PRIORITY SETTING IN PRACTICE: WHAT IS THE BEST WAY TO COMPARE COSTS AND BENEFITS?

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SUMMARY

Prioritising candidates for health-care expenditure using cost per Quality-Adjusted Life Year (QALY) is a helpful but insufficient means of ranking alternative uses for scarce health-care funds at the local level. This is because QALYs do not by themselves capture all criteria decision makers need to take into account. Other criteria such as reducing inequalities, meeting national and local priorities and public acceptability also feature in the decision maker's utility function.

Programme budgeting and marginal analysis (PBMA) is an established framework for systematic priority setting in which a ‘weighted benefit score’ for each option is calculated based on all relevant decision-making criteria. Ranking options as a ratio of cost to benefit is desirable and necessary to ensure efficiency.

In this paper we review a number of approaches to scoring costs and benefits of options in a PBMA context. Several approaches rank by benefit score alone, rather than efficiency (cost per unit of benefit). Of those that do rank by efficiency, we discuss the benefits and drawbacks. The optimal approach is far from clear, with each technique having its own strengths and weaknesses. A deliberative approach using summaries of costs and benefits of options as a basis for discussion may be preferable.

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KEY WORDS: programme budgeting and marginal analysis; decision analysis; priority setting; local level; option appraisal

1. INTRODUCTION

Economic approaches to setting priorities are based on the premise that it is possible to design a rational priority setting system that will produce legitimate changes in resource allocation (Donaldson et al., 1995; Mooney et al., 1992; Shill et al., 1993). Orthodox economic approaches suggest that priority setting is a relatively straightforward optimisation problem: decision makers should seek to maximise the utility (health-related well-being) of their population subject to the constraint of scarce resources. Much of the health economics literature has therefore focussed on developing technical methods for the appraisal of the costs and benefits of health services, most notably within the framework of economic evaluation (Drummond et al., 1997; Gold et al., 1996).

However, several authors have argued that orthodox economic approaches have failed to adequately capture the complex and multi-faceted nature of objectives and constraints in priority setting (Baltussen and Niessen, 2006; Carter, 2001; Jan, 2000; MacDonald, 2002). This criticism arises (at least in part)
from evidence showing that economic approaches have only enjoyed limited success in practice (Alban, 1994; Carter, 2001; Hoffmann and Graf von der Schulenburg, 2000; MacDonald, 2002; Ross, 1995). In response, some economic approaches are giving greater attention to understanding the inherent complexity of the health service decision-making environment (Baltussen et al., 2006; Peacock et al., 2006) whilst recognising the need to present the results of economic evaluations in as simple a manner as possible (Coast, 2004; Mauskopf et al., 1998). In particular, developments in the programme budgeting and marginal analysis (PBMA) framework have focussed on better understanding of decision makers’ objectives and utility functions and the political economy of priority setting (Carter, 2001; Jan, 2000; Mitton et al., 2003b; Peacock et al., 2007).

Current guidance on conducting PBMA and related multi-criteria priority setting approaches recommend ranking candidates for investment and disinvestment using data on the costs and benefits of alternative health programs (Mitton and Donaldson, 2004). However, which is the ‘best’ methodological approach to ranking programs is far from clear.

In this paper, we firstly define PBMA and then discuss approaches to ranking the options for investment and disinvestment. A number of the approaches in the literature rank only in order of benefit score, rather than efficiency (cost per unit of benefit). We look at approaches that do rank by efficiency, and discuss the benefits and drawbacks of these. Finally, we consider a number of alternative solutions to the drawbacks, and conclude with recommendations for how best to rank options for investment and disinvestment in PBMA, which we hope will be of use to decision makers and economists involved in priority setting exercises.

2. PBMA DEFINED

PBMA is an established framework for assisting decision makers in setting health service priorities (Donaldson et al., 1995; Mooney et al., 1992; Shiell et al., 1993). It has been used in over 80 studies worldwide, with applications across a wide range of health programs and health-related conditions (Mitton and Donaldson, 2001; Mitton et al., 2003b). The PBMA framework comprises two distinct tools: programme budgeting splits overall budgets into programmes of care rather than individual procedures and supplies, whilst marginal analysis analyses the effects of changes to the programmes in terms of costs and outcomes.

PBMA is above all a pragmatic solution to the prioritisation problem, capable of incorporating costs and outcomes data of varying quality, and combining those data in a common framework to allow systematic and transparent decision making (Mitton and Donaldson, 2004). However, it should be noted that PBMA is an input to the decision process, and not the decision itself (Holm, 1998). This type of priority setting activity can take place both within health programs at the micro-level (Mooney, 2002) or across programs at the macro-level (Mitton et al., 2003a). PBMA can be broken down into seven stages, (Table I), which are designed to provide a transparent, pragmatic and explicit framework for priority setting (greater detail can be found in Mitton and Donaldson, 2004; Peacock et al., 2006).

3. RANKING THE OPTIONS

The critical part of PBMA is the recommendation of candidates for service investments and disinvestments (step 6). In order to maximise outcome for a given budget, it is logical to rank these in order of efficiency (or reverse efficiency for the disinvestment list), as a ratio of output (or rather outcome) to the input required (Gafni and Birch, 2006). This process identifies the best and worst value for money options such that if the recommendations are implemented, resources will be reallocated to maximise benefits subject to available resources. It should be noted that PBMA does not seek to maximise benefits across all programs at any given time. Instead it focuses on ranking a subset of

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**Table I**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The health service environment</td>
<td>Identify the health service environment and its priorities</td>
</tr>
<tr>
<td>2. Setting objectives and priorities</td>
<td>Define the objectives and priorities for the health service</td>
</tr>
<tr>
<td>3. Identifying health programs</td>
<td>Identify the health programs to be included in the analysis</td>
</tr>
<tr>
<td>4. Collecting and analysing data</td>
<td>Collect and analyse data on the costs and outcomes of the health programs</td>
</tr>
<tr>
<td>5. Evaluating health programs</td>
<td>Evaluate the health programs based on the collected data</td>
</tr>
<tr>
<td>6. Recommending candidates for investment and disinvestment</td>
<td>Recommend candidates for investment and disinvestment based on the evaluation</td>
</tr>
<tr>
<td>7. Implementing decisions</td>
<td>Implement the decisions made in stage 6</td>
</tr>
</tbody>
</table>

**Footnotes**

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programmes in a given year (potential investments and disinvestments) to maximise benefits across those options. The process is incremental and sequential – in later years other investments and disinvestments may be considered.

A consistent single composite measure of outcome is required to compare options. One such metric is the Quality-Adjusted Life Year (QALY). However, this has limitations as such data are not always available, valuation methods vary from study to study and (as alluded to in our introduction) it is questionable whether the QALY encompasses all the criteria that form part of the decision-making process (Brinsmead and Hill, 2003; Holm, 1998; Mauskopf et al., 2003).

One solution is to weight the QALYs to accommodate equity concerns (Bleichrodt et al., 2004; Dolan, 1998; Richardson et al., 2004; Schwappach, 2002; Wagstaff, 1991), but this does not address the problem of incorporating wider objectives in the decision-making process. An alternative is to use a multi-attribute utility (MAU) model/multi-criteria analysis to construct a composite measure of benefit (Dodgson et al., Undated; Peacock et al., 2007).

Briefly stated, the MAU approach involves forming an advisory panel, comprising relevant stakeholders (usually managers, patients, clinicians and members of the public). The panel defines a number of decision-making criteria encompassing not only the effectiveness/health gain from the proposed intervention (e.g. QALY data where available), but also the degree to which the intervention reduces health inequalities, improves access to services, helps decision makers achieve both national and local targets and priorities, etc. (see Mitton and Donaldson, 2004; Baltussen and Niessen, 2006; Peacock et al., 2007 for a discussion of relevant decision-making criteria). Critically, relevant decision-making criteria are dependent on priority setting context, and should reflect the stated preferences of the advisory panel as part of the PBMA study protocol (step 4 in Table I) (Peacock et al., 2007).

To obtain the single index measure of benefit, the criteria must be combined using an appropriate MAU model. MAU models are based on the ‘decomposition of a complex decision problem into

Table I. Stages in PBMA

<table>
<thead>
<tr>
<th></th>
<th>Determine the aim and scope of the priority setting exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Determine whether programme budgeting and marginal analysis will be used to examine changes in services within a given programme (micro/within programme study design) or between programmes (macro/between programme study design)</td>
</tr>
<tr>
<td>2.</td>
<td>Compile a “programme budget”</td>
</tr>
<tr>
<td></td>
<td>The resources and costs of programmes may need to be identified and quantified, which, when combined with activity information, is the programme budget</td>
</tr>
<tr>
<td>3.</td>
<td>Form a “marginal analysis” advisory panel</td>
</tr>
<tr>
<td></td>
<td>The panel is made up of key stakeholders (managers, clinicians, consumers, etc.) in the priority setting process</td>
</tr>
<tr>
<td>4.</td>
<td>Determine locally relevant decision-making criteria</td>
</tr>
<tr>
<td></td>
<td>To be elicited from the advisory panel (e.g. maximising benefits, improving access and equity, reducing waiting times, etc.), with reference to national, regional and local objectives, and specified objectives of the health system and the community</td>
</tr>
<tr>
<td>5.</td>
<td>Identify options for (a) service growth (b) resource release from gains in operational efficiency (c) resource release from scaling back or ceasing some services</td>
</tr>
<tr>
<td></td>
<td>The programme budget, along with information on decision-making objectives, evidence on benefits from service, changes in local health-care needs and policy guidance, is used to highlight options for investment and disinvestment</td>
</tr>
<tr>
<td>6.</td>
<td>Evaluate investments and disinvestments</td>
</tr>
<tr>
<td></td>
<td>Evaluate in terms of costs and benefits and make recommendations for (a) funding growth areas with new resources (b) moving resources from 5 (b) and 5 (c) to 5 (a)</td>
</tr>
<tr>
<td>7.</td>
<td>Validate results and reallocate resources</td>
</tr>
<tr>
<td></td>
<td>Re-examine and validate evidence and judgements used in the process and reallocate resources according to cost–benefit ratios and other decision-making criteria</td>
</tr>
</tbody>
</table>
smaller and less complex sub-problems... represented by variables [criteria], which are organised into a hierarchy’ (Bohanec et al., 2000).

The simplest approach is to weight the criteria relative to one another, such that the sum of the weights is 1. Scoring proposals against these (e.g. from 0 to 10 or 0 to 100), multiplying by the weight and summing across all criteria gives a weighted benefit score (WBS) of between 0 and 10 (or 0–100), incorporating all the relevant criteria into a single index. In Equation (1), the weighted benefit score for programme \( j \) is score, \( s \), for programme \( j \) against criterion \( i \) multiplied by the weight, \( w \), on criterion \( i \), summed across all \( n \) criteria. Variations on this include alternative functional forms for the MAU equation, summing un-weighted scores (implying equal weighting for all criteria), allowing different maximum scores for different criteria, and the use of negative scores where a proposal is detrimental to a particular criterion (negative scores may be used to evaluate disinvestments, but this risks introducing an asymmetry between how investments and disinvestments are scored. If disinvestments are presented in the same manner as investments, that is as self-contained services, they should be scored in the same manner as investments, where low scores would indicate a candidate for disinvestment):

\[
\text{WBS}_j = \sum_{i=1}^{n} w_i s_{ij}
\]

The choice of functional form is an important issue (Peacock et al., 2007), requiring a balance between simplicity and complexity: an overly simple form will ignore important subtleties in the decision-making process, whilst an overly complex form may acquire a ‘false legitimacy’ by virtue of it ‘looking mathematical’ and therefore appearing rigorous when there is no objective proof that it is so (Mullen, 2004). Nevertheless, decision makers will have to combine the criteria to reach a conclusion. Calculating a weighted benefit score makes this process explicit rather than implicit.

4. TAKING EFFICIENCY INTO ACCOUNT

The above approach is commonly employed for comparing options for investment and disinvestment, and results in two lists, ranked in order of weighted benefit score. If a desired investment costs £20 000, then options totalling £20 000 should be selected from the disinvestment list (subject to indivisibilities), and a decision reached as to whether there is a net improvement as a result. It is logical to start by comparing the highest scoring investment with the lowest scoring disinvestment, but it should be noted that this is unlikely to lead to the greatest benefit for the resources as several less expensive options may produce a greater benefit than one larger one. The solution to this is to rank the options not by ‘bangs’ alone, but by ‘bangs for bucks’. The most efficient option(s) on the investment list should then be switched with the least efficient on the disinvestment list. Options should be switched until the efficiency of the last item is equal (subject to indivisibilities). To continue reallocating beyond this point means that the benefit per pound gained from the new investment is less than the benefit per pound released from the disinvestment list. Therefore, total benefit falls. To measure this, ranking investments and disinvestments in order of efficiency is essential.

This approach ensures that benefits are maximised subject to the budget available, and is achieved by simply dividing the weighted benefit score by net cost, which we will call a ‘cost-value’ ratio (to distinguish from a conventional cost-effectiveness ratio).

5. APPROACHES USED IN THE LITERATURE

A search on Pubmed with the terms ‘Programme Budgeting Marginal Analysis’ and ‘local level priority setting’ yielded a total of 68 articles. Review by title and abstract reduced this to 10 case studies of
PBMA or similar prioritisation exercises. Hand searches identified a further five articles, making a total of 15 recently published case studies. Of the 15, two ranked by benefit score alone (Chappel et al., 2001; Cohen, 1995), with six others ranking in order of efficiency (Carter et al., 2000; Mitton et al., 2006; Peacock et al., 2007; Scott and Lees, 2001; Wilson et al., 2006, 2007). However, just under half did not report their criteria or details of the MAU function, or assumed or demonstrated equal effectiveness of alternatives and thus performed cost-minimisation analyses (Bohmer et al., 2001; Haas et al., 2001; Henderson and Scott, 2001; Madden et al., 1995; Ratcliffe et al., 1996; Scott et al., 1998; Twaddle and Walker, 1995).

5.1. Ranking by benefits only
Chappel et al. (2001) devised a priority setting scheme for stroke care in a District Health Authority in Newcastle, UK. Their six-stage process comprised (1) formation of a District Stroke Group (DSG) and (2) a review of evidence from which 43 recommendations were made. The third stage, a postal survey of DSG members, asked them to score each against just two criteria: importance and urgency, on a scale of 1–5. These were converted into percentages and the four top scoring (scoring over 90%) became provisional priorities, with those scoring 70–80% classed as secondaries. The remaining stages in the process were (4) survey of wider professionals and managers, (5) consensus meeting of the DSG and finally (6) wider consultation with service users and carers.

Cohen (1995) reported a PBMA exercise on maternal and early child health in Mid Glamorgan, Wales. Criteria included effectiveness, ‘jurisdiction’, severity of condition, numbers treated, distance from target and ‘people centredness’ of the project. Each criterion was given equal weighting, and total benefit score used to rank investment and disinvestment options.

5.2. Ranking by cost and benefit
A PBMA exercise on Australian cancer control planning in Australia (Carter et al., 2000) used a two-stage process whereby options for expansion and contraction were firstly ranked by cost per DALY, before a second ‘filter’ stage was used to refine the list, taking into account issues such as equity, quality of evidence, size of the health problem and acceptability and feasibility.

Scott and Lees (2001) devised a ‘Prioritisation Scoring Index’ (PSI) where the final ranking was based on an average of benefit rank and cost rank. There were nine benefit criteria, covering patient-specific aspects such as health gain, prevention and quality of life, as well as ‘system-specific’ criteria such as ‘appropriateness’, strength of evidence and fit with priorities. The cost measure was ‘cost per additional person receiving the intervention’.

Wilson et al. (2006) employed a ‘cost-value’ approach to rank a number of options for investment of growth monies in an English Primary Care Trust (PCT): firstly criteria were identified and weighted, and options scored against them in terms of how they would improve outcomes compared with current practice. The resulting WBS was divided into the net cost per patient to generate the ‘cost-value ratio’, which was used to rank options for service development. A subsequent exercise in another PCT (Wilson et al., 2007) used a similar approach, although rather than presenting results as a league table of cost-value ratios, results were presented graphically.

Finally, Mitton et al. (2006) in Canada ranked a series of options by both total weighted benefit score and cost value (score divided in to 5-year costs). They also ranked options by ‘gut feeling’. All three ranked lists were presented to the executive committee of the subject provincial health services authority, who generated the final ranked list based on the consideration of all three.
6. LIMITATIONS OF THE ‘COST-VALUE’ RATIO

The prioritisation exercises performed by Wilson et al. (2006, 2007) and Mitton et al. (2006) identified criteria typical of those identified in other exercises: a mixture of directly patient-specific (e.g. effectiveness, health gain, quality of life), and more general system-specific or population-specific issues (e.g. fit with national and local priorities, 'appropriateness', access, political acceptability), which whilst ultimately do relate to fulfilling the needs of patients, and are considered important issues for the PCT, cannot readily be applied at the individual patient level.

The scoring systems generated a WBS as per Equation (1) of between 0 and 10 or 0 and 100. In the Wilson papers, cost measure was net cost per patient affected (taking into account cost offsets, e.g. from reduced hospitalisations), and in the Mitton study, total capital plus operating cost over 5 years.

There are two points to note here. Firstly, the criteria are a composite of patient- and system-level concerns. Secondly, the WBS is bounded between 0 and some upper limit. These two points have implications for the derivation of a valid ratio: namely, the score is unable to directly take into account the scale of one programme compared with another.

To illustrate the effect of the latter point, suppose two options, A and B, were identical except for scale: option B was four times the cost and was generated four times the benefit (in terms of health gain, e.g. QALYs and all other possible benefit dimensions) of A (Table II). Assuming that constant returns to scale, both are equally efficient and thus should be ranked equally (the £/QALY is equal). Now suppose a weighted benefit scoring system such as that in Equation (1) with maxima and minima of 10 and zero was used to score the options. Suppose A scored six out of ten. As B is bigger, it generates more health and has a bigger impact on other criteria. If the scoring was proportional, B should score 24, but the WBS limits the maximum score to 10. Therefore, the ‘true’ benefit of B relative to A cannot be expressed within this mechanism, and B looks less efficient than A (£4000 vs £1667 per point of benefit). In order to validly capture the relative difference in benefit between A and B, the maximum option A could score is 2.5 (B, at four times the benefit, would then receive the highest score of 10).

It is almost impossible to use a 10 or even a 100 point visual analogue or Likert scale with several criteria and enable a rater to express their value judgment of the relative difference in benefit between two options, let alone place 10 or 20 options relative to each other on that scale. The result is that all options tend to get very similar scores (even if the rater genuinely believes that some options are two, three or four times more effective than others). We as analysts assume cardinal properties for this 10-point scale when we calculate our ratios, and because the options score similarly they all appear of relatively similar benefit. The costs, even when adjusted for the number of beneficiaries, can vary quite substantially and thus it inevitably follows that when benefit–cost ratios are calculated there is a bias towards the cheapest options; the relative differences in cost ‘drown out’ the relative differences in benefit, as observed in both Mitton et al. 2006 and Wilson et al. 2006. This would not happen if the ‘true’ differences in benefit could be captured.

7. POTENTIAL SOLUTIONS

The issue illustrated above arises as a result of attempting to capture decision-making criteria on a scoring scale that is bounded between zero and ten, and dividing this by a total or per-patient cost.
We now propose a number of potential solutions to this problem:

1. Measure all benefits and costs on a per-patient basis;
2. Magnitude estimation scaling;
3. Average rankings of cost and benefit;
4. Incorporate cost-effectiveness as a criterion in the weighted benefit score;

These are considered in turn below.

7.1. Measure all benefits and costs on a per-patient basis

Peacock et al. (2007) measured the health-related benefits of options at the individual patient level (analogous to measuring QALYs), and then weighted this score for the option’s performance under equity and community health criteria (which is analogous to an ‘extended’ equity-weighted QALY approach). Equity was defined in terms of the extent to which a health programme addressed the needs of disadvantaged groups, and community health was defined in terms community ownership and control of a health programme. They then calculated the cost per patient of the option. Cost–benefit ratios were calculated using cost per-patient data and the patient-level weighted benefit score. These ratios were valid for a representative patient from that programme.

This approach overcomes the problem described above if (a) health-related benefits can be readily measured at the patient level and (b) other relevant decision-making criteria can be applied at the patient level. However, this excludes other wider system-specific criteria that cannot be readily applied at the patient level (e.g. ‘achievability’), and therefore may only be a partial solution. The approach also requires that a multiplicative model be used to combine criteria scores using an MAU model. The most appropriate MAU function appears to be the ‘multiplicative weights for health’ model (Peacock et al., 2007).

7.2. Magnitude estimation

This is an approach whereby firstly the least beneficial option is identified as the ‘anchor’ and given a score of one against the first criterion. Every other option is then scored according to how much more beneficial it is compared with the anchor. This has been used to develop a scoring system for several condition-specific outcome measures (Ruta et al., 1994, 1995), but can be somewhat laborious when there are many options to be scored, each against several criteria. It is also unclear whether scores between criteria are comparable, although standardisation of scores to common mean and standard deviations would correct for this.

7.3. Average rankings of cost and benefit

This approach was successfully trialled in a Scottish Health Board (Scott and Lees, 2001). Options are ranked firstly by benefit score, and then again by cost per patient. The average of these two rankings is taken and is called the PSI. The options are then ranked by this PSI.

This method takes equal account of both cost and benefit, and should in general lead to high benefit/low cost bids being prioritised above low benefit/high cost ones, although this may not always be true as there still may be floor and ceiling effects. An alternative approach would simply be to ask raters to rank in order options from most beneficial to least beneficial on each criterion then take a weighted average of the criterion ranks and use the average of this ranking and the cost ranking. However, both of these approaches suffer from a risk of perverse rankings in the middle of the table as the relative size of costs and benefits is not taken into account.
To illustrate, suppose that four options, A, B, C and D, had costs and benefits on some measure (e.g. WBS, QALYs or some other outcome) as per columns 2 and 3 of Table III (‘cost’ and ‘WBS’). The ‘true’ ranking in terms of cost per point of benefit is A, B, C and then D. However, when ranking by PSI, bid A (highest benefit, least cost) does indeed come in at the top, and bid D (relatively low benefit, highest cost) comes in last, but in between, the PSI ranks C above B. As the cost per benefit point for C is higher than for B, there is a risk that some health gain will be foregone by choosing to invest in C in preference to B.

### 7.4. Incorporate cost-effectiveness as a criterion in the weighted benefits score

This approach entails abandoning the creation of a ratio of inputs to outcomes, and incorporating an estimate of cost-effectiveness within the benefits criteria (where an extremely cost-effective intervention would score a ‘10’, and an extremely cost-ineffective intervention would score ‘0’).

This neatly sidesteps the problems with using a ratio: options are now ranked purely and simply by weighted benefit score alone. The disadvantage is that the ranking process does not now consider overall benefit per pound spent. Thus, the benefit will not necessarily be maximised subject to the budget available.

### 7.5. Mixed methods approach

With this technique, a set of options is first ranked in order of cost per QALY (or cost per DALY). The rank order is then revised in the light of a set of explicit qualitative criteria, used to ‘filter’ the raw results (Carter et al., 2000). This is an appealing approach, but requires cost per DALY or QALY estimates for each option under consideration, which is unlikely to be available for every option. In reality it may be necessary to rely heavily on expert opinion to gauge DALY change, in which case the process is little better informed than a pure MAU model.

A variation on this approach is to summarise the costs and benefits of alternative options onto a single A4 sheet of paper. One is chosen at random and placed on a large surface (i.e. wall). Another option is selected at random and placed above or below this based on a qualitative consideration of the panel of the two options (a ‘paired comparisons’ approach). Further options are selected at random and positioned appropriately.

A further variant is to plot cost and weighted benefit score values graphically in cost-WBS space, analogous to a standard cost-effectiveness plane and use this as a basis for discussion to arrive at a final ranking (Figure 1) (Wilson et al., 2007).

These options all use the quantitative information on costs and benefits to inform a qualitative discussion to finalise the priority order (a deliberative approach). However, this use of mixed methods (quantitative and qualitative assessment of performance under different criteria) may compromise the transparency of the decision making. Using the Carter approach (Carter et al., 2000), there is a risk that outside observers will be unable to determine how criteria were defined and applied, and how the performance of programmes was measured against these criteria. Indeed it is possible, without clear definitions for criteria and the development of measurement instruments, that individual members of priority setting panels will not be evaluating programmes consistently, that is they may use different

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**Table III. Prioritisation Scoring Index**

<table>
<thead>
<tr>
<th>Bid</th>
<th>Cost</th>
<th>WBS</th>
<th>£/WBS</th>
<th>Cost rank</th>
<th>Benefit rank</th>
<th>Av rank</th>
<th>PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>£15000</td>
<td>5.0</td>
<td>£3000</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>£20000</td>
<td>3.5</td>
<td>£5714</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>£30000</td>
<td>4.8</td>
<td>£6250</td>
<td>3</td>
<td>2</td>
<td>2.5</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>£40000</td>
<td>4.0</td>
<td>£10000</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

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definitions and measures (although this is true also of the Wilson approach (Wilson et al., 2007) and indeed any other scheme using explicit criteria). To maintain transparency, it is essential firstly that all panel members are agreed on criteria definitions, and secondly, that discussions are fully documented.

8. DISCUSSION

In this paper, we have outlined the case for using PBMA-type approaches in local-level priority setting. We argued that ranking the options selected for (dis)investment is desirable. To do this, a single measure of benefit is required. Decision makers face a number of competing objectives that can be broadly grouped into ‘patient level’ (e.g. health gain) and ‘system level’ (acceptability, achievability) concerns; combining these objectives into a weighted benefit score achieves this. Further, ranking the options not by WBS alone, but in order of efficiency (cost per point scored) ensures the maximum overall benefit for the available budget. However, there are limitations to ranking in order of ‘cost-value’: dividing an index (WBS) into a cardinal number (cost) leads to cost dominating the final ordering, and we have presented a number of possible solutions to this. None of these are perfect and introduce problems of their own. We therefore reiterate the critical need for discussion of the results of any technical priority setting exercise: the formulae cannot provide the answer. They do however provide a valuable starting point and framework for discussion, and important input into the overall process.

There will always be objections to whether a single number can reflect appropriately all the relevant decision-making issues. Mishan’s principles for measurement in cost–benefit analysis can be summarised as ‘value what can be valued, measure what cannot be valued and at least identify what cannot be measured’ (Mishan, 1972, Chapter 4). These principles equally apply to the marginal analysis exercises described in this paper. Quantifying the degree to which a service development is ‘politically acceptable’ and combining this with a score quantifying its effectiveness may be objectionable to some. Nevertheless, both are relevant inputs into decision making. What the MCA approach adds is to make these competing objectives explicit, providing the means to explore why one option is considered superior or inferior to another.
The use of a ratio to rank the options assumes that returns to scale are constant, and that proposed service developments are perfectly divisible. In reality most projects are not divisible, although they may be ‘chunky’ (it may be possible to reconfigure a proposal with fewer staff, etc.). However, it should be noted that if returns to scale are not constant, rescaling a project in this way will affect the cost-value ratio. In situations where perfect divisibility does not exist, stepwise budget-neutral comparisons should be taken from each list, and consideration given as to whether that particular change would increase net welfare.

9. CONCLUSION

As demands for health care will always outstrip the resources available, prioritisation decisions have to be made in order to maximise the objectives of the PCT subject to the funding available. An explicit prioritisation procedure such as PBMA, making use of the evidence base with a clear set of goals and objectives, is more open and defensible than implicit decision-making techniques. PBMA is also more versatile to data availability and inclusion of decision-making criteria beyond QALY-maximisation alone.

Ranking the investments and disinvestments in the context of PBMA is a critical exercise. Many dimensions of benefit can be considered, both directly related to the individual patient, and more ‘system-wide’ benefits. Using weighted benefits scores to calculate cost-value ratios generates a list of projects in a recommended priority order. However, this creates potential problems because whilst cost is measured on the per-patient level, the WBS is a composite of both patient and system-level criteria, and is bounded between a ceiling and floor. This leads to the cost-value ratio being largely driven by cost.

If all benefits and costs are measured on a per-patient level, a valid ranking in order of efficiency can be derived. However, this may exclude wider benefit criteria that cannot be quantified on a per-patient basis.

We examined a number of potential solutions including rescoring benefits and costs on a per-patient basis, magnitude estimation scaling or taking average rankings of both cost and benefit separately. However, all these solutions have their limitations.

To identify the most appropriate approach, it is necessary to consider the information a decision maker requires to make decisions. Namely, what benefit do we get from an intervention, what does it cost and thus what are we going to have to forego in order to provide it. A valid weighted benefit score allows a measure of the benefits of an intervention across a wide range of relevant criteria (both patient- and system-specific). The cost per patient affected gives the decision maker an estimate of the resource intensity of each intervention. A simple summary of cost and weighted benefit score using a graphical approach to derive a preliminary ranking in our experience appeals to decision makers, laying bare opportunity costs and tradeoffs. Deriving weighted benefit scores using some form of standardised magnitude estimation that has true ratio properties would improve the validity. However, as all of the proposed techniques have their limitations, it is vital to remember that technical solutions are only an input into the decision-making process, and not the decision itself. Therefore, a deliberative approach based on the discussion of the initial rankings in our view would appear to be the most promising solution for decision makers.

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