

OPI-ESRC Seminar Series on Health Services Productivity

Measuring health service productivity in developing countries: methods

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Summary

Ratio, accounting, statistical and frontier methodologies for estimating health service productivity were reviewed and assessed based on circumstances typically found in low income countries; mainly that cost and data constraints are likely to be greater than in richer countries. There is no single measure that captures all aspects of productivity and the choice of method will depend on the use for which it is intended as well as on the data available and their quality. The problem of measuring service quality and relating it to cost remains a significant unresolved issue.

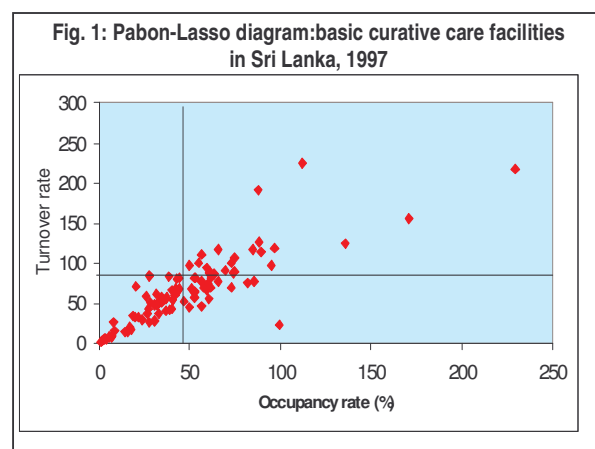
Background

The measurement of health service productivity in developing countries poses specific challenges in addition to more general measurement difficulties. These may compromise the validity of the information produced and render comparisons invalid. Record keeping may also be incomplete and poor; it may be difficult to control for quality and it is often impossible to make generalisations at a national level due to large internal variations. In addition, very little work has been done on the impact of private sector costs on public sector productivity.

Measurement approaches

Ratio measures

The simplest measures are based on ratios: the number of outpatient visits per doctor or nurse, or in the case of inpatient care, average length of stay, bed occupancy and turnover rates.¹ Differences across facilities, between and within countries, can be compared through the use of the Pabon-Lasso diagram. An example is shown for Sri Lanka in Fig. 1. This diagram is divided into 4 quadrants. The southwest shows capacity under-utilisation and low



1. The last three are often combined.

turnover, compared with the northwest quadrant, which shows high utilisation and high turnover rates. Although ratio measures are easy to estimate using data that is available routinely, they have limited utility, largely because they usually focus on only one type of hospital activity. This is problematic given the multi-dimensional nature of hospital services. In addition, inpatient and outpatient activities cannot be aggregated and comparisons between hospitals offering different patterns of inpatient care are not valid.

Accounting methods

This type of measure provides unit cost estimates of, for example, admissions, bed-days, surgical procedures and outpatient visits. Such estimates can be produced using aggregated data or by step-down analysis where the cost of inputs (staff, drugs etc.) from different cost centres (wards, OPD, pharmacy etc.) are attributed to the services being provided by each cost centre.² The main advantage of this method is that the average service cost estimates are often used in financial analysis documents such as National Health Accounts. The main limitation of this approach is that estimates usually reflect only average costs (AC) and not marginal costs (MC), unless these are analysed separately. Inferences about economies of scale and scope therefore cannot be made since AC will only coincide with MC under conditions of constant economies of scale.

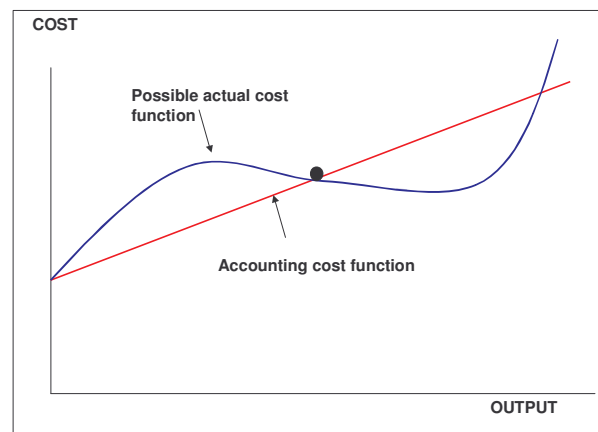


Fig. 2: Accounting cost function compared with actual cost function

Statistical methods

These measures use the estimated residuals from OLS estimates of cost or production functions to measure inefficiency. Their advantage over accounting methods is that non-linear functions do not assume constant economies of scale (Fig. 2), and hence provide a better understanding of how costs respond to differences in service mix, input prices and the scale of operation. Their limitation stems from the fact that all positive deviations from the predicted cost of output are interpreted as inefficiency, which may not be the case.³ In addition, they assume that the technology or cost function is the same both at the frontier and in the middle of the data. A further problem is that the estimated residuals are sensitive to the choice of functional form.⁴

2. Overheads need to be attributed to each cost centre. This may be difficult.
 3. COLS estimates adjust for this weakness. See note on January seminar in this series.
 4. Developing countries examples in which this measure has been employed can be drawn from Sri Lanka (Somanathan et al., 2000), Bangladesh (Rannan-Eliya and Somanathan, 1999), PNG (JSI, 1988), and Nigeria (Wouters, 1993).

Frontier Approaches

Stochastic frontier analysis (SFA) SFA attributes any deviation from optimal performance to either random or systematic sources of inefficiency by decomposing estimated residuals into the stochastic and systematic variations. SFA's limitation stems from its reliance on untestable assumptions about the distribution of the error components. This increases the possibility of a specification error.⁵

Data Envelopment Analysis (DEA) DEA employs linear programming to estimate the "best practice frontier" through the use of observed inputs and outputs. The efficiency of each provider is determined by its position relative to the frontier. DEA has the advantage of being a non-parametric method and is therefore not subject to the specification error. Its disadvantage is that it estimates the efficiencies of the best performing units in that class, and the entire residual (distance from frontier) is attributed to inefficiency.

Discussion

The choice of measurement method depends largely on the audience, the use of the estimates and the data available. For example, while both cost functions and ratios are often required by policy makers, ratios can often be calculated using only the data that exists in low-income country hospitals. In addition, it is important that the information provided is understandable and is calibrated with experience 'on the ground'. Furthermore, it is necessary that the interpretation of the results obtained from all approaches be tempered by an understanding of the chosen method's limitations. There is insufficient information available at present to estimate the impact of these limitations accurately. It may be best to use a number of methods and then piece together the picture from the results. Finally, it should be recognised that the inconsistent nature of the data captured often renders it useless for purposes of comparison between facilities within a country and between countries.

It is often more difficult to estimate private sector healthcare costs since data is often shrouded in secrecy. This may be because the structure of ownership does not offer any incentives to reveal commercially sensitive information either to the public, or to other private companies. In addition, it might be that the costs incurred in the private sector are a poor basis for comparison with the public sector because private operations focus more on cost containment since funding is generally not derived from government sources. On the other hand, in resource-constrained circumstances, public sector managers should be keenly aware of costs. This question bears on the merits of commissioning services from the private sector. As yet there is no clear evidence for the relative efficiencies of the public and private sectors. However, the issue needs to be considered in the context of the long-term goals of the public health facility. For example, if the aim is to decrease fixed costs, then purchasing services from the private sector that are comparatively cheaper should enable this to occur. However, if the aim of outsourcing is to reduce long-run average costs, then merits are harder to justify, taking into account contract management costs.

5. Examples from developing countries include Liu (1995).

The relationship between quality and cost is an important, unresolved question. In the first place, the cost implications of meeting minimum quality standards are unknown since the link between quality and outcomes is unclear. Second, although there is increasing interest in quality, the focus has been largely on clinical quality improvement and other areas such as productivity improvement, quality as perceived by the patient and relationships between technical quality and productivity over time have been neglected. In addition, there are substantial difficulties in measuring quality in developing countries. Although measures such as mortality rates have traditionally been used, these may be affected by demand side distortions. For example, mortality rates in public hospitals may be higher than in private hospitals simply because private hospitals will not accept patients with complications. It is therefore necessary to exercise care when using mortality rates as a measure of the relative efficiency of private and public health facilities.

Further reading

Barnum, H. and Kutzin, J. 1993. Public hospitals in developing countries – Resource use, cost and financing. Published for the World Bank. The Johns Hopkins University Press: Baltimore and London

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Acknowledgments: The figures are taken from Aparnaa Somanathan's presentation at the seminar. Further details can be obtained by contacting Aparnaa Somanathan at asomanat@hsph.harvard.edu.

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