

# A practical approach to planning health services: using PBMA

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## Abstract

*Planning health services is a difficult and often complex task. There are many approaches to planning, including the use of tools such as needs assessment, goals and targets, as well as economics-based tools such as cost of illness or economic evaluation. It is not always clear which planning tool is the most appropriate. In this paper we compare an economics approach to planning using program budgeting and marginal analysis (PBMA) with other approaches. We provide an overview of the methods of PBMA, report on experience with its use, and draw conclusions about its likely usefulness to health services planners.*

## Introduction

Planning health services using evidence-based principles is a complex task. Planning requires the linking of objectives, service provision, research and evaluation evidence and information about resource use. Consider the hypothetical planning and priority setting dilemmas described in Boxes 1 and 2.

### Box 1: Maternal, Child and Adolescent Health Services

A regional health service, responsible for funding and provision of services to meet the health needs of the population, adopted an evidence-based approach to planning maternal and child health services. Taking as its starting point national goals and targets for these population groups, it then established a working group to review evidence in relation to effective interventions. This was used as a basis for prioritising services and for establishing local goals and targets. At the end of the process, the region had identified a set of strategies for which there was evidence of effectiveness, and had developed local goals and targets in relation to these services. However, the strategic plan that emerged from this process could not be implemented without beginning a further round of planning. While the region had used evidence in its planning processes, it had not considered resource use. Thus, there was no information to suggest how many of the identified strategies could be implemented within existing resources, whether additional resources would be needed, what changes in service provision were needed to implement the strategies, and which goals and targets were likely to be achieved.

**Box 2: Acute Myocardial Infarction**

The cardiovascular disease steering group within a regional health service planned to use evidence on cost-effectiveness to inform the difficult resource allocation decision between alternative strategies for treatment of acute myocardial infarction. The issues to be considered were whether the use in hospital of tissue plasminogen activator (tPA) was preferred to streptokinase, whether the region should implement pre-hospital thrombolysis, or whether more resources should be devoted to cardiac rehabilitation. The effectiveness and cost-effectiveness literature was reviewed. The literature suggested that tPA was both more costly and more effective than streptokinase, that pre-hospital thrombolysis may be life-saving in the short term but is resource intensive, and that cardiac rehabilitation may be life-saving in the long term. Despite being well-informed from a theoretical point of view from this review of the literature, the steering group found the cost-effectiveness information difficult to interpret. At the end of the process they felt they did not have the information to set priorities at the local level. They could not decide which strategy or combination of strategies to implement.

Each of these planning processes stumbled because it lacked an essential ingredient of successful planning: the linking of local information about resource use and activities to the consideration of objectives and the assessment of effectiveness or cost-effectiveness information. In the first case, consideration of costs, and any assessment of marginal benefit and marginal cost was absent. In the second case, the intention was to assess benefits against costs, but this can only be done appropriately at the margin with local information. They demonstrate the challenge of incorporating economics principles into the practical process of planning.

In this paper we discuss how the framework of program budgeting and marginal analysis (PBMA) can be used to overcome this challenge. In the next section of the paper we discuss the limitations of different approaches to planning and priority setting and provide a rationale for using an economics approach. However, there is often a gap between the use of economics in theory and the practical application of economics principles to planning. We provide an overview of the PBMA framework and how it can be used to address this gap, using examples from our experience of the use of PBMA in New South Wales. In the last section of the paper we discuss some of the barriers to more widespread use of an economics approach to planning, and provide some suggestions about how these barriers might be overcome.

## Planning and priority setting

Health services planning is often treated as two separate tasks. There is a “big picture” task that involves identifying the vision for the future and setting goals and targets relating to this vision: that is, strategic planning. But there is also a day-to-day task of determining how services should be configured and how resources should be allocated to these services - in other words, business planning. These tasks are marked by fundamentally different approaches. The notion of evidence-based health care has achieved prominence in relation to strategic planning, and evidence is used in the process of setting goals and targets. However, the approach taken to strategic planning in health services rarely involves any explicit or implicit assessment of resource implications, and there is often no clear identification of the link between strategies and objectives, the plans to achieve them and the resources required for those plans. In business planning, the process tends to begin and end with resource allocation, without any real assessment of how resource allocation will link to ultimate objectives (that is, those in the strategic plan). Successful planning requires a direct and explicit connection between strategic planning and business planning.

One factor that may contribute to this schism between strategic planning and business planning is the range of available tools and techniques that can be applied to the planning process, which are driven by different underlying theoretical approaches. Some of these were referred to in the hypothetical scenarios outlined above. Techniques in the planner's toolkit include needs assessment, goals and targets, burden of illness or cost of illness, economic evaluation, and cost-effectiveness league tables. However, none of these techniques on its own provides a comprehensive framework necessary for planning, even though some of them incorporate the assessment of marginal benefits and costs, as required for the achievement of efficiency.

The principle underlying needs assessment is the allocation of resources according to identified needs, which might be described in terms of different population groups, different diseases or both. Thus it involves identifying population health needs and the services required to meet these needs. The problem with this approach is that when resources are scarce, needs assessment provides little information about how to set priorities among different needs.

Goals and targets have been widely used in strategic planning for health services. Usually a range of information is brought to bear on the process of setting goals and targets, particularly information from needs assessment, epidemiological profiles and projections, and reviews of effectiveness and cost-effectiveness literature. Drawing on this information, health system goals are then set, defined by disease and population groups. In theory this can then be used to inform resource allocation. In fact, goals and targets have little value in setting priorities unless the process has explicitly incorporated assessment of resources available and the opportunity costs of achieving each goal or target. What is most often lacking from a set of goals and targets for the health system is a sense of how much it will all cost.

Many economists have proposed the use of burden of illness or cost of illness information in priority setting. For example, the World Bank has endorsed this approach in making international comparisons and determining relative need. The underlying philosophy is that resources should be allocated in relation to the size of the burden of illness, sometimes quantified in terms of costs of illness. There are two problems with this approach. First, it confuses costs and benefits as not only will the costs be driven by the mortality and morbidity associated with the condition but also by what the health system is already spending on the disease. Second, it is likely to be inefficient to allocate resources according to burden of illness. If there is no evidence that there are effective strategies available then allocating resources to a health need may produce no health gain at all.

None of these methods employs the two principles which many economists would argue are necessary to ensure efficiency: minimise opportunity cost and evaluate at the margin. Resources are allocated efficiently if the opportunity cost of the alternative chosen is minimised relative to the benefit gained. Health service resources are scarce, and choosing to allocate resources to a given program or intervention means they are not available for some other use. The other potential uses would also provide benefit. Allocating resources to one intervention means the benefit from another intervention is forgone. This forgone benefit is the opportunity cost of the chosen alternative. To maximise benefit, resources should be allocated to the best possible use, that is, opportunity cost should be minimised relative to the benefit gained. This decision should be evaluated at the margin. The key question is what are the additional (marginal) benefits and the additional (marginal) costs? Benefits will be increased by allocating resources to an intervention so long as marginal benefit is greater than marginal cost.

These principles are central to economic evaluation, and thus, economic evaluation is often seen as a potential tool to assist in planning of health services. However, economic evaluation does not, on its own, provide a planning framework. It is unlikely that economic evaluation results will be available for all resource allocation decisions that need to be made at the local level. Even where results are available, they need to be interpreted in the light of local circumstances. Systematic reviews of well-conducted economic evaluations cannot answer the question of whether the same intervention will achieve the same results in terms of costs and outcomes if implemented locally. Relative cost-effectiveness will be determined in part by local factors, which are particularly relevant to costs. Further, a particular economic evaluation provides an estimate of the average incremental cost-effectiveness of one intervention compared with an identified alternative. The results cannot generally be extrapolated if, for example, current practice is not the same as in the study, or the scale of production is different. Thus, it is difficult to interpret economic evaluation results from elsewhere without first making some assessment of current use of resources and of outcomes at a local level. Even if each individual economic evaluation undertaken correctly assesses opportunity cost at the relevant margin for the evaluation, a planner must ask "What are the marginal costs and benefits in my setting?"

A more formalised use of economic evaluation to assist decision making has been proposed in the use of cost-effectiveness (or quality adjusted life years - QALY) league tables. Initially, such league tables were presented in the results of published studies to provide a point of comparison for planners or decision makers in interpreting results: the evaluated intervention is "more cost-effective" than a given set of other interventions which are currently in use. Subsequently, the league table has been proposed as a mechanism for priority setting and planning within a defined budget. One difficulty with a league table approach is that it generally does not

involve comparing like with like, because of differences in study methods or settings, or in the quality of evaluation studies. The approach has been adapted in a number of ways. The state of Oregon (United States) initially developed a league table based method for priority setting, which involved comparable methods for estimating costs and outcomes (measured in QALYs) for a large number of possible conditions and interventions. A number of countries have adopted an implicit cost-effectiveness league table approach in determining which pharmaceutical interventions will be publicly funded. While in both these examples, the comparability of interventions in the league table has been increased, there remain a number of problems. It cannot be assumed that the average estimated cost-effectiveness will apply if the scale of the intervention changes. Thus, the implicit rule of thumb in the league table, that is, fund all the demand for the most cost-effective intervention first before allocating any resources to the next intervention in the league table, is likely to be inefficient.

A further problem arises if a cost-effectiveness league table approach is used implicitly or explicitly in the absence of a defined budget. There is a risk that it will lead to a rule of thumb in which interventions are funded if they are more cost-effective than current practice. This has been described as a recipe for uncontrolled expenditure growth (Gafni and Birch 1993).

Incorporating economics principles in planning and priority setting can be challenging in practice. Many of the existing frameworks, while being based on the pursuit of efficiency, incorporate methods which compromise the assessment of marginal benefit and marginal cost. A further difficulty arises when it is recognised that efficiency may not be the only goal of the health system. In particular, there may be conflict between efficiency as a goal and ensuring equitable access to services.

## Overview of PBMA

One framework which is being increasingly employed for planning purposes is that of program budgeting and marginal analysis (PBMA). PBMA is a framework for planning and priority setting which incorporates economics principles, but which emphasises the need for local information and local assessment of costs, outcomes, and other relevant factors, particularly assessment of equity. It starts by identifying what resources are available, how these resources are currently being used to produce what outputs and outcomes, and how these outputs and outcomes relate to stated objectives. It then involves explicit assessment of the costs and benefits of shifting resources, that is, what health gains or other outcomes can be achieved if services are expanded or a new service provided and what health gains or other outcomes will be forgone if services are contracted to fund the expansion. The advantages of this are that the implied resource shifts are integral to the planning process and the results of PBMA can be used for planning even when new funds are not available. Indeed, the basis of PBMA is to assess the issue of whether it is possible to do better within existing resources.

There are three stages to PBMA. The first stage is development of the program budgets. A program budget provides the framework for examining the relationship between resource use, activities, outputs and objectives. An important feature of the program budget framework is that it is output and objective oriented rather than being focussed on inputs and activities. There are a number of ways of developing a program structure, that is, of grouping the activities of the service. For example, the programs might be divided by disease category, by age group of population, on a geographical basis, or by type of activity. The main requirements are that the separate programs should ideally be mutually exclusive and collectively exhaustive. A useful rule for deciding on a program structure is to try to think in terms of where meaningful resource shifts could occur. Table 1 shows some examples of how different services in NSW which have undertaken a PBMA process have developed their program structures.

The program structure is really just the beginning of the process, although in many cases, it has proved extremely valuable in identifying issues about how the service is structured and operates. For example, it may identify where there is a mismatch between the activity of programs and the objectives. Equally, it may identify important gaps in service provision, that need to be addressed.

Table 1: Program structures in New South Wales

Authority	Central Coast Area Health Service	South West Centre for Public Health	South Western Sydney Area Health Service
Program	Community Dental Services	Asthma Services	Coronary Heart Disease
Aims and objectives	⊕ education/promotion ⊕ public assessment/private treatment ⊕ private assessment/public treatment ⊕ public assessment/public treatment ⊕ recall (individual) ⊕ fail to attend follow up	⊕ numerous aims and objectives for each program area centred around emergency asthma care and ongoing management of asthma patients.	⊕ prevention ⊕ treatment ⊕ rehabilitation
Program areas	⊕ child ⊕ adult ⊕ pensioner denture scheme	⊕ emergency departments ⊕ inpatients ⊕ ambulatory medical services ⊕ pharmaceuticals ⊕ ambulance ⊕ asthma education	AHS geographical sectors ⊕ Bankstown ⊕ Camden/Wollondilly ⊕ Campbelltown ⊕ Fairfield ⊕ Liverpool ⊕ Wingecarribee

Sources: Central Coast Area Health Service (1996), Mooney, Haas et al. (1997), and Haas, Viney et al. (1999)

The second stage involves marginal analysis, that is, identifying where there is scope to improve services by reallocating resources within and between programs. An assessment must be made of the potential benefits gained or forgone from any shift in resources. The basic principle is that of assessing marginal benefit against marginal opportunity cost. Reducing resources in one program means that some activity must be reduced, and some outputs will not be achieved. Equally, increasing resources in another program means additional activity and additional outputs. In marginal analysis the question is asked whether the additional benefits from the expanded program outweigh the forgone benefits in the contracted program.

The practical steps in undertaking marginal analysis involve first developing incremental and decremental wish-lists. These are developed by asking what would be done if we had more resources, and what would be stopped if we had fewer resources. Wish-lists should really be seen as plans. They should specify the additional or forgone activity, the additional resources required or released (in terms of physical resources as well as an estimate of cost), the changes in outputs expected, and the benefits which will accrue or be forgone. Unless all of this can be specified, the item should not be on a wish-list. Ideally, developing final wish-lists should involve detailed costing and identification of consequences, based on the best evidence available. In practice, sometimes there is only limited evidence available on likely consequences, but it is always necessary and possible to estimate likely resource impacts.

The final stage of PBMA involves assessing the planned expansions and contractions, and determining which should occur. While the main measure of consequences in the marginal analysis may be in terms of health gains (for example, additional cases detected; additional life-years saved), the objectives of the health service may be broader than health alone. In particular, it is important to consider the impact of any change in activity on equity of access to services. However, it may also be necessary to consider other factors such as barriers to shifts in service provision, or the level of uncertainty surrounding projected consequences. As with any planning process, the final decisions may result from a multitude of factors. An advantage of PBMA is that when a decision is made on some other basis apart from efficiency, the opportunity costs of this have been made explicit by the process. A decision may still be made on the grounds of politics, but it will be clear to everyone involved in the decision how much health gain has been forgone.

The key feature of PBMA as a planning process is that throughout each step, there is a linking of inputs, activities and objectives. At the end of the process it should therefore be clear exactly what actions are to be taken to achieve the vision of the future.

Could the use of PBMA have changed the outcome of the planning processes in the two hypothetical scenarios outlined in Boxes 1 and 2? In the child and adolescent health scenario (Box 1), while national goals and targets would be important in setting objectives, and in developing wish-lists, the starting point in the PBMA process would have been current activity and current resources. Thus, the region would have been in a position to assess the extent to which activity was related to achieving national goals and targets. Similarly, while the review of evidence would have been an important input to the marginal analysis, the key difference would have been that assessment of effectiveness, or consequences, would have been linked to required resource use at the local level. Thus, there would have been some basis on which to rank effective interventions, that is, in terms of efficiency. Most importantly, the region would have, at the completion of the planning process, had a clear picture of which activities to undertake and what they would cost. Thus, the plan could have been implemented immediately.

In the case of acute AMI (Box 2), framing the same question in a PBMA process would have resulted in a clear decision about which interventions to undertake. The process of describing the program budgets would have required an assessment of current resources available for treatment of acute myocardial infarction, how these resources were currently allocated between the different strategies, and of the number of people in the population likely to need treatment within a given time period. This information would be critical to the assessment of likely costs and benefits of each strategy that would be undertaken in the marginal analysis. The information from the literature review could then be combined with local information on costs to answer the question of which strategies would be feasible within existing resources. For example, would it be possible to provide all patients with pre-hospital thrombolysis, and what would have to be forgone to achieve this? Addressing these issues within a PBMA framework would mean that if additional resources are required for acute services for coronary heart disease patients, it would be possible to identify what other activities in the region's programs these resources would need to be diverted from, for example, coronary heart disease prevention, or from rehabilitation.

## **Experience with using PBMA to plan health services**

In practice, the use of PBMA has not been widespread in health systems, but there is a growing body of examples of where it has been used successfully to plan services. This section briefly summarises the published literature on use of PBMA, and reports on the relatively recent experience with the use of PBMA in the NSW health system.

There have been a number of applications of PBMA to health services planning, both in Australia and overseas. These are summarised in Table 2. Many of the applications of PBMA overseas have occurred in relation to the organisation of purchasing health services in the United Kingdom's National Health Service (NHS). Applications of PBMA techniques began in the early 1980s and the introduction of separation of purchaser and provider in the 1990s made PBMA a particularly useful tool for purchasers. Use of PBMA extended from the development of a general decision making tool, to use in setting the options for consideration by health services managers in a Delphi study, to its application in organising maternal and child health and maternity and gynaecological services (Wilkinson and Williams 1985; Cohen 1994; Craig, Parkin et al. 1995).

What is notable about the examples of where PBMA has been used successfully is that it has generally been undertaken with close involvement of a health economist. The absence of a health economist may be one of the main barriers to its more widespread use. Despite the fact that the ideas and steps in PBMA are relatively straightforward, there seem to be barriers to wider acceptance of the basic principles from which economists begin: scarcity of resources; identifying opportunity costs and assessing marginal benefit against marginal cost.

**Table 2: Applications of PBMA**

Author	Area of Interest	Location
(Wilkinson and Williams 1985)	Delphi study of mental health services in a primary care setting - but options constructed using PBMA	London
(Cohen 1994)	Allocating resources to areas of identified health gain.	Mid Glamorgan Wales
(Brambleby 1995)	Purchasing health care services	East Sussex (UK)
(Craig, Parkin et al. 1995)	General approach to decision making and purchasing health care services	Newcastle and North Tyneside Health Authority (UK)
(Donaldson 1995)	Primary, secondary and tertiary child health services	Scotland NHS trusts
(Madden, Hussey et al. 1995)	Ischaemic heart disease and mental illness services	North Mersey (UK)
(Twaddle and Walker 1995)	Purchasing of gynaecology services - later extended to use in diabetes and urology	Greater Glasgow Health Board (UK)
(Wilson and Scott 1995)	Level of health care purchasing arrangements - general practice or locality	Scotland NHS trusts
(Ratcliffe, Donaldson et al. 1996)	Delivery of maternity services	Grampian Health Board (UK)
(Hunter, Donaldson et al. 1997)	Physiotherapy services	Three Scottish NHS trusts
(Peacock and Edwards 1998)	Mental health services provided through community health centres	South Australia (Australia)
(Scott, Currie et al. 1998)	Innovation in diabetes care in a primary care setting	United Kingdom
(Crockett, Cranston et al. 1999)	Management of disease specific group - chronic airflow limitation	Flinders Medical Centre, South Australia
(Scott, Donaldson et al. 1999)	Purchasing in general surgery services	Scotland (UK)

In one sense, the experience in NSW has been no different. However, the approach adopted in recent projects has been to focus on dissemination of the ideas underlying PBMA, and encourage health services planners and managers to be responsible for the implementation of the PBMA process. This has resulted in a slower process in undertaking PBMA, but has the advantage of developing direct experience with the techniques among health service planners. In addition, it is demonstrating that PBMA can be undertaken without direct involvement by health economists. Given the shortage of experienced health economists in health systems worldwide, this is necessary if the approach is to be adopted more widely. Table 3 summarises a number of PBMA projects recently undertaken or currently underway in NSW.

**Table 3: PBMA in New South Wales**

Project	Timeframe	Health economics input	Identified Outcomes
Central Coast AHS Community Dental Services	1995-96	Project overseen by health economics team; no health economists working on project	Resources shifted from private provision to public provision within pensioner dental scheme to increase services provided  Resources shifted from pensioner dental scheme to schools based health promotion
Central Sydney AHS Child, Adolescent and Family Health Services	1995-96	Project overseen by health economics team; health economist employed as project officer	Project abandoned because of incompatibility with currently implemented planning framework
South West NSW Asthma Services	1995-96	Project overseen by health economics team; no health economists working on project	Preferred model of asthma education identified and implemented
South West Sydney Coronary Heart Disease Services	1997-98	Project overseen by health economics team; health economist employed as project officer	Recommendations made to AHS Board to restructure health promotion services and employ Area-wide coordinators; to shift resources within rehabilitation and employ Area-wide coordinator to facilitate more equitable access to services; and to implement treatment guidelines for acute AMI across AHS
Midwestern AHS Rehabilitation Services	1998-	Project received initial input and some ongoing advice from health economics team	Project ongoing; Project officer employed to develop program structure and identify program budgets; Working party established to develop wish-lists
Midwestern AHS Alcohol and Other Drug Services	1998-	Project received initial input and some ongoing advice from health economics team	Project ongoing; Program budgets developed; Wish-lists developed and currently being evaluated

Sources: (Mooney, Haas et al. 1997; Haas, Viney et al. 1999)

While these projects (with the exception of one) have been relatively successful, they have also provided a number of lessons in terms of the key barriers to undertaking PBMA as a planning process.

First, for PBMA to be successful, it requires high level support from within the specific health service. The process of identifying costs and benefits of resource shifts is both challenging and costly to those involved in delivering services, and without this high level involvement, there is little incentive to complete the process. For example, in the South Western Sydney AHS project, the continued emphasis by the director of planning that the process would result in concrete recommendations to the AHS board was important in ensuring completion.

Second, there is a danger that projects can be stalled by the detail of establishing the program budgets. While this is an important part of the process, it should be seen as a step towards the evaluative phase, that is, the marginal analysis. In a number of the projects outlined above, it was difficult to move beyond the program budget phase because of the perceived need to gather detailed information on resource use and activities. In these cases it proved helpful to focus the project on identifying the key items of resource use in each program, rather than on costing this resource use. Related to this, it is important that the process of costing involves local assessment of resource use, rather than relying on published costs from elsewhere. In two cases, the project



team attempted to use AN-DRG average costs to estimate the program budget for inpatient care, but found that these provided little useful information about available resources at the local level. However, lack of consistency in local financial reporting represents a major barrier to the development of the program budget, often leading to a frustrating and time-consuming process of gathering primary data. This proved the case in the Central Sydney PBMA project which was abandoned.

Third, the process of evaluating wish-list items can be challenging. In particular, when PBMA projects are undertaken across the range of services from health promotion to treatment and palliation, there can be considerable variation in the quality of evidence available, both in the published literature and at the local level. While there is often more published evidence available to support incremental activities in acute care, there is a risk that this evidence does not translate readily to identification of costs and benefits at the local level. One specific example of this arose in one of the projects described above, when acute care physicians argued that the additional resources required to fund expansion of stress testing would be available because of resulting reductions of length of stay, but were unable to quantify the impact on length of stay. There is a danger in cases such as these that the proposed shift in resources would not happen, and the provision of the new service would increase costs overall. Another example is that it is often assumed that implementing best practice will improve services within existing resources, whereas in fact both the process and the outcomes of implementation of best practice may involve increased use of resources.

Fourth, while most participants in PBMA have little difficulty identifying incremental wish-list items, it is much more difficult for participants to identify areas where services might be reduced from within their program. This may reflect a lack of understanding or trust with the process. There is often a fear that identifying an area where resources could be reduced will automatically lead to this reduction in services being enacted. One way to overcome this is to ensure that the process of identifying and evaluating wish-list items remains confidential within the group until it is completed. However, when the group undertaking the PBMA process is multidisciplinary, it can be difficult to create a sense of confidence in the process, even with such agreed "rules".

Finally, there is a danger that the use of PBMA as a planning tool will be undermined by stakeholders, precisely because it is so directly related to allocation of resources. Some participants have avoided or been unwilling to recognise the value of care which is not within their area of expertise. This may reflect the largely hierarchical nature of health care; in many health care organisations, doctors are assumed to have the greatest expertise.

## Conclusion

PBMA has been shown to be a useful and flexible tool in planning and setting priorities for a wide range of health services in NSW and elsewhere. Although it may result in some discomfort because of the explicit way in which changes to resource allocation are handled, the benefits of understanding the opportunity costs of any proposed changes outweigh such costs. It has proved itself to be a powerful and dynamic device in assisting health service planners and managers to make difficult choices. In particular, it commences from the point of view of considering currently available resources, which means that the ultimate decisions made should be able to be implemented. It focuses simultaneously on the objectives to be achieved and the practical steps required for implementation. Finally, by paying explicit attention to opportunity cost it requires managers to make assessments about whether a planned change in activity is worthwhile.

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