



Priority Setting for Population Health
Working paper series

ISSN 2046-4614

Working paper no. 7

Healthcare prioritisation at the local level: a socio-technical approach

M Airoidi, A Morton, J Smith and G Bevan

A working paper from the SyMPOSE Research team:

Mara Airoidi, Research Officer, LSE
Gwyn Bevan, Professor of Management Science, LSE
Alec Morton, Lecturer, LSE
Jenifer Smith, Director of Public Health and Medical Adviser, Isle of Wight NHS PCT

Corresponding author:

Mara Airoidi
Department of Management
London School of Economics & Political
Science
Houghton Street
London WC2A 2AE
Tel. +44 (0)20 7955 6234
Email: m.airoidi@lse.ac.uk

Series editor:

Prof Gwyn Bevan
Department of Management
London School of Economics & Political
Science
Houghton Street
London WC2A 2AE
Tel. +44 (0)20 7955 6269
Email: r.g.bevan@lse.ac.uk

Online publication March 2011

Healthcare prioritisation at the local level: a socio-technical approach

Abstract

Cost effectiveness analysis is a systematic tool to inform resource allocation decision in healthcare. There is extensive evidence, however, that the tool is difficult to apply in practice, particularly at the level of local health planners, because it is not accessible to those involved in the prioritisation process and not embeds assumptions which are felt to be unacceptable for ethical or other reasons. Pragmatic tools such as Program Budgeting and Marginal Analysis appear to be more suitable for supporting local decisions by engaging stakeholders in a deliberative process. Unlike cost-effectiveness analysis, however, these tools are hard to relate to widely accepted health economic principles. This paper presents a socio-technical approach which draws explicitly on health economic theory and in a practical and reproduceable way through an action research case study with a local healthcare planner of the English National Health Service. Through close and iterative work with those responsible for allocating resources we present a formal model to capture the objectives of the health planners, a communicative procedure and interactive elicitation methods to help key stakeholders to articulate their knowledge and values. The approach proved accessible and acceptable and has been used in making spending decisions.

1. Introduction

One of the central aims of health economics as a discipline is the development of methods for the prioritisation of healthcare resources in a way which is justifiable with respect to normative principles and incorporates evidence about health and healthcare performance. However, methods also have to be practical and what counts as practical depends on the level at which prioritisation takes place. For example, in the English National Health Service (NHS) over the last few years, at least two levels can be distinguished. At the national level priorities are expressed through national policies which lay out standards of care and good practice guidelines. However, it is at the local level that decisions about contracting particular services are made, and it is these decisions which determine, in the most direct and tangible sense, how much, what and what sort of care patients resident in the locality receive. System actors at these different levels have quite different needs and competencies, and hence may require different processes for setting priorities.

The most widely accepted framework for healthcare prioritisation, at least within the health economic community, is Cost Effectiveness Analysis or CEA (Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005; Gold, Siegel, Russell, & Weinstein, 1996). The precise usage of this

term is somewhat contested, but considered in its broadest sense, the key idea of CEA is that decisions about which particular programmes to fund should be made on the basis of (or at least meaningfully informed by) a comparative analysis of the costs of those programmes, and the quantum of health which those programmes deliver, and to whom. Within the mainstream of health economics orthodoxy, the quantum of health is generally measured in Quality Adjusted Life Years or QALYs, and the focus is traditionally on the marginal beneficiary (Williams, 1985).

A subject of some controversy in the area in recent years has been the role of the methods of the World Health Organisation, so-called “Generalised Cost Effectiveness Analysis” (Tan-Torres Edejer, Baltussen, Adam, Hutubessy, Acharya, Evans et al., 2003). Two features of this generalised approach stand out: one is the use of the DALY (Disability-Adjusted Life Year) instead of the QALY metric, and the other is a stress on taking the population perspective, rather than the perspective of the marginal beneficiary. We consider the DALY metric to be problematic for technical reasons (Airoldi & Morton, 2009), but we also take a population focus. As we argue below this allows decision makers to have a sense of the cost impact of implementing change and the opportunity costs when operating out of a fixed budget envelope – something which applying a simple cost-effectiveness cut-off rule does not do (Birch & Gafni, 2006; Gafni & Birch, 2006).

Despite the existence of standards to perform CEA laid out in the above cited texts, there is a gap between technical analyses and their use to design policy recommendations both at the national and local levels, but particularly at the local level.

At the national level, where CEA is relatively widely applied, Bryan and colleagues (Bryan, Williams, & McIver, 2007; Williams & Bryan, 2007), offer a general characterisation of barriers to the use of CEA in terms of “accessibility” and “acceptability” based on interviews, committee observations and document analysis of the Appraisals Committee, the Health Technology Assessment agency of the English NHS. These authors claim that accessibility is compromised because of the difficulties of interpreting the results of CEA because of the lack of health economic skills of individual members of the committee, lack of timely access to data underlying the analysis and results presented too technically, making it difficult for non health-economists to fully appreciate their meaning and robustness. The acceptability of CEA is limited because of the inability of the Quality Adjusted Life Year (QALY) tool to account for benefits which are valued by patients (e.g. an issue identified by NICE Appraisal Committee was the difficulty to account for disease irreversibility); the lack of a standard, systematic way to account for the impact of

interventions on health inequality which the committee could apply consistently across different evaluations; and concerns over the implicit consideration of the opportunity cost of recommended interventions through the use of a threshold cost-effectiveness value, over which interventions are deemed cost-ineffective and should not be funded.

At the local level the problems of acceptability and accessibility are exacerbated by the even scarcer availability of time and resources to commission CEA, and the specialist skills to interpret it. Moreover, the local environment is more constrained than the national environment, as local prioritisation must take place within a framework of budgets and political objectives which are exogenously determined and imposed on the local organisation (Eddama & Coast, 2008).

One approach that has been proposed and used extensively to facilitate systematic planning at the local level is Program Budgeting and Marginal Analysis (PBMA; Madden, Hussey, Mooney, & Church, 1995; Mitton & Donaldson, 2001; Mitton & Donaldson, 2004; Mitton, Patten, Waldner, & Donaldson, 2003; Mooney, 1978; Peacock, Mitton, Ruta, Donaldson, Bate, & Hedden, 2010; Peacock, Richardson, Carter, & Edwards, 2007). PBMA is a pragmatic approach to applying the economic principles of marginal analysis and opportunity cost to local resource allocation decisions. In PBMA a structured process is used to engage local stakeholders in considering current spend, and proposing a ‘wish list’ of new interventions and a ‘hit list’ of potential disinvestments from current activity to fund the new proposals. The value of current and new interventions is generally assessed against all the criteria considered relevant by the local stakeholders using Multi-Criteria Decision Analysis (MCDA; Keeney & Raiffa, 1976) and participants are invited to consider the impact of changes to healthcare provision, that is the difference in benefits between funding the interventions on the wish list or on the hit list. However, contrary to CEA, it is not clear how the criteria proposed within PBMA relate to the normative principles, of health economics, nor it is clear how epidemiological and clinical evidence can be integrated into the modelling in a way consistent way.

This paper contributes to the development of methods to inform resource allocation by local healthcare planners proposing a “socio-technical” approach. The term “socio-technical” emerged around the 1960s to refer to an approach to designing organisational change in the workplace which recognised the need to take into account simultaneously the people and technology dimensions of the work environment (Trist, 1981). More broadly, the term can be understood as applying to approaches which consider simultaneously a social dimension, e.g. engaging

stakeholders in defining and solving a problem, and a technical dimension, e.g. the rational-analytic method which could be applied to quantify and solve the problem at hand (Phillips, 2007; Phillips & Bana e Costa, 2007). The use of a socio-technical approach seems appropriate in the context of healthcare systems, which are characterised by a natural tension which arises from the need to reconcile policy-making as both a political process with policy-making and an analytical-rational process based on expertise (Klein, 2006).

The paper presents a case study to describe the development and application of a socio-technical approach. Section two describes the research methods. Section three presents the case study in terms of context, terms of reference, the socio-technical process (formal analysis, communication procedure and interactive elicitation methods) and results. Section four discusses the accessibility, acceptability and the impact of the approach and section five provides concluding remarks.

2. Methods

This paper employs action research and the case study methodology. The term *action research* covers a multitude of activities and methods; their common feature is the participative engagement of the subjects of the analysis in the research, the research objective of analysing the world and trying to change it at the same time (Eden & Huxham, 1996). The case study methodology illuminates the set of decisions taken by the health planners in terms of *why* and *how* they were taken (Yin, 2009).

The research was conducted in collaboration with and for the Isle of Wight Primary Care Trust (PCT) of the English National Health Service (NHS) in 2008. PCTs are responsible for designing contracts with providers defining the type and volume of activity they expect to purchase to meet the health need of the local population of about 330,000 people on average. As the local planning and purchasing agency of the NHS, PCTs are funded through general taxation and a capitation formula (Department of Health, 2008).

The approach we took to helping the organisation prioritise was a decision analysis approach. Decision analysis aims at assisting ‘decision makers’ to make better decisions by dividing a complex problem in its simpler elements, analysing these separately, and re-combining them according to a valid theory (Raiffa, 1968). The use of decision analysis to assist with problems of

prioritisation or choice of a portfolio of multiple items to fund, is sometimes referred to “Portfolio Decision Analysis” as opposed to the simpler and more traditional setting where the decision maker has to choose one item out of a set (Salo, Keisler, & Morton, 2011).

The approach was organised around evaluation workshops with stakeholders which took the form of ‘Decision Conferences’. Decision Conferencing (DC), like PBMA, is a deliberative process. An impartial facilitator works iteratively with key stakeholders to generate a formal, ‘requisite’ model to assess options on multiple objectives using MCDA and generate a summary benefit score (Phillips & Bana e Costa, 2007). A model is ‘requisite’ when it is sufficient to represent the mental models, beliefs about uncertainty and preferences of the participants and additional model refinements do not generate new insights in the problem (Phillips, 1984). The various authors had somewhat different roles in the implementation of the approach, and in the ensuing, authors will be referred to by their initials (MA, AM, JS, RGB).

The analysis is based on extensive field notes, which include: the chronological development of the stakeholder engagement process and of the prioritisation technique, comments and reflections on these developments of the Strategic planning group, semi-structured and unstructured interviews with clinical staff and PCT managers, email correspondence with PCT staff, direct observation of workshops, flipcharts produced by workshop participants, clarification questions and comments received on the report summarising the results of the analysis.

3. Case study

Organisational context and term of reference

The Isle of Wight NHS PCT is located on an Island off the South-East coast of England and has a population of about 140,000. The PCT is comparatively small and, in contrast to elsewhere in England, it is organised as an integrated healthcare system with both purchasing and provision responsibilities, but with governance arrangements to ensure separation of responsibilities.

The project was formally launched when JS presented her annual Public Health Report to the NHS Board; and identified five key priority areas to focus on to reduce mortality and improve quality of life: cardiovascular disease, cancer, respiratory condition, mental and children health.

During the same meeting MA illustrated the process of DC and gained support from the Board to use this in developing their commissioning strategy. The aims of the engagement were to involve local stakeholders in the five identified priority areas to generate a robust plan for allocating an additional £1m on a recurrent basis from 2008 to 2012 through the PCT 'operational plan' (i.e. the budgeting or purchasing plan), on a value for money basis. The Board recommended looking at costs and using three criteria to identify value: to increase health (both in terms of reduced mortality and increased quality of life), to reduce health inequalities, and to be operationally and politically feasible.

The socio-technical process

The action research project ran from April to November 2008. This time corresponded with the process leading up to the operational plan proposal. The engagement consisted in (i) a schedule of meetings (two initial meetings in the spring and then fortnightly from June); (ii) the design, in collaboration with the PCT, of a social process to engage key stakeholders (including managers, clinicians, patients and public representatives) and of a technical process based in CEA principles to derive a list of priorities to allocate the growth money; (iii) the guidance on extracting information from available demographic and epidemiological data to support the evaluation of different interventions; (iv) the facilitation of meetings with stakeholders; (v) the analysis of results; (vi) the production of a report to document the process and to identify recommendations from the analysis; and answering further questions and performing supplementary analyses.

Executive level leadership was provided through the Strategic Planning group, which was set up by the Director of Public Health and Chief Medical Adviser of the Island (JS) with the support of the PCT board. They met fortnightly under the chairmanship of JS who also proposed and circulated for comments an agenda in advance. The group consisted of all eight executive directors; MA and a secretary also attended meetings. Its responsibility was to design an engagement process, choose a prioritisation technique and put forward recommendations to invest available, additional resources.

The Strategic Planning group selected and engaged stakeholders in two different types of event. First, they organised separate workshops for each of the five priority areas asking lead commissioners responsible for those areas to draw a list of key stakeholders including acute and

community care clinicians, council representatives, voluntary sector representatives, nurses, public and patients' representatives, managers of the hospital and the ambulance service. The cardiovascular area was divided in the two subcategories of coronary heart disease and stroke, which were led by different commissioning managers.

The six stakeholder workshops followed a similar structure. They were two-hour meetings, co-chaired by one executive director and the lead commissioner responsible for the area, and facilitated by MA (with the exception of the workshop on Children, which was facilitated by JS.). The mix of invited stakeholders aimed to represent the diverse perspectives which the commissioners wished to consider in allocating resources. The number of participants varied between 10 and 30 (a total of about 100 people were consulted in total) and the facilitation aimed at airing all perspectives. To support the discussion, basic demographic and epidemiological data on the disease area produced by the PCT analyst were provided. The workshops identified the key issues in each area and put forward a total of twenty-one strategic initiatives to improve quality of life and reduce health inequalities on the Island to be formally evaluated in the Decision Conference and prioritised the allocation of the available £1m of additional resources. Some people from each group volunteered to collect further information to give a clearer picture of their proposed initiatives. The total cost of the initiatives to be prioritised was over £5m.

The lead commissioners summarised the proposed initiatives in their area according to a common template requiring them to define the intervention operationally (e.g. to hire two health visitors in defined locations), to assess its expected cost, to estimate the number of people who would benefit, to describe the 'average' beneficiary (by demographic information, severity of the condition and socio-economic background in order to reflect on the impact on health inequalities) and to describe qualitatively or quantitatively the health benefit to the intended beneficiaries, and their families and carers.

The issues and interventions emerging from the workshops were reviewed in a one-day Decision Conference attended by 25 key stakeholders facilitated by MA with the support of AM. The meeting ran from 9.30 to 16.45 with a brief introduction, discussion in separate groups according to disease areas in the morning, plenary discussion and analysis of the results in the afternoon. The key stakeholders were the eight executive directors of the PCT, nine commissioning managers, three patients and public representatives, four clinical experts and one representative of social services.

In the meeting, participants built a formal model of the costs and value of all twenty-one strategic interventions on-the-spot in terms of costs and the three criteria defined by the Strategic planning group as follows:

- *Costs (c)*: The additional annual funding required in 2009 and 2010 both to set-up and to run the intervention, in £'000. Set-up costs included initial investments such as training and equipment and the running costs included costs such as personnel.
- *Health benefit to the Isle of Wight population (N*B)*: the extent to which *the assessed additional intervention* would improve the quality (and length) of life of those who benefit. The health benefit was modelled as the product of:
 - the number (*N*) of patients who benefit (excluding carers/family) by funding *this additional intervention*;
 - the potential benefit (*B*) in quality (and length) of life from *this additional intervention*, assuming successful implementation, to the 'average' patient who benefits, including the benefit to his/her carers/family and taking into account the timing and duration of those benefits.
- *Health inequalities (I)*: the extent to which *this additional intervention* has the potential for reducing both differences in access and differences in health outcomes (across geographical areas, between men and women, of special groups) *if appropriately targeted*.
- *Feasibility (p)*: Probability of success (from 0% to 100%) to achieve the assessed benefits, assuming funding is granted and taking into account: ease of implementation; availability of workforce; acceptability to stakeholder/environment (e.g. willingness to make this change happen); process complexity (e.g. number of steps required). This criterion captures the concept of 'operationally and politically feasible' the Board asked the Strategic Planning group to consider in its terms of reference.

The formal model underpinning the evaluation is to $\text{Max } \sum_j E(v_j) * x_j$, where $E()$ indicates an expected value calculation, v_j is the benefit from intervention j (details of its calculation will be provided later), and x_j is an index variable with value 1 in case intervention j is funded, and value 0 in case it is not. In the model used during the workshop, we made a simplifying assumption about $E()$, namely we assumed that the intervention would have been successful and deliver its benefits in full with probability $p\%$; if unsuccessful ($1-p\%$ probability), it would have delivered no benefit. This assumption was subjected to sensitivity analysis after the stakeholder event. The

formal model and its notation were hidden to workshop participants, who were presented with simpler, accessible visual aids for each step of the process, which will be described below. The budget constraint was not modeled explicitly because the PCT had some flexibility on allocating resources in the current and the subsequent year. The aim of the technical model was hence to generate a priority list of the twenty one interventions in terms of their cost-effectiveness or Value-for-Money and to agree the exact amount of available budget after the analysis.

To inform the evaluation, each participant drew on a copy of the templates describing the interventions proposed by the six stakeholder workshops, background demographic and epidemiological information on the local population, a handout with the operational definition of the assessment criteria and, of course, their individual expert knowledge. Through facilitated discussion and challenge, participants assessed each intervention following a systematic three-step process.

First, participants revised the information provided by the lead commissioners and scored the options for each separate commissioning group $g=1,\dots,6$ (which corresponded to the six stakeholders' groups), one criterion at a time as illustrated in Table 1, which reports the assessment for the three proposed interventions by the commissioning lead for cancer services, who also commissioned all palliative care. This required:

- Validating the number N of people who benefit (using demographic and epidemiological statistics, data on hospital admissions and expert judgment).
- Providing a description of the 'average' beneficiary of the proposed intervention and agreeing a qualitative description of the expected benefit (derived from clinical evidence of effectiveness and expert judgments).
- Quantifying the health benefits B to beneficiaries attributable to action within the budget period (over the beneficiaries' lifetime, assuming successful implementation and compliance). This assessment was informed by evidence (e.g. QALY gains) whenever available. Due to time constraints and the exploratory nature of this approach, we used direct rating with a Visual Analogue Scale (VAS) technique (Parkin & Devlin, 2006; von Winterfeldt & Edwards, 1986) on the basis of the evidence brought to bear by clinical experts attending the meeting as follows: participants identified the option providing the greatest individual health benefit which was assigned a score of 100; they then scored the remaining interventions relative to this benchmark score of 100 and a fixed benchmark of 0 corresponding to 'no additional health benefits compared to current care'. A rectangle

summarised the population health impact $N*B$ visually (Figure 1), with the numbers who benefit on the horizontal axis and the average benefit per person on the vertical axis. The area of the rectangle is the expected overall benefit of the intervention in the population.

- Assessing the impact on reducing health inequalities I on a VAS. Interventions which had no impact on health inequalities were given a score of zero. Participants identified the option with the greatest potential to reduce health inequalities (assuming successful implementation and compliance); this was assigned a score of 100 and the remaining options scored relative to this benchmark.
- Assessing the operational and political feasibility of the option by asking participants their degree of belief that it would deliver the stated benefits in probabilistic terms p (with 100% representing absolute confidence).

In case of disagreement, participants explored the reasons and sought a consensus view, which was usually reached. If a consensus view could not be arrived at, the range of proposed values was recorded for sensitivity analysis purposes and the majority's view at the end of the discussion used for the base model.

Table 1 Example of template and scores: options for cancer (a similar template was used for each of the other four priority areas and their eighteen interventions)

Initiative [j]	No. who benefit per year [N _j]	'Average' beneficiary	Description of individual benefit compared to current care	Health benefit per person score [B _j]	Health inequality reduction score [I _j]	Feasibility (Probability of success) [p _j]
Early detection & diagnosis in cancer	200	Person in her/his mid-60s, more likely to be female and from "hard to reach" groups in society	Earlier diagnosis is associated with better prognosis (we assume no benefit for people screened and with negative results)	100	100	95%
Palliative & End of Life care (all diseases)	1,500	Person in her/his late 70s, with life limiting long term health condition, equally likely to be from any socio-economic groups	Benefits to carers/family/friends. Benefits to patient: no change in life expectancy but a better quality of life in its last months	75	50	70%
Relocation of active treatment in cancer	300	Person in her mid-60s, more likely to be female; extremely severe illness	Patients are already receiving this treatment off the island, but there are psychological benefits of providing the service locally	25	0	10%

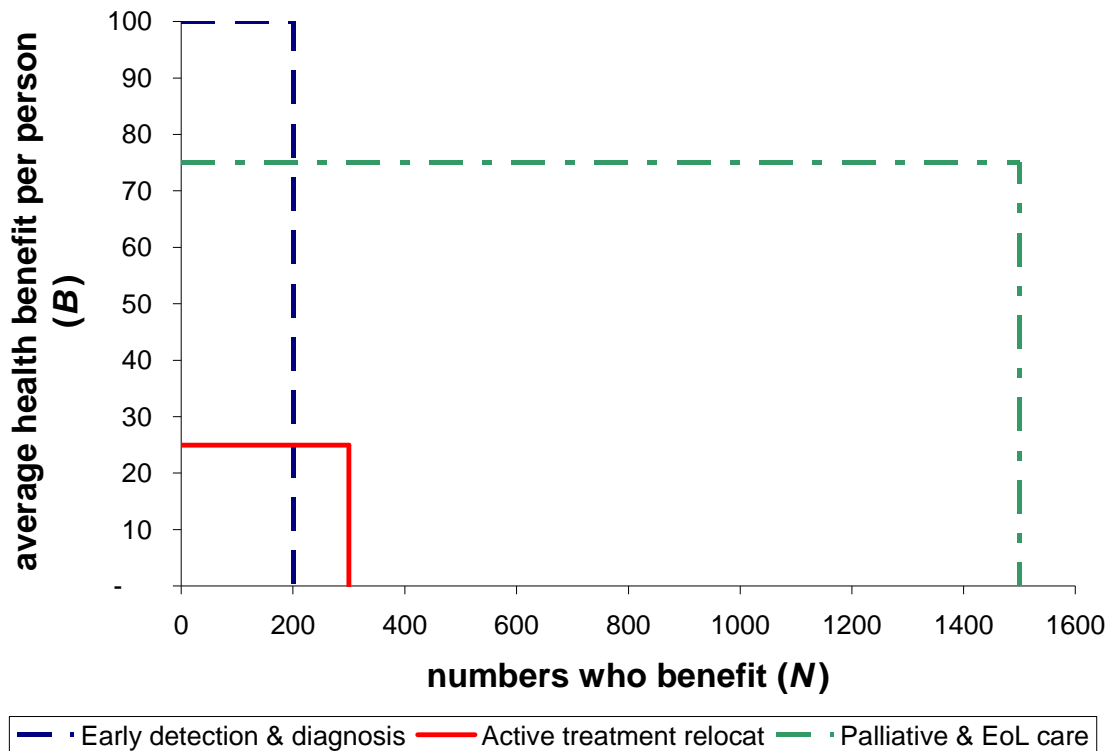


Figure 1 The rectangles of health benefit to the population for the three proposed initiatives in Cancer. Similar rectangles were drawn for each of the five areas and their interventions.

Second, the facilitators used decision analysis techniques to convert the scores on the three criteria on a common metric using three vectors of weights (Goodwin & Wright, 2004), which were elicited from participants. With the first vectors of weights, $w^B = (w_1^B, \dots, w_g^B, \dots, w_6^B)$ and $w^I = (w_1^I, \dots, w_g^I, \dots, w_6^I)$, participants considered one objective or criterion at a time and assessed the *relative contribution* to achieving the given objective by investing in a set of interventions in a disease group g (e.g. all proposed initiatives in the Cancer area) compared to another (e.g. all proposed initiatives in the Respiratory one). These weights are rescaling factors to convert scores for the same criterion in different disease areas on a common scale. We elicited a total of twelve within-criteria weights assigning a weight of 100 to the highest w_g^B and the highest w_g^I . Then participants considered health benefit and inequality reduction criteria and assessed their *relative contribution* to achieve the PCT's objectives, to convert scores on different criteria on a common value scale. To elicit this weight, participants considered the disease areas which received the highest within criteria weights of 100. A single rescaling factor W was sufficient to render scores

on the health inequality criterion commensurable with scores on the health benefit criterion. The judgments expressed in the across criteria weights are inherently subjective and the weighting procedure is cognitively complex and emotionally challenging. The facilitator helped participants in forming and expressing these values openly, noting uncertainty and disagreements to be explored by sensitivity analysis.

To incorporate the feasibility criterion, in the Decision Conference it was assumed that the PCT would not achieve any benefit from an unsuccessful intervention (for each intervention j this occurs with probability $1-p_j\%$). After the meeting, extensive parametric sensitivity analysis tested the robustness of results to this assumption through a parameter $k \in [0,1]$, which represented the proportion of benefits which would have been achieved in case of unsuccessful interventions. Defining $g(j)$ as the commissioning group of intervention j , the expected value of each intervention was hence calculated as follows (assuming $k=0$ during the Decision Conference):

$$E(v_j) = p_j \cdot (w_{g(j)}^B \cdot N_j \cdot B_j + W \cdot w_{g(j)}^I \cdot I_j) + (1 - p_j) \cdot \left[k \cdot (w_{g(j)}^B \cdot N_j \cdot B_j + W \cdot w_{g(j)}^I \cdot I_j) \right]$$

Thus, at the core of the analysis was a value model based on the expected value, with value computed as a weighted additive combination of health gain and inequality reduction. There is precedent for this sort of modelling strategy in the decision analysis literature: for example, Keeney and Winkler (1985) also present an additive model with absolute and distributional components for evaluating risk reductions.

Third, participants were presented with a triangle that focused the discussion on Value-for-Money of each intervention (Figure 2). The horizontal side of the triangle is the additional cost c_j associated with the intervention; the vertical side is the additional expected benefit score $E(v_j)$; and the slope of the hypotenuse of the triangle represents Value-for-Money with steeper hypotenuses representing better value for money, that is, more benefits for each pound spent. Showing the triangles stimulated a discussion both for their comparative size and slope. In most cases participants recognised the comparison as a fair representation of their intuitive judgments, but they had now a language to entertain a more informed discussion. In few cases results were less intuitive and explored extensively by revising the assessments of costs and benefits that constituted the scale and slope of the triangle creating a better understanding of the appraised interventions. Whenever necessary, assessments were revised.

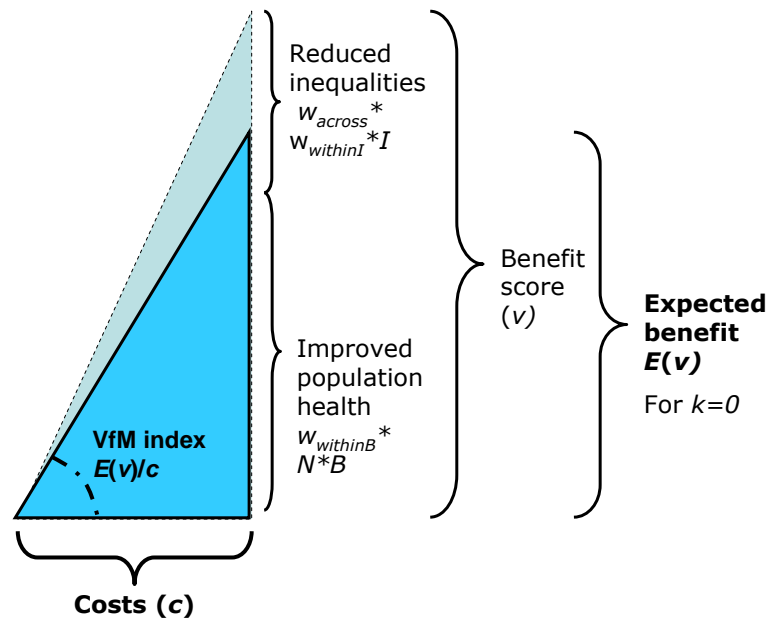


Figure 2 The structure of a value-for-money triangle

Results

The triangles were used to generate a priority list in which interventions were ranked according to Value-for-Money (Table 2), from the triangle with the steepest hypotenuse to the one with the flattest. This ranking is a cost effectiveness ranking similar to cost/QALY league table. Extensive sensitivity analysis was used to explore the uncertainties and disagreements among participants and the model proved robust. Figure 3 shows the same information in graphical form. The visual display generated important learning: for example, one intervention the evaluation of which had attracted considerable attention within the organisation, was represented by a triangle which was not only shallow (and thus low value for money), but tiny, because they it touched such a small number of people. Thus, from the point of view of almost everyone in the local population, and from the point of view the cost imposed on the system, it did not really matter whether this intervention was undertaken or not. To our minds, this sort of insight validates the importance of looking at benefits scaled up to the level of the population.

Table 2 Priority order according to Value-for-money ('league table') for $k=0.5$.

Commissioning area [g]	Intervention [j]	Additional cost in £k [c _j]	Additional benefit [E(v _j)]	VfM ratio [E(v _j)/c _j]	Cumulative cost in £k	Cumulative benefit
RESPIRATORY	pneumonia	£ 75	11.84	0.1579	£ 75	11.84
MENTAL HEALTH	Dementia services	£ 50	5.18	0.1036	£ 125	17.02
CVD	TIA & 2ndary prevention	£ 130	5.40	0.0415	£ 255	22.42
MENTAL HEALTH	Prison MH	£ 150	4.51	0.0301	£ 405	26.94
CHILDREN	Obesity training	£ 60	1.73	0.0289	£ 465	28.67
CHILDREN	Workforce development	£ 100	2.78	0.0278	£ 565	31.44
MENTAL HEALTH	Psych therapies	£ 120	3.05	0.0254	£ 685	34.49
CANCER	Early detection and diagnostics	£ 300	5.74	0.0191	£ 985	40.23
CHILDREN	CAMHS School	£ 160	2.76	0.0173	£ 1,145	42.99
CVD	Prevention	£ 650	10.48	0.0161	£ 1,795	53.48
CHILDREN	CAMHS 1:1	£ 80	1.26	0.0157	£ 1,875	54.73
CVD	Cardiac Rehab	£ 100	1.29	0.0129	£ 1,975	56.02
MENTAL HEALTH	Alcohol misuse svc	£ 300	3.77	0.0126	£ 2,275	59.78
MENTAL HEALTH	Social inclusion	£ 300	3.75	0.0125	£ 2,575	63.54
CANCER	Palliative & EOL	£ 760	9.05	0.0119	£ 3,335	72.59
CHILDREN	Obesity 1:1	£ 140	1.22	0.0087	£ 3,475	73.81
CHILDREN	Primary prevention	£ 600	4.61	0.0077	£ 4,075	78.42
CHILDREN	Access to dental	£ 480	3.24	0.0068	£ 4,555	81.66
CANCER	Active Treatment	£ 50	0.31	0.0062	£ 4,605	81.97
CVD	Stroke emergency	£ 600	3.37	0.0056	£ 5,205	85.34
CVD	CHD acute	£ 300	0.78	0.0026	£ 5,505	86.12

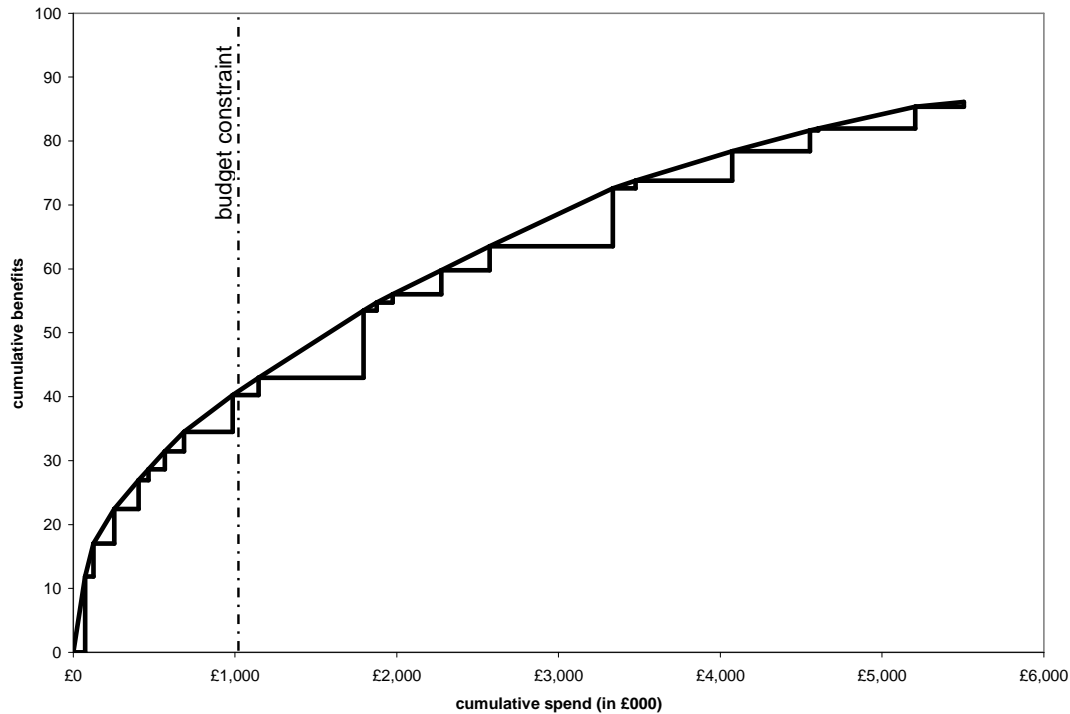


Figure 3 The efficient frontier of triangles ranked by value-for-money

Three weeks after the Decision Conference, participants received a copy of the report for consultation. The report summarised the approach, documented each step of the process, and the results of the base models and of sensitivity analyses. The executive directors and commissioning leads discussed the results and proposed an operational plan based on the analysis to the IoW NHS Board for approval. The proposal followed the VfM ranking of Table 2 and Figure 3 with the exception of End of Life care for which separate funding was provided in addition to the planned £1m.

The IoW NHS Board received the results of the analysis favourably and approved the proposed operational plan. The Board found the efficient frontier (Figure 3) particularly insightful (JS attended the meeting). It enabled them to visualise the expected efficiency gain of about 25% compared to the alternative ranking and to articulate a clear rationale for the proposed list of interventions based on the principles of opportunity cost. In the end, the PCT Board approved an operational plan to fund the interventions with the highest Value-for-Money as resulting from the analysis, with the exception of the End of Life proposal which was funded irrespective of the analysis.

The following year, 2009, the PCT hired a private consultancy firm of trained decision analysts able to replicate the approach and participants from the previous year confirmed their willingness to engage in the workshops, which were extended to more people. Thus the approach which we introduced was seen as adding value, and had momentum. However, following the structural reforms announced by the coalition government in 2010, the Primary Care Trust tier of the NHS is to be abolished. At the time of writing it is unclear where healthcare planning will sit in the English system and what form it will take.

4. Discussion

Accessibility

The approach was relatively accessible to the Strategic planning group. This is not surprising because they had been continuously and actively engaged in designing the framework and the elicitation frameworks used were based on their conscious and deliberate choice. For instance, in the design of a scoring procedure the group first considered the use of “fixed scales” to provide a qualitative description of different levels on the scale of each criterion (Bana e Costa & Beinart, 2005), but the Strategic planning group considered this too laborious to develop and too difficult for invited participants to understand. The group proposed to use a simple scoring tool of ‘High-Medium- or Low- impact’ which was not ultimately used because it might not have been sufficient to discriminate among alternatives and it would have been difficult to ensure consistency in scoring alternatives which fell on the border of two categories. Further, in preparation for the prioritisation event with stakeholders of the six commissioning areas the Strategic planning group pilot-tested the proposed scoring tools in a mock Decision Conference for a sample of interventions. The pilot proved useful to test the accessibility of the visual aids, and to improve the definition of feasibility in terms of ‘probability of success’ to replace the original definition in terms of ‘ease of implementation’, a concept which proved unhelpful whenever participants held different views because each participant seemed to hold a different perception of ‘ease’.

The use of the decision analytic principles with the development of simple visual aids for each step of the process proved invaluable in the deliberative process with the invited stakeholders, and

participants particularly praised the quality of the discussion the framework enabled before, during and after the event. Before the event, the framework defined specific questions and focused the data extraction. During the event, the use of rectangles to visualise the population health gain helped clinicians and patients to share their knowledge or to articulate their expert opinion on the impact for the individual patient; and it enabled participants to advise commissioning leads more clearly on the details of the implementation to achieve a larger number of beneficiaries, the associated costs, and to document the agreed changes. This was particularly evident for interventions in primary prevention, for which hard evidence was not available and local characteristics of the health economy are particularly critical: it enabled participants to volunteer estimates and for these to be challenged by others.

Similarly, the triangles of Value-for-Money and their aggregation in an efficient frontier enabled participants to engage in a discussion on the opportunity cost of alternative budget allocations both during and after the event. In particular, participants tested the impact of alternative scores and weights on the efficiency frontier as well as the opportunity cost of financing an alternative with relatively low VfM, by exploring what options would have to be given up if that alternative were to be funded.

At the merge meeting it became evident, however, that our definition of health inequalities was not as accessible as we would have liked. In particular, if health inequalities are measured in terms of the health gap between different groups in the population measured for instance in terms of quality-adjusted life expectancy at birth, one would expect that the higher the number of health-poor people affected the higher the impact on health inequalities. Participants, however, did not consider the number of people affected by the intervention unless prompted by the facilitators and the rationales used to defend their health inequality score usually reflected their personal view of the extent of “health-poverty” of a typical beneficiary or his/her deservingness of better health. The development of a more intuitive and theory-based approach to modelling health inequality is the focus of ongoing research (Morton & Airoidi, 2010).

Acceptability

With the exception of one member, members of the Strategic planning group found the approach acceptable in terms of the included criteria, their definition, their operationalisation, and the

method to translate values into a priority order and the evaluation of palliative and end of life treatments.

The objecting member of the Strategic planning group raised a general concern with the use of “an approach which aims at getting the greatest good for the greatest number”. This was clearly a rejection of the utilitarian principle embedded in the ‘a QALY is a QALY is a QALY’ principle commonly applied in health economics. At the core of the objection was a legalistic and pragmatic perspective and she contended that it would have been difficult to defend hard choices based on the utilitarian principle in front of the public or the courts. The majority of the Strategic planning group, however, thought that the utilitarian principle was acceptable and would have been useful to identify the hard trade-off involved in funding decisions; they agreed to aggregate health gains across people additively in the analysis and to discuss the political feasibility of the recommended set of interventions to be funded at the end of the process.

For the specific assessment of palliative and end of life interventions the executive directors and commissioning leads judged the approach unacceptable and decided to ignore the results for these treatments. They felt that the value of these interventions is to provide ‘a good death’ and this could not be captured by the criteria used in the approach. They were not able to articulate a general, acceptable definition of ‘good death’ as different patients and their families may have very different needs at this difficult time of their life and ‘a good death’ may have more to do with allowing them time to understand these needs and respecting their wishes than with a specific healthcare intervention (Sandman, 2005).

The difficulty of using a common tool to assess curative and palliative interventions is not unique to this case study, as demonstrated by the debate about the appropriate cost-effectiveness threshold within the cost per QALY approach for end of life treatments, in which some authors advocate for the appropriateness of a higher cost per QALY threshold (Mason, Jones-Lee, & Donaldson, 2009; Towse, 2009). The recent report on End of Life issued by the National Audit Office in the UK, which assess the Value-for-Money of public services, has also sidestepped the issue of attaching a value to treatment and focused its analysis on costs (National Audit Office, 2008).

The assessment of preventative and potentially life-saving interventions posed a similar challenge, with participants invoking the ‘rule of rescue’ principle – the moral imperative to

rescue identified people in immediate peril regardless of the costs – to express their difficulty in comparing the relative health benefits across these interventions. The executive directors decided to exclude ‘rule of rescue’ considerations in the formal analysis in order to be able to quantify and to face the hard trade-offs between investing in prevention compared to treatment. They recognised that the choice between prevention and potential cure is an intrinsically difficult value judgment but also highlighted the value of visualising the opportunity cost of providing additional treatment to inform their decisions. Their difficulty is consistent with the current absence of any clear, agreed operationalisation of the rule of rescue principles (Cookson, McCabe, & Tsuchiya, 2008). Despite the dismissal of ‘rule of rescue’ considerations, however, the analysis identified most preventative interventions as poor Value for Money because they were usually also associated with a relatively low probability of success (which reduced their expected value).

Most clinicians and patients appreciated the logic of the approach but were somewhat uncomfortable with the use of subjective estimates to assess interventions. For instance, clinicians played a crucial role to assess the health benefit to the average patient. They volunteered their estimates based on their knowledge of the literature and their professional expertise and found the process acceptable to stimulate a discussion but frequently called for a more systematic use of the evidence to validate their judgments. In particular, they found it difficult to assess the relative health gain from different interventions for the ‘average’ beneficiaries as they felt that in their professional experience “there is no such thing as an ‘average’ patient” and their professional ethos demanded “to do the best [they] could possibly do for each individual patient”.

Similarly, one of the patient representatives highlighted that he enjoyed the event and that the process was “an advance on just sitting around a table and talking it through”, but that he was uneasy about the subjectivity of the estimates. He was not convinced that extensive sensitivity analyses could replace objective evidence and invited the PCT to collect more objective epidemiological and clinical evidence, and to use it to put into perspective the anecdotal evidence that the public is most likely to draw upon.

The executive directors recognised that several estimates were based on expert judgments brought to bear on the day and discussed their confidence in the model results. They concluded that the model was a fair representation of the evidence available on the day, the knowledge shared by those who participated in the event but appreciated that a different group of participants and the collection of more evidence might have led to different results. This naturally raised questions

which were dealt with extensive sensitivity analysis on scores and weights to assess in particular the robustness of the model to different assumption on the effectiveness (numbers who benefits and benefit per person) of preventative interventions. The model proved robust to extreme changes in scores and weights, which increased the confidence of the executive team to base the recommendations for funding on the results of the model.

5. Conclusions

This paper describes a socio-technical approach to bring together those responsible for allocating resources to healthcare intervention on behalf of a local population with different sources of expert knowledge to inform their decision. It presents a framework for prioritisation, comprising a value model, a communication procedure and an interactive elicitation method to enable participants in articulating their views, communicating and sharing their expertise and formulating their value judgments through a weighting a scoring procedure supported by simple visual aids. The interactive engagement with those responsible to recommend a plan for resource allocation in designing the approach contributed to its accessibility and acceptability. The results of the work had a material and demonstrable influence on spending decisions by the PCT.

The framework that we present draws explicitly on health economics. As such it provides a framework within which evidence from public health and demographic surveys, health economic studies and RCTs, and local administrative and accounting systems can be synthesised with the judgement of the people who know the system best, and structured to be directly relevant to management decisions. We believe our success in facilitating clear, value-driven and evidence-based discussions are attributable to the intellectual robustness of the underpinning health economic theory, and indeed, where our methods were less informed by health economics – as in the modelling of inequality, and the health benefit/ inequality tradeoff – we were less successful in facilitating such discussions.

This notwithstanding, the approach we present is genuinely a sociotechnical one, which aims to enable discussion and reflection rather than prescribe choice. Hence, in areas where health economics theory has less purchase as a normative theory– in particular in the valuation of End of Life care – decision makers set aside the priorities as assessed by the model and, for explicit and legitimate reasons, made their decisions on the basis of other concerns. This is of course as it

should be, for in an arena where values are as contested as healthcare, the highest aspiration for analysis can only be to provide a basis for thoughtful and informed moral choices.

References

- Airoldi, M., & Morton, A. (2009). Adjusting Life for Quality or Disability: stylistic difference or substantial dispute? *Health Economics*, 18, 1237-1247.
- Bana e Costa, C. A., & Beinart, E. (2005). Model-structuring in public decision-aiding. LSE Operational Research working paper series. London.
- Birch, S., & Gafni, A. (2006). The biggest bang for the buck or bigger bucks for the bang: the fallacy of the cost-effectiveness threshold. *Journal of Health Services Research and Policy*, 11(1), 46-51.
- Bryan, S., Williams, I., & McIver, S. (2007). Seeing the NICE side of cost-effectiveness analysis: a qualitative investigation of the use of CEA in NICE technology appraisals. *Health Economics*, 16, 179-193.
- Cookson, R., McCabe, C., & Tsuchiya, A. (2008). Public healthcare resource allocation and the Rule of Rescue. *J Med Ethics*, 34, 540-544.
- Department of Health. (2008). Resource allocation: weighted capitation formula - sixth edition. In Resource Allocation Team (Ed.). London: Department of Health.
- Drummond, K. F., Sculpher, M. J., Torrance, G. W., O'Brien, B. J., & Stoddart, G. L. (2005). *Methods for the Economic Evaluation of Health Care Programmes*. Oxford: OUP.
- Eddama, O., & Coast, J. (2008). A systematic review of the use of economic evaluation in local decision-making. *Health Policy*, 86, 129-141.
- Eden, C., & Huxham, C. (1996). Action Research for the study of organisations. In S. Clegg, C. Hardy & W. Nord (Eds.), *Handbook of Organization Studies*. Beverley Hills: Sage.
- Gafni, A., & Birch, S. (2006). Incremental cost-effectiveness ratios (ICERs): The silence of the lambda. *Social Science & Medicine*, 62(9), 2091-2100.
- Gold, M. R., Siegel, J. E., Russell, L. B., & Weinstein, M. C. (Eds.) (1996). *Cost-effectiveness in health and medicine*. Oxford: OUP.
- Goodwin, P., & Wright, G. (2004). Chapter 13 Resource allocation and negotiation problems. *Decision Analysis for management judgment* pp. 329-354). Chichester: John Wiley & Son.
- Keeney, R. L., & Raiffa, H. (1976). *Decisions with Multiple Objectives. Preferences and Value Tradeoffs*. Cambridge: Cambridge University Press.
- Keeney, R. L., & Winkler, R. L. (1985). Evaluating decision strategies for equity of public risks. *Operations Research*, 33(5), 955-970.

- Klein, R. (2006). *The new politics of the NHS*. Oxford: Radcliffe publishing.
- Madden, L., Hussey, R., Mooney, G., & Church, E. (1995). Public health and economics in tandem: programme budgeting, marginal analysis and priority setting in practice. *Health Policy*, 33, 161-168.
- Mason, H., Jones-Lee, M., & Donaldson, C. (2009). Modelling the monetary value of a QALY: a new approach based on UK data. *Health Economics*, 18, 933-950.
- Mitton, C., & Donaldson, C. (2001). Twenty-five years of programme budgeting and marginal analysis in the health sector, 1974-1999. *Journal of Health Services Research and Policy*, 6(4), 239-248.
- Mitton, C., & Donaldson, C. (2004). Health care priority setting: principles, practice and challenges. *Cost Effectiveness and Resource Allocation*, 2(3).
- Mitton, C., Patten, S., Waldner, H., & Donaldson, C. (2003). Priority setting in health authorities: a novel approach to a historical activity. *Social Science & Medicine*, 57, 1653-1663.
- Mooney, G. (1978). Planning for balance of care of the elderly. *Scottish Journal of Political Economy*, 25(2), 149-164.
- Morton, A., & Airoldi, M. (2010). Incorporating health inequalities considerations in PCT priority setting (LSEOR10.122). LSEOR Working Paper Series. London: LSE.
- National Audit Office. (2008). *End of Life Care*. London: National Audit Office.
- Parkin, D., & Devlin, N. (2006). Is there a case for using visual analogue scale valuations in cost-utility analysis? *Health Economics*, 15, 653-664.
- Peacock, S. J., Mitton, C., Ruta, D., Donaldson, C., Bate, A., & Hedden, L. (2010). Priority setting in healthcare: towards guidelines for the program budgeting and marginal analysis framework. *Expert Review of Pharmacoeconomics & Outcomes Research*, 10(5), 539-552.
- Peacock, S. J., Richardson, J. R. J., Carter, R., & Edwards, D. (2007). Priority setting in health care using multi-attribute utility theory and programme budgeting and marginal analysis (PBMA). *Social Science and Medicine*, 64(4), 897-910.
- Phillips, L. D. (1984). A theory of requisite decision models. *Acta Psychologica*, 56, 29-48.
- Phillips, L. D. (2007). Decision Conferencing. In W. Edwards, R. F. Miles & D. Von Winterfeldt (Eds.), *Advances in decision analysis: from foundations to applications*. Cambridge: CUP.
- Phillips, L. D., & Bana e Costa, C. (2007). Transparent prioritisation, budgeting and resource allocation with multi-criteria decision analysis and decision conferencing. *Annals of Operations Research*, 154(1), 51-68.
- Raiffa, H. (1968). *Decision analysis: Introductory lectures on choices under uncertainty*. Reading, MA: Addison-Wesley.
- Salo, A., Keisler, J., & Morton, A. (Eds.) (2011). *Portfolio Decision Analysis: methods for improved resource allocation*. New York: Springer.

- Sandman, L. (2005). *A good death. On the value of death and dying*. Maidenhead: Open University Press.
- Tan-Torres Edejer, T., Baltussen, R., Adam, T., Hutubessy, R., Acharya, A., Evans, D. B., et al. (Eds.) (2003). *WHO guide to cost-effectiveness analysis*. Geneva: World Health Organisation.
- Towse, A. (2009). Should NICE's threshold range for cost per QALY be raised? Yes. *BMJ*, 338(31 January 2009), 268.
- Trist, E. L. (1981). *The evolution of socio-technical systems: a conceptual framework and an action research program*. Toronto: Ontario Ministry of Labour, Ontario Quality of Working Life Centre.
- von Winterfeldt, D., & Edwards, W. (1986). *Decision analysis and behavioral research*. Cambridge: Cambridge University Press.
- Williams, A. (1985). Economics of coronary artery bypass grafting. *British Medical Journal*, 291, 326-329.
- Williams, I., & Bryan, S. (2007). Understanding the limited impact of economic evaluation in health care resource allocation: a conceptual framework. *Health Policy*, 80, 135-143.
- Yin, R. K. (2009). *Case study research: design and methods*. Los Angeles: Sage.