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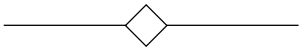

Hospital input price indexes in Australia: Are they worth the effort?

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Abstract

This paper summarises aspects of the design and use of hospital input price indexes, and describes four indexes produced in Australia in the last decade. It argues that there would be some benefit in establishing a routine national index, if it were designed to be low-cost.

However, care should be taken to avoid excessive reliance on the results in the resource allocation and funding context. Input prices contribute relatively little to hospitals' expenditure changes. It is also necessary to monitor and manage changes in the volumes of inputs, and this is likely to be a more rewarding task.

Concepts and definitions

A hospital input price index is a tool which measures the change over successive periods in prices paid by hospitals for the resources required to create their products. There are seven main attributes, as follows.

First, there is the frequency of updating, which is usually quarterly or annual. Increased frequency tends to produce more useful results, but there is a compensating increase in operating costs (Cymer 1988).

Second, there is the scope of the inputs. It is beneficial to cover all types (consumables, labour, buildings and so on). However, there may be

circumstances in which the monitoring of some types of inputs is not worth the effort (such as when the prices are not able to be controlled, or if they vary hardly at all).

Third, inputs may be categorised at varying levels of detail. At one extreme, each of the many thousands of items may constitute its own expenditure category. At the other, only a few major aggregations may be studied such as nursing labour, medical labour, consumables, and other.

There should be sufficient categories to ensure that items in the same class are similar in terms of physical manifestation, use, and nature of price movements; and that the results can be disaggregated to meet users' analytical needs. Ten to fifty categories are normal for hospital indexes. One limiting factor is that it becomes more difficult to obtain expenditure data from many hospitals in a consistent form as the number of categories increases.

Fourth, there is categorisation of the purchasers, which are hospitals in this context. There could be a single index for all Australia. Alternatively, hospitals may be categorised by State, ownership, size and so on. More detail in the results may be helpful for analytical purposes, but increases the costs of operation (Cromwell 1988).

Fifth, there is the method of computation of averages. Each input type may experience a different price change. It is normal practice to compute the overall change as a weighted average, where the weights represent the relative contributions of each input type to total expenditure. The most common approach is the Laspeyres index, which has the form

$$I_t = \sum_i (P_{it} / P_{i0}) * W_i$$

where $W_i = E_{i0} / \sum_j E_{j0}$

and P_{i0} the price of item i in period 0

P_{it} the price of item i in any subsequent period t

E_{i0} the expenditure on item i in period 0

whereby the price changes for component items are weighted in proportion to their shares of expenditure in the base period. Thus it measures the effect of price changes on expenditure that would have been experienced if the hospital had

purchased the same mix of products in period t as it actually purchased in the base period.

Another common approach is that used in the Paasche index. Its form is identical, excepting that current period (E_{it}) rather than base period expenditure (E_{i0}) terms are used. It therefore measures the effect of price changes on expenditure which would have occurred if the hospital had purchased the same mix of products in the base period as in the current period. If the mix of inputs is changing, the results of Paasche and Laspeyres indexes may be quite different.

Both measures are potentially useful, although they are hypothetical to some degree. Hospitals tend not to purchase items in the same proportions between successive periods. The Laspeyres approach is generally preferred, mainly because it is easier to obtain base period expenditure data.

Sixth, there is the method of updating if a Laspeyres index is used. The expenditure weights become progressively less relevant as a consequence of changes in clinical practice and technology. It is therefore necessary to re-base from time to time (that is, to redefine the base period and to adjust the expenditure weights accordingly). Disruptions in the time series may be partially overcome by splicing techniques (whereby the effects of re-basing are distributed over several periods).

Seventh, there is the method of data capture. The effort can be reduced by using proxy measures, that is, measures of price change derived for another purpose. For example, rather than asking hospitals to report the prices they paid for foodstuffs, use could be made of another source such as the consumer price index, which routinely measures changes in the prices of foods and most other goods purchased by the community at large (Australian Bureau of Statistics 1993). However, the data capture effort is reduced at the expense of loss of validity.

In most production contexts, the key design issue concerns the method of sampling. There are three aspects to be considered: items, events and purchasers.

In the hospital context, the sampling of items is of particular importance because of their great variety. The subset of items whose prices are measured is termed the schedule or the market basket. Factors to be taken into account include the size of the item's contribution to total expenditure, price variability, price unpredictability, and representativeness.

The sampling of purchasing events involves selecting records of purchases in the period, for each item in the schedule. When sampling hospitals, account must be taken of intended uses. For example, if the results are to be used to support

changes in diagnosis related group (DRG) payment rates, it will be important to sample in such a way that casemix variations are taken into account.

There are three main kinds of uses. First, there is management of the acquisition process (say, evaluation of different methods of purchasing). Second, indexes may be used to control for input price change so that other relationships can be investigated. For example, McMenamin (1990) studied changes in doctors' charges for United States Medicare beneficiaries and found that there were many locations where charges were poorly correlated with input price movements. Similarly, Ensor (1992) controlled for price in order to assess the contribution of generic competition and the introduction of new drug entities on future drug expenditure.

The third application is the most common: facilitation of health care funding (or payment for hospital products). Changes in payment rates might be directly linked to input price changes. A more general goal is enhancement of understanding of the causes of expenditure change so that informed negotiations may take place with respect to hospital charges.

Most OECD countries make use of hospital input price indexes. For example, Canada has several partial indexes, including one described by Hall and Jacobs (1991) which monitors hospital equipment. France and Germany monitor drug purchases (Gross et al. 1994), whereas Sweden has a relatively crude index which covers all types of inputs.

The United States makes more use of input price indexes in the setting of hospital payment rates than does any other country. Many are local. For example, Massachusetts uses the state consumer price index to update its Medicaid rates, whereas New Hampshire and South Dakota use their own state-specific hospital input price indexes. The larger commercial insurers tend to have their own indexes, but most use modifications of federal or state government indexes.

Some indexes cover only a subset of purchases. For example, Holloway and Reeb (1989) developed an index for biomedical research and development. They found that it produced much higher estimates of price inflation than are able to be derived through using components of other indexes not specifically designed for the purpose (such as the consumer price index).

The most important United States index is that maintained by the Federal Government's Health Care Financing Administration. It began to monitor input prices with some rigour after 1965, when its health expenditure increased dramatically as a consequence of the expansion of eligibility through initiation of the Medicare and Medicaid programs (Freeland, Anderson & Schendler 1979). Price changes have been reported on a quarterly basis since 1977, and

five-year projections of expected changes have been routinely published since the mid-1980s (Donham, Maple & Sensenig 1994).

Major enhancements were made in 1979, when legislation was introduced which required automatic adjustment of Medicare payment rates each year to '...reflect the average increase in the prices of the goods and services used in provision of care'. Further changes were made in 1983, when the Health Care Financing Administration introduced its DRG-based prospective payment system. They included adjusting the schedule, so that it reflected only those goods and services included in the PPS payment. The index was re-based in 1991 (Freeland et al. 1991). In 1994 the index was revised to take account of capital costs (which had been excluded from the DRG payment until 1993).

Australian hospital input price indexes

Several indexes have been developed over the last two decades. Most have been restricted in scope. Some have been used for a period, and then abandoned.

All State health authorities have made attempts to monitor input prices, but South Australia and New South Wales have made the greatest effort in recent years. The South Australian Health Commission began a Laspeyres index in 1982, with design support from the Australian Bureau of Statistics (ABS). The core was direct measurement of purchase prices from hospital and group supplier sources, but use was also made of proxies from the ABS. The index was abandoned in 1988 as part of a policy of reduction of central office costs.

New South Wales initiated a sophisticated index in 1993, for the purpose of establishing a more rational basis for budget negotiations between the State Treasury, the department, and area health services. A particular concern was acquisition of high technology items from overseas, because it was suspected that indexes not specific to health were insufficiently sensitive to fluctuations in exchange rates.

The index is operated by the State office of the ABS, and is restricted to the purchase of goods and services by public hospitals. Items out of scope include wages and salaries, repairs, maintenance and renewals. Results are published quarterly for three hospital categories: teaching, other metropolitan, and non-metropolitan.

Four main sources of data are employed. First, data on purchases covered by statewide contracts are obtained from the department's Supply Service. Second, inputs obtained from a small number of suppliers are captured directly from those suppliers. They include water and sewerage, electricity and gas. Third, price

data for drugs, instruments, and pathology services and supplies are obtained directly from sampled hospitals by way of a questionnaire. Finally, use is made of proxies from the ABS (and particularly from the consumer price index).

The only routine index which covers private hospitals is that operated by the Australian Private Hospitals Association since 1991. It is relatively low-cost, and depends almost entirely on proxy measures from the ABS.

An Australia-wide index was developed by the Commonwealth Department of Human Services and Health in 1994 for the purpose of taking account of the effect of changes in hospital input prices when computing the cost weights for Version 3 of the AN-DRG classification (Newman & Hindle 1995). The National DRG Cost Weights Project had previously produced weights for Versions 1 and 2 from 1992–93 data from 97 hospitals (KPMG Peat Marwick 1994). These data were used again, but with several changes, including updating of the starting costs by cost centre prior to repetition of the cost allocation process. It has therefore been possible to take account of differential effects across DRGs according to their mix of inputs by type (Casemix Development Program 1995).

The price index study had two subsidiary objectives. One was to produce and distribute the input price change data, for use in other ways. The other was to obtain experiences relevant to determination of the value of routine operation of a price index and, if this were contemplated, to propose a suitable methodology.

The December quarter of 1992 was selected as the base period, because it was near to the midpoint of the 1992–93 financial year. The deadline for production of the Version 3 weights meant that the December quarter of 1994 was the latest period for which price changes could be estimated. An interval of exactly two years was desirable for analytical reasons.

A standard Laspeyres design was used. Expenditure categories were defined in much the same way as in the National DRG Cost Weights Project, because the 97-hospital database was to be used as the source of expenditure data for the base period.

The schedule of items was identical to that used in the New South Wales index where items were within its scope. Where items were not in the New South Wales schedule, a purposive sample was selected based on the study team's knowledge of critical factors. In the event, most of the additional items did not require to be sampled because the complete set of data was available.

There were five data sources. First, all 97 hospitals in the sample were asked to provide data by questionnaire on the prices they paid during the base and update

periods for a sample of items. The response rate was only 55 per cent, and this means that great caution should be taken when using the results. However, this probably had little effect on the validity of the data for the purpose of adjusting DRG cost relativities.

The second data source was the State health authorities themselves. They are the best source of data on prices which are generally determined at a State level (such as some types of labour costs). Third, data were obtained from suppliers. Fourth, some data were obtained from hospital groups. In particular, purchasing agencies of State health authorities were approached for prices of items obtained by all or most hospitals by central purchase.

Finally, use was made of ABS indexes. The key source indexes were the National Accounts Non-Dwelling Building Costs for materials used in repairs, maintenance and renewals; the SITC Professional, Scientific, and Controlling Instruments and Apparatus for a wide range of computer and medical equipment; the consumer price index for motor vehicles; and award rates of pay indexes for repairs and maintenance to plant and equipment.

The category weights were determined by analysis (and reprocessing where necessary) of the starting costs of the 97 hospitals. Hospitals had used a wide range of structures for their accounting costs, and it was therefore necessary to develop a common denominator.

The relative contributions to category costs were determined for every item in the schedule. In some cases, precise data were available. In other cases, best estimates were made, taking account of data capture from a purposefully selected sub-sample of hospitals. Finally, mean price changes were computed for each item in the schedule, and used in combination with the item weights to compute price changes by expenditure category.

Table 1 shows a few of the results. They are price changes for selected expenditure categories for the national private and public hospital sectors. The table also shows the proportions contributed by each expenditure category.

The overall changes in input prices were 3.2 per cent for public hospitals and 2.9 per cent for private hospitals. These are generally consistent with the results from other surveys of hospital input prices, including the New South Wales goods and service index and the private hospitals index published by the Australian Private Hospitals Association. For example, the New South Wales goods and services index showed a change of 1.6 per cent between quarter 4 1993 and quarter 4 1994.

Table 1: Prices in November 1994 (November 1992 = 100) and expenditure weights for selected input categories, all Australia

Expenditure category		Public hospitals		Private hospitals	
		1994 price	% expenditure	1994 price	% expenditure
01	Unspecified labour	104.5	3.0	102.5	2.5
02	Administrative labour	104.9	3.0	104.6	6.4
04	Domestic labour	104.9	5.0	104.6	5.9
10	Medical labour, general	104.9	9.1	104.0	2.3
12	Nursing labour	104.1	21.0	104.1	26.3
20	Sessional labour	100.3	2.7	100.2	0.0
21	Fee-for-service labour	103.7	0.4	101.9	0.0
25	Unspecified goods and services	102.1	16.0	103.3	7.9
30	Drugs	100.9	3.0	102.4	1.9
38	Medical/surgical supplies	98.3	3.9	100.4	6.3
54	Superannuation	101.0	3.3	101.0	1.3
63	General administration supplies	102.1	0.3	101.8	5.4
69	Engineering	102.9	0.7	102.8	0.4
96	Buildings	101.3	0.1	101.3	1.7
97	Plant and equipment	101.1	0.2	101.1	3.9
98	Overheads (external services)	103.2	0.0	103.0	0.0
99	Overheads	103.2	0.9	103.0	2.1
All		**103.2**	**100.0**	**102.9**	**100.0**

Using price index data

There are two main causes of expenditure change. There may be a change in prices per unit of input (such as where a hospital increases its hourly rates of pay for nursing staff) or in volumes (such as where nursing time per case is revised in response to adjustments in clinical practice).

When negotiating prices (or budgets), both types of causes are relevant. For example, a hospital has a legitimate argument for increasing its charges if it has no control over the price of an item which cannot be substituted and must be used if cost-effective care is to be provided, or if it must increase consumption rates in order to avoid a problem of poor outcomes which has been recognised

by all knowledgeable parties. On the other hand, an insurer should be reluctant to provide increased benefits if the increased costs are a consequence of (say) inefficiency in the hospital's purchasing methods, choosing to use high-cost brands of supplies or equipment which have not been shown to be more effective, or failure to control usage rates (such as lengths of stay or nursing minutes per patient).

There is no easy way of distinguishing unavoidable from avoidable increases in input prices or in volumes of resource used. Many of the effects are interrelated, and it is rarely possible to determine precisely whether an increase in cost is justified by the increase in quality of care and patient outcomes. An example is the introduction of an entirely new and expensive medication, which is not a substitute for a previously used but perhaps less effective brand. The resultant increase in cost would be treated as a volume rather than an input price change, and would therefore not affect the hospital input price index.

The effect on overall costs might not easily be deduced. For example, use of the drug might allow for a reduction of nursing and allied health inputs, or even cause increases in diagnostic tests aimed at monitoring the effects of the drug. Similarly, it might be known that the drug improves outcomes in some patients, and not in others. In effect, one would need to know whether the drug was being appropriately used before being sure that the additional cost was justified. Another consideration is whether patients expect to be treated with the drug, even if its effects are uncertain.

As noted above, a Laspeyres index measures only those changes in expenditure which would have resulted if hospitals had retained their base period mix of inputs. However, it would be a poor hospital which continued to purchase exactly the same kinds of inputs for year after year. It would be failing to take account of increased knowledge about patient care, enhanced technology and so on.

One can take a simple view, whereby hospital payments are automatically updated in proportion to input price changes. This does not, however, resolve the problem. It merely means that the trade-offs between cost and outcome are largely devolved to individual providers (and consequently less transparent).

In the short term, there may be little choice but to continue to use price index and other data in non-discriminating ways. However, there is a growing view that the key to effective negotiation of funding levels in future is the multidisciplinary care protocol.

The underlying idea is simple. The most appropriate funding level can only be determined to the satisfaction of all parties if there is agreement about the nature

of the product to be created. A charge for (say) a normal delivery or a hip replacement cannot be judged to be reasonable only on the basis of mean production cost.

A better approach may be one in which the purchaser and the hospital consider each high-volume case type in turn. The first step might involve discussions with a view to deciding in principle whether the hospital's care plan is appropriate. The second step could comprise discussion of the hospital's production cost estimates, taking account of both volume and unit price. The hospital input price index has some utility here, albeit at the margins. The third step should then involve a sharing of responsibilities between the hospital and the funder with respect to the trade-off between cost, quality of care and outcomes.

This process will allow both causes of cost change to be reviewed in specific contexts, rather than across the board. It would be time-consuming, and all parties would need to develop their skills as well as to improve their access to relevant data. However, there is no obviously better approach, and the task will become progressively more manageable over time through the emergence of national standards.

The future of hospital input price indexes

The Commonwealth's price index report suggests that the public and private sector funders and providers need to share the task of deciding whether there should be a routinely generated national index. The authors argue that this would probably be justified if some conditions are met. The fact is that all parties continually take account of input price changes in a wide variety of contexts. By failing to coordinate the generation and interpretation of relevant data, the results are less precise than would otherwise be the case. Moreover, the costs thus incurred through duplication of effort are likely to be much greater than those which would be incurred through collaboration.

However, the authors argue for caution. They suggest that the Commonwealth should not proceed unless there is agreement from most parties. Without broad support, the task of data capture will be difficult, and the results will be of reduced value. They also argue that a low-cost solution should be sought for the immediate future, given that there are other pressing needs for information systems development.

An input price index is less useful to the hospital sector than to most other production systems, simply because the control of input prices is relatively less important than management of usage rates. This is an inevitable consequence

of the high rate of change in production methods, and their considerable complexity. Hospitals are consumers of low volumes of a large number of inputs, and most must be differentiated, not only in terms of cost, but also with respect to their contribution to patient well-being.

There has been little detailed work in Australia with respect to the relative contributions of input prices and other factors to hospital expenditure. There may, however, be a similar pattern to that in the United States. A study by ProPAC (1993) found that only 8 per cent of the expenditure change from 1985 to 1991 was attributable to hospital-specific price inflation. More significant factors were input price increases in the general economy, case complexity and service intensity.

Finally, it is interesting to contemplate why the United States health care system makes much greater use of price indexes. Some factors are unrelated to the health sector, such as the larger geographical variations in price changes (ProPAC 1995).

However, there may be aspects which are specific to health care. One possible explanation is that there is a lower degree of control in other, more purposeful ways. Cutler (1995) notes that the United States expends more per capita on health care than almost any other country, and yet on most measures of health status '...it ranks at or near the bottom of the other countries in the OECD'. In such circumstances, expedient solutions like the linking of payment rates to a price index (or legislation on lengths of stay for obstetric cases, or the definition of outlier thresholds at twice the geometric mean length of stay) may be all that can be done. Australia has the opportunity to take more sophisticated and clinically sensible approaches, in which data on input price changes play a relatively small part.

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