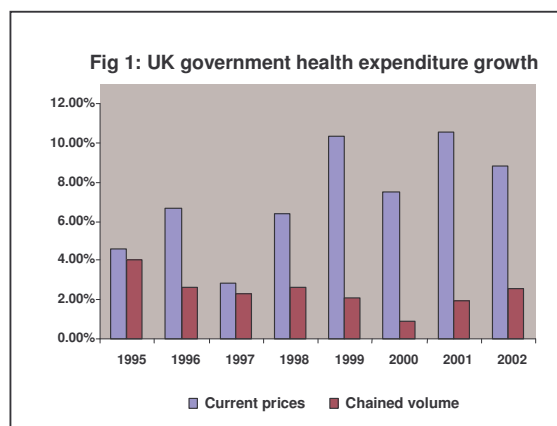
Improving Measurements of Health Service Output
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Summary

Earlier measures of healthcare sector output employed in the UK National Accounts were unable to capture rates of innovation or technical substitution, a phenomenon prevalent in the treatment of some diseases. In the light of this, this presentation described a new measure based on 'episode of illness', and illustrated its application to the treatment of coronary heart disease.

Background

The accurate measurement of health output is important, as expenditure on healthcare in OECD countries is a significant proportion of GDP. In the UK, it represents around 8 percent of nominal GDP (Fig 1). This however is challenging, given the complex nature of both health and health services. Hence, this presentation outlined a new method of measuring health output: 'Episode-of-Illness', and described its application to coronary heart disease. It was argued that this measurement technique might improve upon existing methods by better accounting for both technological change (improved efficiency and substitution), and quality adjustment (health outcomes and patient experience). The method draws upon the work of Pritchard (2003), and the Atkinson team, who will produce a final review of UK government services output in Jan 2005. The theoretical foundations of the work are based upon US literature¹²³⁴ - and an attempt is made to apply it to the UK context.



¹ D. M. Cutler, M. McClellan, J. P. Newhouse, D. Remler. "Pricing Heart Attack Treatments". *Medical Care Output and Productivity* (D. M. Cutler and E. R. Berndt, 2001, pp. 305 – 361).

² R. G. Frank, E. R. Berndt, and S. H. Busch. "Price Indexes for the Treatment of Depression". *Measuring the Prices of Medical Treatments*, (J. E. Triplett, 1999, pp. 72-102).

³ I. Shapiro, M. D. Shapiro, D. W. Wilcox. "Measuring the Value of Cataract Surgery". *Medical Care Output and Productivity* (D. M. Cutler and E. R. Berndt, 2001, pp. 411 – 438).

⁴ J. E. Triplett. *Measuring the Prices of Medical Treatments*, 1999

Measurement methods in the UK

Before 1998, health service output was measured by:

$$\text{Health output} = \frac{\text{Total current health expenditure}}{\text{Composite healthcare deflator}}$$

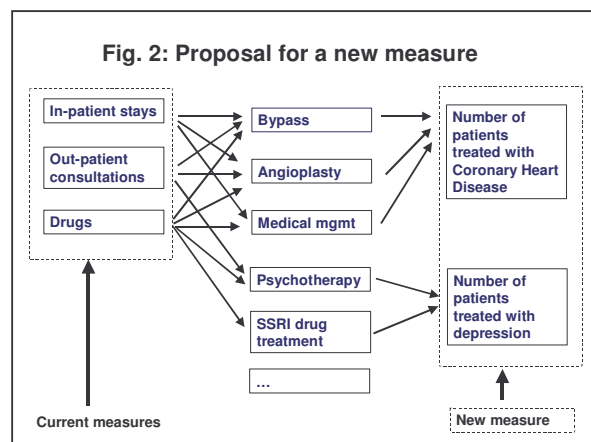
This measure was regarded as problematic for two main reasons. First, the deflator was based on input costs rather than output prices, and second, it failed to consider any data on volumes. A crucial implication is that with this measure productivity would always be constant by definition. This gave rise to a new measure, the Cost Weighted Activity Index (CWAI), a measure which is still used.

$$\text{CWAI} = \sum \frac{\text{Expenditure on area in base yr}}{\text{Total expenditure in base yr}} \cdot \frac{\text{Activities in area in current yr}}{\text{Activities in area in base yr}}$$

This measure requires that health services be grouped by categories (areas). The classifications which have typically been used are based on the administration of service delivery (in-patient, out-patient). The growth rates in the individual activity areas are then weighted using their expenditure share. Although this measure represents an improvement upon earlier measures, it has raised a number of concerns. First, questions arise regarding the activity classification, since these have been motivated largely by administrative convenience. Second, the activities chosen represent “throughputs” rather than outputs. Third, the index fails to consider health outcomes, and finally, it works poorly in areas where technological change and treatment substitution are important.

A new measure: Episode of Illness

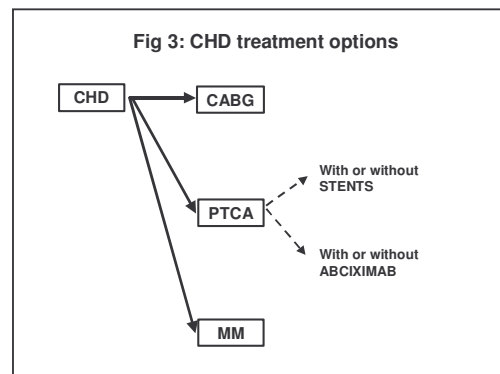
A new measure based on activities related to an “episode-of-illness” has been proposed to address these shortcomings. According to this new measure, the unit of output is the number of patients treated, where ‘patient treated’ refers to a full course of treatment. Patient cases are aggregated by diagnosis and output growth rates for different diagnoses are weighted on the basis of expenditure shares. It is important to



emphasize that since aggregation is by diagnosis, and not by treatment, different treatments for the same diagnosis are grouped in the same category and weighted according to medical efficacy (Fig 2). Thus, this method improves upon CWAI by adopting a patient perspective. It computes the number of patients treated, rather than the number of activities performed. In addition, it accounts for technological change in terms of increased efficiency and treatment substitution, while incorporating quality adjustments in terms of improved medical outcomes or patient experience. In spite of these advantages, however, it is important to recognise that this measure is data intensive, costly and possibly untimely.

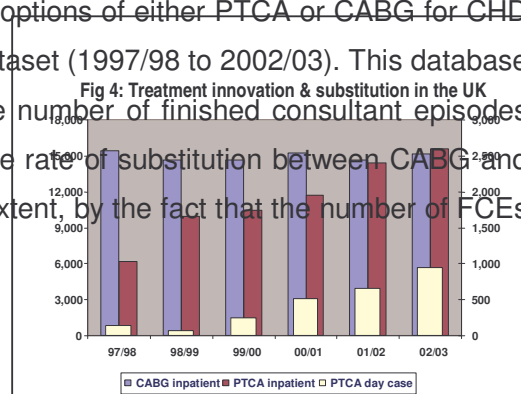
An application to coronary heart disease

This new measure has been applied to coronary heart disease (CHD) in order to assess its potential as a measure of health outputs. CHD was considered an appropriate disease, given the scope for treatment options involving both technical substitution and innovation. Specifically, there are three main treatment options (Fig. 3). The first, coronary



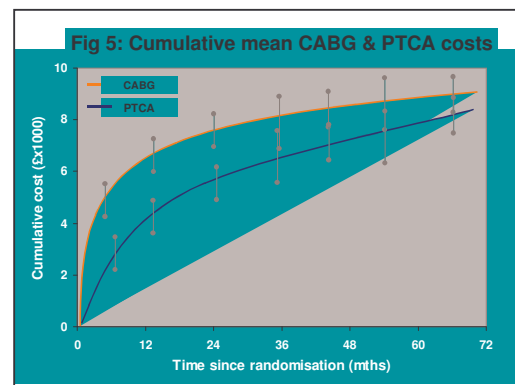
artery bypass grafting (CABG), is a surgical procedure, which involves replacing narrowed coronary arteries with veins obtained from the patient's lower extremities. The second, percutaneous transluminal coronary angioplasty (PTCA) is an operation for enlarging an artery by inflating and withdrawing a balloon through the narrowed region. PTCA can be applied with or without the use of *stents* (a tube made of metal or plastic) or *Abciximab* (a powerful anti-clotting drug that inhibits platelet aggregation). The third treatment option is medical management (MM), which involves predominantly the use of beta-blockers and long-term nitrates.

The number of patients treated with treatment options of either PTCA or CABG for CHD was analysed using the UK Reference Cost dataset (1997/98 to 2002/03). This database for NHS hospitals provided information on the number of finished consultant episodes (FCEs) for PTCA and CABG and quantified the rate of substitution between CABG and PTCA. The results were compromised, to an extent, by the fact that the number of FCEs



were different from “number of patients” as it is possible for patients to see more than one consultant per episode. Hence, it was not possible to distinguish between FCEs for the first or later revascularisation procedures. In addition, no information was provided on medical management, and the use of stents or Abciximab was unspecified. Nevertheless, the results show a rapid growth in PTCA, both as an in-patient and as a day case procedure and little growth in CABG (Fig 4). This suggests growth in surgical treatments for CHD, and a relative substitution of PTCA for CABG. In addition, medical studies suggest that there is no significant difference in outcomes between the two types of treatment in terms of risk of death or subsequent myocardial infarction.

Two studies have been carried out to compare the costs of CABG and PTCA with long-term outcomes. A trial was conducted in the UK, by Henderson and associates,⁵ and involved CHD patients who were assigned randomly to PTCA and CABG and had been followed for over 6.5 years. The analysis showed that there was no significant difference over a five-year period between CABG and PTCA in either death rates or the occurrence of non-fatal myocardial infarction (MI). Although a single PTCA is cheaper than a CABG, because of repeated PTCA interventions, cumulative healthcare costs were lower by less than 5 percent in PTCA patients (Fig. 5), and the difference statistically insignificant. Although CABG was more expensive and more invasive, it was associated with both a lower prevalence of angina and lower readmission rates.



A second paper on the National Service Framework for CHD by Vella⁶ reports the results of two studies: the RITA-1 (UK) – covered by Henderson and associates - and the EPISTENT (North America) trials. It defined typical treatment pathways and the ex-ante outcome probabilities and it compared the costs and benefits in terms of QALYs for CABG and PTCA, with and without the use of stents and Abciximab. This data suggested that Stents and Abciximab appear to improve outcomes when added to

⁵. Henderson et al. (1998) Long-term results of RITA-1 trial: clinical and cost comparisons of coronary angioplasty and coronary-artery bypass grafting, *The Lancet*, Vol 352, 1998

PTCA. However, the paper did not compare PTCA and CABG treatment outcomes directly. Vella also confirmed the higher readmission rates associated with PTCA: while there was only a 7 per cent chance of CABG patients requiring further treatment, there was a 33 per cent chance of readmission among PTCA patients. This suggested that there may be benefits from incorporating the probability of re-admission into the quality weighting adjustment. In fact, Henderson et al. suggest that the increased probability of a second intervention after PTCA may balance the fact that CABG is more invasive and more expensive than PTCA.

Conclusion

An “Episode-of-illness” approach to output measurement could be used to improve health service output measures. Its main benefit, based on aggregation by diagnosis, is in analysing substitution between treatments quantifying different treatments of the same disease in terms of outcomes. This is particularly advantageous when innovation is rapid. However, the widespread use of this measure would require much more detailed, patient-level data. In addition, the quality of research would be improved if FCEs could be reconciled with both the number of patients treated and new treatments. Additional datasets are currently being reviewed in the ONS.

Discussion

During the discussion, concerns were raised about the ability of this measure to take into account patient experience, particularly in relation to the quality in the process of care. In this regard, the speaker stressed that although the importance of this was well known and a possibility would be to incorporate results from qualitative surveys conducted on UK patients. In any case, the author noted that it was difficult to construct a methodology which would account for all of the factors that were regarded to be important and that the arguments in favour of the new measure were not intended to imply that it would replace other measures in aiding the development of policy.

Another concern brought forward was that this measure might lead to preferences by hospital managers for cheaper interventions. Such perverse incentives were a common outcome of incomplete attempts to measure costs in relation to service outputs. In this regard, the speaker argued that this measure did not remove the need to analyse both

⁶ Vella (2003). Potential Costs and Effects of the National Service Framework for Coronary Heart Disease in the UK. *Pharmacoeconomics*, 21(1): 49-60, 2003

costs and outcomes. Indeed, more expensive treatments might be preferred if the outcomes were superior.

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Acknowledgments: The figures are taken from Nicola Mai's presentation at the seminar. Further details can be obtained by contacting Nicola Mai at nicola.mai@ons.gsi.gov.uk