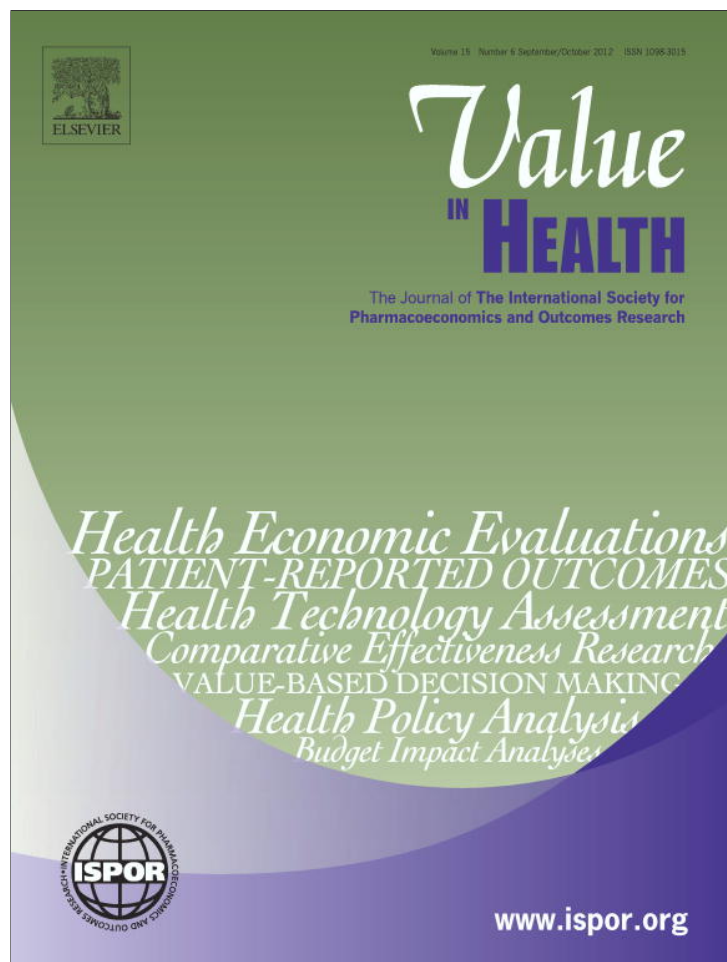


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Multicriteria Decision Analysis for Including Health Interventions in the Universal Health Coverage Benefit Package in Thailand

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ABSTRACT

Objectives: Considering rising health expenditure on the one hand and increasing public expectations on the other hand, there is a need for explicit health care rationing to secure public acceptance of coverage decisions of health interventions. The National Health Security Office, the institute managing the Universal Coverage Scheme in Thailand, recently called for more rational, transparent, and fair decisions on the public reimbursement of health interventions. This article describes the application of multicriteria decision analysis (MCDA) to guide the coverage decisions on including health interventions in the Universal Coverage Scheme health benefit package in the period 2009–2010. **Methods:** We described the MCDA priority-setting process through participatory observation and evaluated the rational, transparency, and fairness of the priority-setting process against the accountability for reasonableness framework. **Results:** The MCDA was applied in four steps: 1) 17 interventions were nominated for assessment; 2) nine interventions were selected for further quantitative as-

essment on the basis of the following criteria: size of population affected by disease, severity of disease, effectiveness of health intervention, variation in practice, economic impact on household expenditure, and equity and social implications; 3) these interventions were then assessed in terms of cost-effectiveness and budget impact; and 4) decision makers qualitatively appraised, deliberated, and reached consensus on which interventions should be adopted in the package. **Conclusion:** This project was carried out in a real-world context and has considerably contributed to the rational, transparent, and fair priority-setting process through the application of MCDA. Although the present project has applied MCDA in the Thai context, MCDA is adaptable to other settings.

Keywords: multicriteria decision analysis, priority setting, UC benefit package.

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Introduction

High-cost health interventions including pharmaceuticals and medical technologies are increasingly becoming available in Thailand, increasing public and patient expectations. Because of limited resources, however, the government cannot make all these interventions available to the population and this makes the need for priority setting of interventions more and more explicit. In the past, decisions on the public reimbursement of interventions were typically ad hoc and not transparent [1,2]: for example, certain interest groups (such as politicians, health professionals, or industry) could selectively advocate new interventions for public reimbursement. The decision-making processes often lack a systematic way without clear criteria for making coverage decisions. Decision makers in Thailand have recently acknowledged this inadequate process and called for more rational, transparent, and fair decisions on the public reimbursement of interventions to improve population health in the country [3]. As a spring-off, the National Health Security Office (NHSO), the institute that manages the largest health plan in Thailand (Universal Coverage Scheme [UC]), initiated a collaborative research and development project

with two independent research institutes—the Health Intervention and Technology Assessment Program and the International Health Policy Program—in 2009. The aim of the project was to develop an optimal strategy for the development of the UC benefit package, that is, to determine which interventions should be candidate for public reimbursement.

At the outset of the project, it was decided to use multicriteria decision analysis (MCDA) as an overall methodological approach for its potential for rational and transparent priority setting [4,5]. MCDA is defined as “a set of methods and approaches to aid decision-making, where decisions are based on more than one criterion, which make explicit the impact of all the criteria applied and the relative importance attached to them” [5].

This article describes the application of MCDA to support the coverage decisions on including health interventions in the Thai UC health benefit package in the period 2009–2010. We addressed the following research question: “Does the use of MCDA lead to (more) rational, transparent, and fair decisions in the development of the UC benefit package in Thailand?” In the absence of a clear standard on all aspects, we evaluated the present project against the accountability for reasonableness (A4R) framework

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[6,7], which specifies conditions for fair decision making. In doing so, the framework also considers the aspects of rational and transparent priority setting.

To our knowledge, this is the first time in a low- or middle-income country that MCDA is practically used including a deliberative process and multiple stakeholders' involvement to guide national-level priority setting in health care coverage decisions. The experience of Thailand, and therefore this article, also holds relevance for other countries, as it may inform them on the options and limitations of MCDA for setting priorities in health.

Multicriteria decision analysis

Empirical evidence suggests that a number of criteria including efficiency, equity (e.g., giving priority to the severely ill or the poor), financial protection, and political considerations are considered important by policymakers when setting priorities [8-10]. It is far from easy for policymakers, however, to consider these criteria simultaneously—evidence on all criteria is not always available, criteria are not equally important and may even conflict with each other, and policymakers (as people in general) are not good at absorbing dissimilar types of information—and risk cognitive overload [4]. This has prompted the use of MCDA for priority setting (Fig. 1) [4]. MCDA allows the identification of a comprehensive set of criteria, establishes the performance of interventions on those criteria in a so-called performance matrix, and then inspects the performance matrix qualitatively or quantitatively to rank order interventions [4]. In a qualitative inspection, policymakers simply interpret the performance matrix and make implicit judgments on the weights of the various criteria. In a quantitative inspection, policymakers weigh the different criteria on the basis of their relative importance, and multiply the scores by the weights to obtain weighed averages for all interventions. Interventions can subsequently be rank ordered according to these weighed averages.

Methods

We described the MCDA priority-setting process through participatory observation. We evaluated the rational, transparency, and fairness of the priority-setting process against the A4Rframework [6,7]. The framework specifies the four conditions for fair decision making. In doing so, the framework also considers the aspects of rational and transparent priority setting.

The whole process involved a project team (including NHSO, the Health Intervention and Technology Assessment Program, and the International Health Policy Program) and a research team (including the Health Intervention and Technology Assessment Program and the International Health Policy Program). At the beginning of the project, the research team reviewed the international experience on the development of public health benefit packages to further refine and operationalize the methodological approach. The review documented the experience of seven health technology assessment organizations in Canada, England and Wales, the United States, the Netherlands, Germany, Sweden, and Spain, which all use an explicit process of priority setting (Table 1). The review concluded that all these organizations consider multiple criteria, involve multiple stakeholders, and distinguish, in one way or another, four basic steps in their priority-setting process. These steps were then also applied in the Thai setting and included 1) nomination of interventions for assessment, 2) selection of interventions for assessment, 3) technology assessment of interventions, and 4) appraisal of interventions.

For steps 1 and 2, the project team established a consultation panel (panel 1) to reach consensus on who should be involved in these steps and which criteria should be included as the selection criteria. Participants of the consultations were identified by their expertise and selected purposively to cover stakeholders who play an important role in the Thai health insurance system. The four steps are discussed in detail in the following subsections.

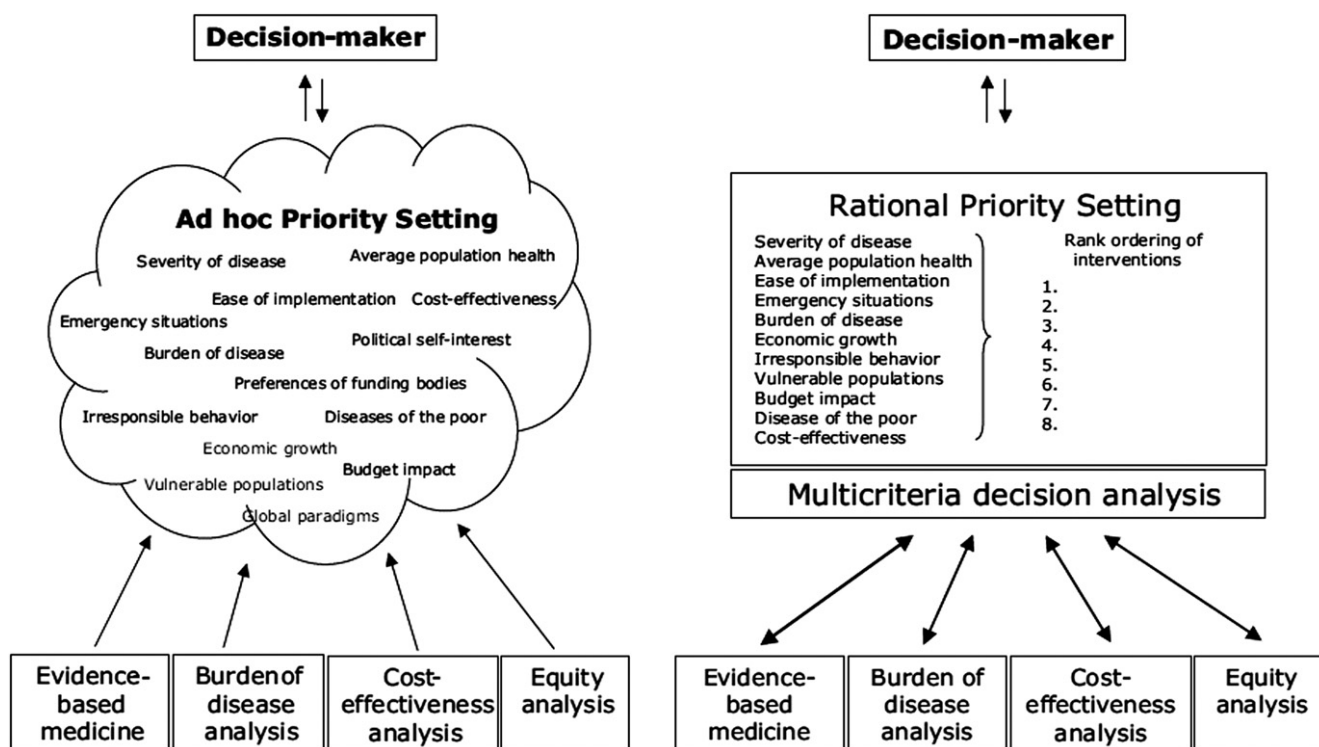


Fig. 1 – Ad hoc priority setting and rational priority setting. From Baltussen and Niessen [4].

Table 1 – The results of the reviews regarding stakeholder involvement and criteria used.

	The reviewed organizations						
	NICE	CADTH	VATAP	Health Council of the NL	SBU	DAHTH	CAHTH
Stakeholder involvement in nomination step							
Policymakers	•	•	•		•	•	
Health professionals	•	•	•		•	•	•
Academics	•	•	•		•	•	•
Patients	•	•	•			•	•
Civil society	•					•	
Private sector	•				•	•	
General populations	•					•	
International organizations			•				
Organizational employees	•	•	•	•			
Stakeholder involvement in selection step							
Policymakers	•	•			•	•	
Health professionals	•	•	•		•	•	•
Academics	•	•			•	•	•
Patients	•					•	
Civil society	•					•	
Private sector						•	
General populations	•	•					
International organizations							
Organizational employees	•	•		•			
Criteria used in selection of health technology assessment topics							
Variation	•	•	•		•	•	•
Resource impact	•						
Necessity				•			
Effectiveness		•		•	•	•	•
Efficiency				•		•	
Cost of intervention			•		•		•
Individual responsibility				•			
Translating new knowledge into clinical practice or care			•		•		•
Possibility of change in cost							•
Burden/severity of disease	•		•			•	•
Need for knowledge of the problem			•				
Urgency/timeliness	•						
Number of potential patients		•	•		•		•
Policy importance	•						
Equity/ethical and social implication	•	•	•		•		•
Economic impact	•	•			•		•
Sufficient evidence for assessment			•			•	
Criteria used in health intervention assessment							
Effectiveness/efficacy	•	•	•	•	•	•	•
Safety							•
Cost		•					
Cost-effectiveness	•	•		•	•	•	•
Budget impact		•		•			
Population impact		•					
Planning/utilization/legal issues		•				•	
Equity/ethical and social implication		•			•	•	

CADTH, Canadian Agency for Drug and Technologies in Health (Canada); CAHTH, Catalan Agency for Health Technology Assessment (Spain); DAHTH, German Agency for Health Technology Assessment (Germany); NICE, the National Institute for Health and Clinical Excellence (England and Wales); NL, Netherlands; SBU, Swedish Council on Technology Assessment in Health Care (Sweden); VATAP, Veteran Administration's Technology Assessment Program (the United States).

Step 1: Nomination of interventions for assessment

The consultation panel 1 reached consensus to include a large variety of stakeholders in step 1, reasoning that coverage decisions also have broad consequences for the population of Thailand. Consequently, the NHSO established a working group including representatives of seven groups—policymakers (i.e.,

decision makers at the Ministry of Public Health and other three public health insurance schemes); health professionals (i.e., representatives from health professional associations); academics, patients, and civil society (i.e., representatives from nongovernment organizations that are managed as permanent associations with legal status); industry (i.e., representatives from multiinternational

and local pharmaceutical companies, and medical devices industries); and laypeople (i.e., citizen constituencies of the Thai National Health Assembly)—but excluded international organizations and the researchers who conduct health technology assessment because their interests may not reflect that of society. The representatives of these different stakeholder groups were nominated by their own groups. Each working group member was then assigned to propose a maximum of three interventions, including supportive information of the performance of these interventions on the established criteria. A total of 17 interventions were nominated.

Step 2: Selection of interventions for assessment

As to the selection criteria, the research team—through its review—identified a range of criteria that are being used internationally (Table 1). The research team made sure that all criteria were sound and relevant to the Thai context. This list of criteria was put forward to consultation panel 1 as an input for discussion. The panel initially agreed with considering the criteria that were frequently used in the health technology assessment organizations. On consultation with panel 1, consensus was reached on the use of six criteria: 1) size of population affected by the disease, 2) severity of disease, 3) effectiveness of health intervention, 4) variation in practice, 5) economic impact on household expenditure, and 6) equity/ethical and social implications. Subsequently, the research team worked with a second consultation panel (panel 2) including policymakers and academics to further develop these criteria (i.e., establishing their definitions and measurement). The panel agreed to score the performance of each intervention on each criterion on an ordinal scale from 1 to 5. The panel decided to give all criteria equal weight and that this could be changed in the future when necessary. The results of the panel discussions are presented in Table 2. The criteria are discussed in turn below.

- *Size of population affected by disease.* The size of the population affected by the disease holds a positive relationship with the impact of that disease for society and is therefore an important criterion for priority setting, the panel argued. As indicator, the panel agreed to use the prevalence of the disease and scaled the prevalence on various levels.
- *Severity of disease.* Thai society generally gives high priority to interventions that target the severely ill because of their greater need for health care [11]. The panel defined the severity of disease on the basis of health state valuations, with a range from 0 (worst health status) to 1 (best health status), and defined five levels. Following a Thai study that showed that some people considered some health states worse than death [12], the panel agreed that the lowest scale could be less than 0.
- *Effectiveness of health interventions.* Effectiveness relates to the outcomes of interventions and is a routinely used criterion in priority setting [13,14]. Effectiveness is often expressed in quality-adjusted life-years (QALYs), but the panel did not consider this suitable for this step because the effectiveness of interventions in terms of QALYs was not available for all interventions and could not be made available within the limited study period. Therefore, the panel created a separate scoring system for three categories of interventions: treatment/rehabilitation (giving higher priority to interventions that cure a disease than only improve quality of life), screening/diagnostic (giving higher priority to interventions with high accuracy [$>60\%$] targeting a curable disease), and preventive (giving higher priority to interventions that can prevent $>60\%$ of a disease).
- *Variation in practice.* All Thai citizens are covered by a public health plan (the Civil Servant Medical Benefit Scheme for civil servants, state enterprise employees, and their dependents; the Social Security Scheme for private sector employees; and the UC for the rest of the population). Because these plans hold different agreements with health providers, there is growing

concern about the inequity in health services delivered to beneficiaries of the different plans [15]. The panel acknowledged the differences in intervention coverage between the health plans, and across the country, and therefore the importance of this criterion. The panel developed different scales to reflect variation in practice, taking into account the source of evidence (local, national, or international).

- *Economic impact of household expenditure.* One of the objectives of the UC is to protect household income from catastrophic health expenditure [16,17]. The literature defines *catastrophic expenditure* as households' spending on direct health care costs (e.g., medicines) that exceeds 10% of households' expenditure [15,18,19]. The panel adopted this definition to establish the scoring scale of this criterion. The scale was established by dividing the 10% top rank of the average household expenditure on health care (baht per year) from a national household socioeconomic survey conducted in 2008 [20] into quintile groups and then using the upper value of each expenditure interval for setting the scores.
- *Equity/ethical and social implication.* The panel considered ethical and social implications of interventions to be important and argued that the poor and patients with rare diseases are—in a moral sense—more deserving of health care than are others. The panel decided that priority should be given to diseases that are more frequent among the poor (based on World Health Report 2002 that classifies poverty as a risk factor of disease) [21]. In the absence of adequate definitions of “rare diseases” in Thailand, the panel decided to use the lowest prevalence level of the criterion “size of population affected by disease” (prevalence = 10,000) as a threshold.

As to the selection of interventions for assessment, the consultation panel (panel 1) determined to use the same working group as mentioned above but without the representatives of policymakers and industry (because they were considered to have a potential conflict of interest) and laypeople (because they were considered difficult to identify, and to be adequately represented by the representatives from civil society), and this working group was established by the NHSO. The research team reviewed the 17 nominated interventions against the six selection criteria and then presented all information to the working group. Because of limited and incomparable information on severity of disease for the nominated interventions, the working group decided to omit this criterion. The performances of the 17 interventions on the five remaining criteria were summarized in a performance matrix (see Appendix 1). On inspection and deliberation, they selected nine interventions for further assessment. Of these interventions, eight were selected because they scored best in the overall ranking. One intervention “absorbent products for urinary and fecal incontinence among disabled and elderly people” was added because the target group was considered to be vulnerable and deserving of publicly funded health care. NHSO's Subcommittee for Development of Benefit Package and Service Delivery (SCBP), which includes multidisciplinary stakeholders, that is, policymakers, health professionals, civil society, and patient groups, approved in May 2010 that these nine interventions would be the subject of detailed assessment.

Step 3: Technology assessment of interventions

The research team proposed another set of criteria (*assessment criteria*) for detailed assessment of the nine interventions. In addition to the review results from the international literature (Table 1), the research team put forward results of a recent study on the criteria and its weight (elicited by discrete choice experiments) for priority setting, as conducted in Thailand [22]. This study suggested the following criteria to be important: type of intervention (classified by the objective of intervention, i.e., prevention or treat-

Table 2 – Selection criteria.

Criteria	Definition	Parameter	Scoring
1. Size of population affected by disease	Number of people affected by the disease or health problem that is treated or prevented by the proposed intervention among Thai population at a specified time	Prevalence	5 = >500,000 4 = 100,001–500,000 3 = 50,001–100,000 2 = 10,001–50,000 1 = ≤10,000
2. Severity of disease	Severity of disease or health problem that is treated or prevented by the proposed intervention by considering its impact on the patients' QOL	QOL score	5 = >0.60 4 = 0.41–0.60 3 = 0.21–0.40 2 = 0.01–0.20 1 = ≤0
3. Effectiveness of health intervention	The final outcomes of the proposed intervention that benefit the patients with regard to the objective of the intervention		
	3.1 For treatment/rehabilitation: Capacity of the proposed intervention to treat or rehabilitate the patients from the disease and its impact on the patients' QOL	The clinical benefit of the proposed intervention and improvement in QOL	5 = cure 4 = prolong life and major improvement in QOL 3 = prolong life and minor improvement in QOL 2 = major improvement in QOL 1 = minor improvement in QOL
	3.2 For screening/diagnostic: Quality of the proposed intervention to screen or diagnose the disease of the patients and the expected outcome beyond the screening or diagnostic	Accuracy of the intervention and whether the screened disease could be cured	5 = accuracy >80% and screened disease could be cured 4 = accuracy 60%–80% and screened disease could be cured 3 = accuracy >80% but screened disease could not be cured 2 = accuracy 60%–80% and screened disease could not be cured or accuracy <60% and screened disease could be cured 1 = accuracy <60% and screened disease could be cured
	3.3 For prevention: Risk reduction or preventive capacity provided by the proposed intervention to the population	Effectiveness of the intervention to prevent the disease	5 = >90% 4 = 81%–90% 3 = 71%–80% 2 = 61%–70% 1 = ≤60%
4. Variation in practice	Variation of implementing the intervention in practice that leads to unequal accessibility to the intervention among Thais. Variation in practice could be identified from the different coverage of the three publicly funded health insurance schemes in Thailand and/or could be identified from the different distribution of the intervention throughout the country	The difference of the benefit packages between the three health insurance schemes in Thailand The difference of health interventions distribution	5 = national evidence presenting variation in practice in Thailand 4 = national evidence presenting variation in practice in some areas 3 = international evidence presenting variation in practice in other countries that could assume there is variation in practice in Thailand 2 = no evidence but we could assume there is variation in practice in Thailand 1 = no variation in practice
5. Economic impact on household expenditure	Impact on household expenditure as a consequence of providing health intervention to a family member with consideration of catastrophic illness or health catastrophe	Direct medical and nonmedical household expenditure as a consequence of the disease or health problem per year	5 = >62,500 baht/y 4 = 35,601–62,500 baht/y 3 = 20,801–35,600 baht/y 2 = 12,000–20,800 baht/y 1 = <12,000 baht/y
6. Equity/ethical and social implication	Priorities for specific groups of patients, i.e., the poor with rare disease, reflect the moral values that should be considered by policymakers	Disease of the poor Prevalence <1,000 (rare disease)	5 = targeting the poor and prevalence <1,000 4 = targeting the poor and prevalence 1,000–10,000 3 = targeting the poor and prevalence >10,000 2 = not targeting the poor and prevalence <1,000 or not targeting the poor and prevalence 1,000–10,000 1 = not targeting the poor and prevalence >10,000

QOL, quality of life.

ment), target group of intervention (classified by age group), severity of disease, number of beneficiaries, value for money, and budget impact. The research team considered all criteria and argued that—because the assessment criteria in the present step follow-up on the selection criteria used in step 2—overlap should be avoided. On careful assessment of all criteria and deliberation, the research team came to the consensus to use two assessment criteria: “value for money” and “budget impact.” Because of the numerical nature of these two criteria, the research team decided they were not further scaled.

- *Value for money.* The criterion value for money refers to the maximization of health outcomes given a certain budget and is an often-cited criterion for priority setting [13,14,23]. The research team defined the criterion in terms of incremental cost per QALY (so-called incremental cost-effectiveness ratio [ICER]) to allow comparison across a broad range of interventions.
- *Budget impact.* The research team considered affordability of inclusion of an intervention in the UC benefit package to be important. This criterion addresses the budget impact by estimating the financial consequences of adoption and diffusion of a new intervention within a specific setting, while considering the fiscal capacities of the health plan [24,25].

The SCBP then approved these two criteria to be used in the assessment. Subsequently, the research team assessed the nine interventions in terms of their value for money (ICER) and budget impact (Table 3) and collaborated with external experts and relevant stakeholders for each intervention for that purpose. The ICERs were calculated by quantifying marginal costs and QALYs of new interventions versus standard practice following health economic evaluation guidelines in Thailand [27] and were therefore reliable and comparable.

In addition, the SCBP requested information of the performance of all nine interventions on the selection criteria (as discussed above)—these were also considered in the appraisal of the interventions.

Step 4: Appraisal of interventions

In the fourth step, in July–August 2010, the research team presented the results of the assessment of nine interventions to the SCBP for appraisal, that is, for final decision on inclusion of interventions in the benefit package (Table 3). The SCBP members elaborated on these assessments, and discussions focused on three major issues: which costs were included in the models, whether the most cost-effective alternative intervention of each disease was already covered in the benefit package, and whether the proposed intervention would be feasible for implementation. They considered a threshold of one time gross domestic product per capita (approximately US \$4500 in 2010 [28]) per QALY gained as good value for money. Table 4 shows the relationship between the results of step 3 (technology assessment) and those of step 4 (appraisal). Two of the nine interventions were analyzed in terms of costs only (one of them was recommended by the SCBP), and their results are also not included in Table 4. Of the other seven interventions, the SCBP agreed to recommend three interventions for further consideration to be adopted under the UC scheme (Table 4) because they were cost-effective with low budgetary impact. At the same time, for two of these three interventions, it was found that cost-effective alternatives were already covered under the benefit package (i.e., lamivudine for treating people with chronic hepatitis B and intravenous cyclophosphamide + azathioprine for treating severe lupus nephritis).

The other four interventions were not selected for a number of reasons. Some interventions (i.e., treatment for people with chronic hepatitis C and absorbent products for urinary and fecal incontinence among disabled and elderly people) were cost-effective,

but the budgetary impact of the intervention was considered too high. One intervention “anti-immunoglobulin E for severe asthma” was not cost-effective with high budgetary impact. Finally, the intervention “implant dentures for people who have problems with conventional complete dentures” was cost-effective but the SCBP denied to appraise it because there had been poor service accessibility to current alternatives that would first need to be solved. No intervention yielding an ICER of higher than one time gross domestic product per capita per QALY gained was recommended for the benefit package.

Whether this use of MCDA indeed improved rational, transparency, and fairness of the priority-setting process in Thailand is not easy to judge in the absence of a clear standard on all these aspects. As an alternative, we evaluated the project against the A4R framework [6,7], which specifies conditions for fair decision making: reasonableness, publicity, revisable, and enforcement. In doing so, the framework considers aspects of rational and transparency at the same time.

The *reasonableness condition* states that the rationale for priority-setting decisions must rest on evidence and principles that are accepted as relevant by fair-minded people. In the present project, contributing elements in this were the following: both selection and assessment criteria were identified and approved by a large variety of stakeholders (including consultation panel 1, the research team, and the SCBP) on the basis of literature review and careful elaboration and supported by a previous study on priority-setting criteria in Thailand [22]. In addition, the definition and scales of the criteria were adapted to the Thai context, and the performance of interventions on every criterion was supported by available local evidence. Also, the nomination, selection for assessment, and final priority setting was based on elaboration among a wide variety of stakeholders in working groups—the latter is described as a key aspect of fair processes [29]. Limiting elements were that the project did observe some difficulties in the working groups as to identifying true representatives of various stakeholders, for example, that of laypeople. Also, while the project involved a range of stakeholders in its consultation panels and working groups in steps 1 to 3, the SCBP eventually made decisions itself and it is not sure to what extent the final decisions still reflect the stakeholders' preferences.

The *publicity condition* prescribes that rationales for priority-setting decisions must be publicly accessible. The present project communicated information on criteria and the selection of interventions for assessment to stakeholders and the general public through a newsletter, chapters in the newspaper, formal letters, and organizational Web sites. However, the reasons underlying the final decisions regarding the adoption of interventions in the package were not explicitly acknowledged. As a result, the working groups had requested the SCBP to provide them an official letter explaining why particular interventions were included or excluded in the benefit package, and subsequently, the SCBP reluctantly accepted it. Although this is a way of sharing the message with the public, there is a need for an assessment of the effectiveness of this mode of communication in the future. The *revisable condition* allows for challenging the decisions and giving opportunities for revision and improvement of policies in the light of new evidence. Yet, the present project did not have a systematic appeal mechanism to challenge the coverage decisions. Nevertheless, the process information and the criteria involved in the original decision are publicly accessible and allow the general public to express its dissatisfaction. This can lead to reconsidering the decisions in light of new evidence and better arguments. The *enforcement condition* can be either voluntary or regulation of the process to ensure that the first three above-mentioned conditions are met. Based on the 1-year experience, there was no rule and regulation to reach this condition.

Table 3 – Health intervention assessment results and policy recommendations.

Health interventions	Results		Policy recommendations
	Cost-utility analysis*	Budget impact analysis*	
1. Treatment for people with chronic hepatitis B	Lamivudine (produced by GPO) is the most cost-effective (cost-saving) compared with palliative care and with the other alternatives: - Lamivudine (original), - Adefovir + lamivudine (GPO), - Entecavir, - Telbivudine, and - Pegylated interferon alpha	The budget of providing lamivudine (GPO) is THB 50 million higher than that of providing palliative care in a first year of implementation and will increase to THB 500 million at the fifth year	The most cost-effective intervention for treating chronic hepatitis type B, lamivudine, has already been covered under the benefit package
2. Treatment for people with chronic hepatitis C	Pegylated interferon alpha 2a (Peg2a) + ribavirin for treating hepatitis type C subtype 1, 4, 5, and 6 is the most cost-effective (ICER = THB 86,600 per QALY) compared with palliative care and with other alternatives: - Interferon alpha + ribavirin, Peg2a + ribavirin, pegylated interferon alpha 2b (Peg2b) 1 µg/1 kg of body weight + ribavirin, Peg2b 1.5 µg/1 kg of body weight + ribavirin	Providing Peg2a for treating hepatitis type C subtype 1, 4, 5, and 6 is increasing budget by THB 3,500 million. Providing Peg2b for treating hepatitis type C subtype 3 is increasing budget by THB 8,600 million. Therefore, it would be in total THB 12,000 million in 5 years	Not recommended because of high budget impact
3. Treatment for severe lupus nephritis	Intravenous cyclophosphamide (IVC) + azathioprine (AZA) for 3 y is the most cost-effective (cost-saving) compared with the standard treatment for treating lupus nephritis (IVC with decreasing dose for 3 y) and with the other alternatives (i.e., IVC + mycophenolate mofetil [MMF] for 3 y, MMF + AZA for 3 y, MMF with decreasing dose for 3 y)	Budget of treatment is approximately THB 1.4–1.5 million per patient	The most cost-effective intervention for treating lupus nephritis (i.e., IVC 1,000 mg/mo for 6 mo and then AZA 50 mg/d for further 2.5 y) has already been covered under the benefit package
4. Smoking cessation program	Every intervention for smoking cessation is cost-effective (cost-saving) (i.e., counseling at the hospital, counseling by quit line, counseling + nicotine gum, counseling + nicotine patch, counseling + bupropion, counseling + nortriptyline, and counseling + varenicline) compared with no intervention (suddenly quit smoking by themselves; smokers)	In case of providing nortriptyline (as a first-line drug) 80% + nicotine gum 10% + varenicline (as a second-line drug) 10%, the budget would be THB 273 million in a first year and would increase to THB 566 million at the fifth year	All interventions for smoking cessation are cost-effective. Therefore, the program is recommended for further consideration to be adopted in the benefit package
5. Anti-IgE for severe asthma	Omalizumab (anti-IgE) is not cost-effective (ICER = THB 414,503 per QALY) compared with standard clinical practice guideline (steroid) for severe asthma	Providing omalizumab to treat patients with severe asthma increases the budget by THB 54,000 million per year and will increase the budget by THB 270,000 million in 5 y	Not recommended because it is not a cost-effective intervention and the budget estimation per year is very high
6. Implant dentures for people who have problem with conventional complete dentures	Implant dentures is cost-effective (ICER = THB 5,147 per QALY)	The 5-y budget will be THB 280–781 million on the basis of expected target population and will be THB 83–208 million on the basis of human resource (health professionals) capacity	Not recommended because problems of access to standard treatment of dental care were still unsolved
7. Absorbent products for urinary and fecal incontinence among disabled and elderly people	Absorbent product is cost-effective (ICER = THB 54,000 per QALY)	Budget of providing absorbent products to the disabled and elderly is approximately THB 4,800 million per year	Not recommended because of high budget impact
8. System for screening, treatment, and rehabilitation of alcoholism	N/A	N/A	Not recommended because of inadequate information (in 2010)
9. Screening for risk factors for leukemia in people living in the industrial areas	N/A	N/A (the researchers estimated social costs of illness instead: from the model of 50,000 populations who are living in the industrial areas with migration of 1,000 people per year, social costs of illness would be THB 3,500 million in 30 y)	Recommended for further consideration to be adopted in the benefit package because the problem causes considerable loss in terms of cost of illness at THB 3,500 million in 30 y

GPO, the government pharmaceutical organization; IgE, immunoglobulin E; ICER, incremental cost-effectiveness ratio; N/A, not available; QALY, quality-adjusted life-year; SLE, systemic lupus erythematosus; THB, Thai baht.

* In 2010, US \$1 was approximately 30.17 baht [26].

Table 4 – The relationship between assessment and appraisal results.

Policy recommendation	Assessment results*			
	Cost-effective (ICER ≤1 per-capita GDP/QALY)		Not cost-effective (ICER >1 per-capita GDP/QALY)	
	Low budget impact†	High budget impact†	Low budget impact	High budget impact
Recommended	<ul style="list-style-type: none"> • Lamivudine for treatment of people with chronic hepatitis B • Intravenous cyclophosphamide + azathioprine for treating severe lupus nephritis • Smoking cessation program 	—	—	—
Not recommended	<ul style="list-style-type: none"> • Implant dentures for people who have problem with conventional complete dentures 	<ul style="list-style-type: none"> • Pegylate interferon alpha 2a + ribavirin for treating hepatitis C • Absorbent products for urinary and fecal incontinence among disabled and elderly people 	—	<ul style="list-style-type: none"> • Anti-immunoglobulin E for severe asthma

ICER, incremental cost-effectiveness ratio; GDP, gross domestic product; QALY, quality-adjusted life-year; THB, Thai baht.
 * Two cost analysis studies, that is, screening for risk factors for leukemia in people living in the industrial areas, and system for screening, treatment, and rehabilitation of alcoholism, are not included in this table.
 † High budget impact >THB 200 million per annum; low budget impact ≤THB 200 million per year.

Discussion

This research and development project, initiated by the NHSO in Thailand, is a first attempt to achieve rational, transparent, and fair health care rationing through the application of MCDA in a real-world context. MCDA was applied in the various steps throughout the project to identify (selection and assessment) criteria, to construct performance matrixes, and to elaborate on these before coming to final conclusions. Although it is difficult to judge in the absence of quantified standards, MCDA seems to have considerably contributed to fairness in priority setting. The merits of MCDA are especially clear when the present process is compared with the situation before where priority setting was said to be ad hoc and driven by interests of stakeholder groups.

Deliberation is an important component of MCDA. Whereas the performance matrix quantifies the performance of interventions on selected criteria, the consideration of other criteria (that cannot be quantified or were for other reasons missing in the performance matrix) is vital in MCDA and is captured in the process of deliberation. As an example, the intervention “absorbent products for urinary and fecal incontinence among disabled and elderly people” was selected for assessment, even though its score was not in the top rank. In the present project, criteria such as “vulnerability,” “a more cost-effective alternative,” and “feasibility of implementation” were put forward in the deliberation process in step 2 (selection of interventions for assessment).

This article described only the first year of experience of the use of MCDA to develop the UC benefit package and did not capture the final coverage decisions. The SCBP is now consulting with the Tobacco Research and Knowledge Management Center in Thailand to make the “smoking cessation program” part of the tobacco prevention program. Likewise, the SCBP is now consulting with NHSO’s Department of Health Promotion and Disease Prevention to incorporate the screening program for leukemia in its regular work. Both interventions still need further consideration before they can be covered under the UC scheme. As to the “absorbent products for urinary and fecal incontinence among disabled and elderly people,” initially the SCBP members seemed to support the coverage of this intervention on ethical aspects, that is, the clear need for this intervention when the assessment was ongoing in 2010. This intervention was finally denied by the SCBP

for inclusion because of its large budget impact (SCBP meeting in July 2011).

Our study has a number of limitations. First, the scoring scales of some criteria were difficult to define, such as targeting the poor and those with rare diseases. A clear definition of both terminologies was lacking; therefore, in this project, the definition and scoring scales development were determined on the basis of experts’ opinion and the international guideline that is, World Health Report 2002 [21]. Although these two information sources are acceptable, country-specific and more reliable evidence for creating the criteria’s and the scoring scales’ definition should be developed. Second, we found a lack of comparable evidence of each intervention on the severity of disease criterion. Because it would be costly and time-consuming to conduct an empirical study for all proposed interventions, only partial information and expert opinion on this criterion were considered. While severity of disease has been widely used in priority setting to balance between equity and efficiency in many settings [30–32], this limitation has led to a doubt in using this criterion in MCDA. Hence, this flags serious attention for its further measurement. Third, some criteria, such as effectiveness, were difficult to understand for nonacademic people—this constituted a barrier to achieving consensus in group discussions as laypeople were dominated by higher educated people. The project however did not consider this reason to delay involving the public in the process of priority setting and informed all stakeholders as much as possible on the way. Fourth, all criteria used in this project were determined to carry equal weights, which may not reflect the local values in reality. Although the relative weights of criteria analyzed from the discrete choice experiments were considered by the research team and the SCBP, they were not used directly—weighing of criteria may be considered in future projects. Then, the question should also be addressed how the potentially divergent weights from the various stakeholders can be accommodated. Fifth, the framework of A4R was purposively selected to evaluate the prioritization process of the project. There are, however, other evaluation tools that can be applied for assessing the resource allocation process such as a framework of internal and external parameters for evaluating successful priority setting in low- and middle-income countries [33] and a checklist for assessing nine common themes of good practice for health research priority setting [34].

It is noteworthy that decision making in itself is a dynamic process, and some interventions' performance on some criteria used for example, severity of disease, effectiveness of interventions, or economic impact of household expenditure, is likely to change over time. For example, changing population structure can lead to an increase or decrease in some disease incidence, or the availability of a new intervention can lead to a change in the costs of an existing intervention. This can be drawn from the case of "pegylate interferon alpha 2a and ribavirin for treating hepatitis C" that was not recommended at the initial decision making because of its high budgetary impact. At the end of 2011, however, this combined intervention for treating hepatitis C was eventually included in the benefit package because the lower price of the intervention, due to extensive price negotiation between the Thai Ministry of Public Health and pharmaceutical companies, resulted in a lower budget impact. Hence, priority setting of interventions is a continuous process. It means that some interventions that failed to be prioritized in the first place may need to be reconsidered again in the future because they may become priorities then. On the other hand, it is possible that some interventions previously

included in the benefit package can become obsolete and should be delisted from the package.

Although the present project has applied MCDA in the Thai context, MCDA—as a general approach—is applicable or adaptable to other settings. This would require identification of priority-setting criteria as relevant to that setting, including assigning weights and/or scores for each criterion, and the assessment of performance of all interventions on these criteria, to arrive at a context-specific priority-setting process. That would then not only in Thailand but also in other settings lead to decisions that are more rational, transparent, and fair. This was, however, not a comparative project; hence it cannot lead to conclusions whether the MCDA approach would have led to better decisions with regard to the allocation of resources to health interventions. Rather, it describes the practice of MCDA and presents its values as can be evaluated by using the A4R framework.

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Appendix 1 Scores of the proposed health interventions against the selection criteria

Health interventions	Selection criteria						Total
	Size of population affected by disease	Severity of disease*	Effectiveness of health intervention	Variation in practice	Economic impact on household expenditure	Equity/ethical and social implication	
1. Anti-immunoglobulin E for severe asthma	4	—	3	5	5	1	18
2. Treatment for people with chronic hepatitis B	5	—	4	2	3	3	17
3. System for screening, treatment, and rehabilitation of alcoholism	5	—	5	4	1	1	16
4. Implant dentures for people who have problem with conventional complete dentures	5	—	2	2	5	1	15
5. Screening for risk factors for leukemia in people living in the industrial areas	4	—	3	5	1	2	15
6. Treatment for severe lupus nephritis	2	—	4	2	5	1	14
7. Smoking cessation program	5	—	3	2	1	3	14
8. Treatment for people with chronic hepatitis C	3	—	5	2	3	1	14
9. Absorbent products for urinary and fecal incontinence among disabled and elderly people	4	—	2	2	4	1	13
10. Treatment for unfertilized women	5	—	0	2	5	1	13
11. Renal replacement by dialysis for new final stage renal failure patients	2	—	1	5	4	1	13
12. Screening and treatment for liver cancer	2	—	3	2	5	1	13
13. Physical examination package (following the Civil Servant Medical Benefit Scheme)	5	—	0	5	1	1	12
14. <i>Cissus quadrangularis</i> L. for hemorrhoid	5	—	1	4	1	1	12
15. Biological agents for psoriasis	1	—	1	2	5	2	11
16. Screening for gall bladder cancer	2	—	2	2	1	3	10
17. Orbital implant and plastic surgery of orbit and facial bones	1	—	2	1	1	2	7

* Severity of disease was omitted from the criteria list in the first year of the project (2010).

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