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CURRENT OPINION

Decision Making and Priority Setting: The Evolving Path Towards Universal Health Coverage

Francesco Paolucci[1,2] · Ken Redekop[3,4] · Ayman Fouda[2,4] · Gianluca Fiorentini[2]

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Abstract Health technology assessment (HTA) is widely viewed as an essential component in good universal health coverage (UHC) decision-making in any country. Various HTA tools and metrics have been developed and refined over the years, including systematic literature reviews (Cochrane), economic modelling, and cost-effectiveness ratios and acceptability curves. However, while the cost-effectiveness ratio is faithfully reported in most full economic evaluations, it is viewed by many as an insufficient basis for reimbursement decisions. Emotional debates about the reimbursement of cancer drugs, orphan drugs, and end-of-life treatments have revealed fundamental disagreements about what should and should not be considered in reimbursement decisions. Part of this disagreement seems related to the equity-efficiency tradeoff, which reflects fundamental differences in priorities. All in all, it is clear that countries aiming to improve UHC policies will have to go beyond the capacity building needed to utilize the available HTA toolbox. Multi-criteria decision analysis (MCDA) offers a more comprehensive tool for reimbursement decisions where different weights of different factors/attributes can give policymakers important insights to consider. Sooner or later, every country will have to develop their own way to carefully combine the results of those tools with their own priorities. In the end, all policymaking is based on a mix of facts and values.

Key Points for Decision Makers

Reliance on cost-effectiveness analysis exclusively when making reimbursement decisions might ignore important factors such as the societal distribution of disease and disability.

Multi-criteria decision analysis is a vital decision-making tool that assists policymakers and stakeholders to better analyze and weight different factors when making reimbursement decisions.

A one-size-fits-all multi-criteria approach is difficult to attain and apply as each country/region has different values, capacities, resources, and constraints.

1 Background

Over the past decades, the main health policy goals in most OECD countries have been to: (1) achieve universal access to healthcare services (i.e. affordability); (2) improve efficiency in the organization and delivery of healthcare; and (3) contain costs [1–4]. However, medical care expenditures as a share of GDP have more than doubled worldwide since 1960 [3–5] and this trend of growing health expenditure will persist in the foreseeable future as a result of many factors, among which are: technological advancements, the demographic trend of ageing societies, and the increasing demand in all populations. To make matters worse, public budget deficits in many countries have

✉ Ayman Fouda
aymanmfouda@gmail.com

1 Murdoch University, Perth, Australia

2 University of Bologna, Bologna, Italy

3 National University of Singapore, Singapore, Singapore

4 Erasmus University Rotterdam, Rotterdam, The Netherlands

endured negative balance as a result of the escalating expenditures for publicly-financed sectors such as social security and pensions or for public sectors such as environment and defence, etc. Therefore, in many countries this dichotomy between the trend of escalating health expenditure and the constrained public budget creates more complicated settings for policymakers to make choices and trade-offs regarding health plans.

Increasing pressure from different sides may cause policymakers in different countries to make coverage decisions. Do different jurisdictions make the same coverage decisions about the same intervention? Decisions about the reimbursement of orphan drugs indicate that the answer is no. For example, there is stark variation in reimbursement decisions about enzyme replacement therapy in Pompe disease, which is only one of many differences between countries that have been observed for orphan drugs [6].

If desperate times may lead to irrational choices taken without a coherent decision framework, the great challenge is to determine the best way to arrange the financing of healthcare services in order to deal with both increasing pressure on public finances and increasing healthcare expenses in an efficient way that is affordable and acceptable for individuals and society. There is a need to formalize the health priority setting process at the national and local levels to provide greater capacity to respond to the growing needs and demand for healthcare services in public and private healthcare systems.

Health Technology Assessment (HTA) is considered to be "a multidisciplinary process that summarizes information about the medical, social, economic, and ethical issues related to the use of a health technology in a systematic, transparent, unbiased, robust manner. Its aim is to inform the formulation of safe, effective health policies that are patient focused and seek to achieve best value" [7]. Methodologies such as cost-effectiveness analysis (CEA) have been increasingly used predominantly within the framework of HTA to make more informed and smarter policy decisions. However, one critical shortcoming of a cost-effectiveness analysis is that it dominates the process of assessment to the extent that it ignores information that could be considered extremely important in decision-making, including the societal distribution of disease and disability [8]. National agencies such as NICE have stated that social values in the national policy process, as well as other criteria, may be applied as a result of local interpretation (by the local contractors) of national level recommendations, which can often lead to variation in regional and district health service delivery [9].

This paper explores the relevant criteria or rationales for priority setting or the design of national packages of healthcare services. It then discusses a methodological approach—multiple-criteria decision analysis (MCDA)—that can be adopted to measure the weights associated with the epidemiological and socio-economic criteria relevant in healthcare decision-making.

2 Economic Rationales for Cross-subsidies in Healthcare

Cross-subsidization in healthcare is considered as one of the important pillars of health financing systems. The process of cross-subsidization often takes place after the process of pooling funds for healthcare coverage. It allows policymakers to channel pooled funds between those who are considered good risks and those who are considered bad risks. In doing so, it represents the main tool to extend coverage to a wider extent of the population in the pursuit of universal health coverage [10]. However, the width of the actual coverage extension, and consequently of the actual cross-subsidization, crucially depends on the political choices on the design of the national package of healthcare services. Indeed, the choice to include or not specific healthcare services that are systematically related to age, gender, income, professional activity, and other socially related factors, may dramatically change the actual degree of cross-subsidization of a healthcare system. For these reasons, although cross-subsidization is often uniquely associated with equity concerns, before deepening the analysis of the normative criteria to be used to take collective decisions on national benefits packages one needs to recall and strengthen the analysis of the allocative rationales for cross-subsidization as well.

In discussing how much to cross-subsidize on economic grounds, there are three main points to be considered: (1) externalities in the demand for healthcare services; (2) the individual's risk of becoming a bad risk; and (3) the moral hazard effect induced by cross-subsidization.

Externalities can arise in different ways. To start with, we can think of altruistic preferences (caring externality), which can occur when consumption by certain individuals affects the utility of other individuals. In addition, we can think of egoistic preferences (selfish externality), where, for example, the individual's (non-)consumption activity of healthcare services generates external effects. The following two sections provide more detail about these two types of externalities.

2.1 Externalities: Altruistic Preferences

Altruistic preferences can come in different forms. One type is where an individual is genuinely concerned about the wellbeing of others, while another type is where an individual is concerned about another person's access to

the healthcare that is needed to improve that person's health (i.e., paternalism).

In certain healthcare services, altruistic preferences can be more evident than other services. Moreover, the strength of preferences can depend on different factors, including the cost-effectiveness of the services, the user's health status baseline, the user's degree of responsibility for the occurrence of the illness, and the expected cost of healthcare services per user.

The first factor related to altruistic preferences is the cost-effectiveness of services. All other factors being equal, rational users with altruistic preferences maximize their utility by maximizing the effect of cross-subsidies on the health status of others. This would imply that subsidising healthcare services that are very cost-effective improves the impact that cross-subsidization has of the health status of others and thereby satisfies the desires of altruistic preferences more than subsidising services at random. One can therefore expect that an individual's altruism increases as the cost-effectiveness of services improves (i.e., as the incremental cost-effectiveness ratio decreases) [11]. However, it is clear that cost-effectiveness is not the only basis for altruistic preferences or decisions about national insurance packages. For example, lung or heart transplants have high cost-effectiveness ratios but are nevertheless considered basic services in many countries. In contrast, Viagra for erectile dysfunction has a low cost-effectiveness ratio but is not considered a basic need (requiring reimbursement) in most countries [12].

A second factor relating to altruistic preferences is the baseline or initial health status of the individual. Specifically, it is the increase in an individual's utility that is produced by an improvement in another person's health status depends on the initial health status of that other person. In fact, it is likely that the poorer the initial health status of some person the greater (*coeteris paribus*) is the increase in another individual's utility when the health status of the former improves. Stolk et al. [13] revealed that "The severity-of-illness approach assumes that the societal value of a health improvement is higher when the patient's initial condition is worse, all other things being equal. In this definition, 'initial health' concerns severity at the time of the intervention as well as the expected health in the case where no treatment is provided."

A third factor is the expected cost of services per individual. If the service (e.g., paracetamol) involves low utilization rates (i.e., volumes) and is relatively cheap, an individual may not be altruistic towards the consumption by others, since the use of these services will not lead to excessive financial burden for the person who uses it. All other things being equal, the higher the expected cost of services per individual, the greater an individual's willingness to subsidise (WTS) [14].

A fourth and final factor relating to altruistic preferences is individual responsibility for the occurrence of the disease. An individual may be less willing to subsidise financial access to healthcare services that could be required as a result of the actions or behavior of others (e.g., smoking) [15]. Therefore, the greater the perceived individual's responsibility in acquiring a disease, the less the use of healthcare services would satisfy altruistic preferences, which would reduce support for cross-subsidization of those services.

2.2 Externalities: Egoistic Preferences

Individuals may be willing to cross-subsidise for egoistic preferences. To start with, they may believe that healthcare services used by others will indirectly help to maintain or improve their own health status. One clear example of this way of thinking is the desire by an individual to subsidise the vaccination of others to control infectious disease, since vaccination can reduce the disease risk amongst others and thereby reduce the disease risk of the individual as well [11].

Interestingly, cross-subsidisation can also have positive externalities, even when egoistic preferences are considered. For example, access to healthcare services can lead to improved health and thereby greater productivity and spending capacity, which can be welcomed by various stakeholders such as employers and industry in general [11].

2.3 Other Economic Rationales that Affect the Willingness to Subsidize in Healthcare

Besides the externalities described above, there are two other economic rationales that could be used in decision-making about subsidies. First of all, there is the risk of becoming a bad risk. Individuals (e.g., low-income individuals) face the problem of obtaining lifetime insurance for the occurrence of catastrophic risks or chronic illnesses, which may cause dramatic increases in health expenditures. Real-world markets fail to provide complete coverage for the risk of becoming a bad risk [16].

The other economic rationale affecting the willingness to cross-subsidize is moral hazard. Subsidies involve a trade-off between affordability and moral hazard: there is a desire to reduce the marginal cost of services borne by the individual (i.e., affordability) and yet avoid overconsumption (i.e., moral hazard). Simply put, the higher the service's demand price-elasticity, the greater the subsidy-induced overconsumption will be. If the chance of moral hazard is low, one could expect a greater willingness to cross-subsidise.

3 Multi-Criteria Decision Analysis (MCDA)

3.1 Background

The ideas found in the previous sections make it clear that various rationales can be used to guide policymaking decisions regarding universal health coverage, including: (1) cost-effectiveness of services, (2) an individual's initial health status; (3) the expected cost of services (at the level of the individual and the population); (4) price elasticity of the services; and (5) an individual's responsibility for acquiring the disease. In addition to these rationales, other factors, such as the age of the individual, can affect decisions. How can these different factors be assessed simultaneously? More specifically, how can we measure the weights associated with the socio-economic and epidemiological rationales when making decisions about what is included in a national benefits package? Obviously, a multiple criteria approach is needed that is able to elicit societal preferences for various factors, including health gain, costs, target groups, and disease severity.

The past decade has witnessed the development of systematic techniques to develop a rational basis for the allocation of healthcare services [17–20]. These are often referred to as techniques relating to multi-criteria decision analysis (MCDA), and studies in this area have involved examining how to combine different criteria in supporting decision-making in a variety of countries and settings. Amongst these different criteria, one can expect to see that criteria based on safety, effectiveness, and efficiency show a substantial impact on established decision-making. Beyond establishing whether or not policymakers consider a particular criterion relevant when making decisions about the extent and distribution of healthcare services in environments with limited resources, these studies can help to determine how much weight policymakers give to one criterion versus another. Moreover, if these criteria are categorised as being related to efficiency or equity, it is possible to see what kinds of trade-offs policymakers are willing to make between efficiency and equity when making such decisions.

3.2 Methods Used in an MCDA Study

An MCDA study investigates different aspects simultaneously. The most common types of MCDA application are discrete choice experiment (DCE), value measurement, goal programming, and outranking [18, 21]. DCE is described briefly below, more details can be found elsewhere (e.g., Mirelman et al. [22] and Paolucci et al. [23]). The stages of a DCE are as follows: (1) identification of attributes; (2) assignment of levels for each attribute; (3) experimental design; (4) data collection; and (5) data entry and analysis. The first stage of a DCE is to decompose the product or variable of interest into its characteristics (or attributes). This can be achieved using the literature, a proper systematic literature review, or focus groups. The second stage of assigning levels for each attribute can be performed using the same methods. The experimental design that is used is a type of factorial experiment that is aimed at examining the relationship between several independent variables and a response (or dependent) variable. This method has been shown to be a valid predictor of individual behavior patterns [24]. In this design, the independent variables are individual attributes of an intervention that is being considered for reimbursement. For example, the size of the individual benefit may be categorised as high or low based on a specific threshold (e.g., health gain of 1 year). Each attribute of the intervention has certain number of levels that are clearly defined and distanced from each other to form the spectrum of the attribute as shown in Table 1 (e.g., one profile for a particular intervention may be poor cost-effectiveness, low individual benefit, many beneficiaries, and children as the target population). During the experiment, respondents are shown a set of possible interventions to reimburse and asked to indicate which intervention they prefer. Once they have made their choice, they are shown a new set of possible interventions. Once all of the participants have completed the questionnaires, the data are analysed using a heteroskedastic conditional logistic regression model [25].

Another type of MCDA is value measurement, March et al. [18] discussed that "value measurement models evaluation interventions based on an overall benefit score estimated as the weighted average of the criteria". When a decision has to be taken between several alternatives, the outranking model of MCDA is useful as it compares the alternatives in question in terms of each attribute. It basically underlines the difference in preferences between the alternatives for each attribute. Then the aggregation and scoring of the preferences and their difference across the alternatives provide a foundation for selecting one alternative over the others [18]. Finally, the goal programming type of MCDA, which according to Colapinto et al. [26] is "a distance based method that optimizes multiple goals by minimizing the deviations of objectives from aspiration levels or goals set by the decision maker. When the deviations are driven to zero the set goals of the model can be achieved, additionally the deviations can be either positive and negative signifying overachievement or underachievement of the goals subject to multiple constraints."

3.3 Sample Results from MCDA Studies

MCDA studies have been conducted in various countries over the past few years. The participants in these studies

Table 1 Example of attributes and their possible levels *Source* Defechereax et al. [31]

Attribute	Level	Definition
Severity of disease	Not severe	Health expectancy >2 years without intervention
	Severe	Health expectancy <2 years
Number of potential beneficiaries	Few	<100,000
	Many	>100,000
Age of target groups	Young age	0–15 years old
	Middle age	15–59 years old
	Elderly	>60 years old
Individual health benefits	Small	<5 healthy years
	Large	>5 healthy years
Willingness to subsidize	>70% of total health expenditure	Poverty reduction criteria: subsidize at more or less than 70%
	<70% of total health expenditure	
Cost-effectiveness	Not cost-effective	Cost/DALY > GDP/capita
	Cost-effective	Cost/DALY < GDP/capita

comprise stakeholders from different organizations (i.e., government, pharmaceutical, consulting, and academia/research). This brief overview describes the results for six countries (Nepal, Uganda, Cuba, Brazil, Norway, and China) [22].

Figure 1 shows star charts that summarize the average results as well as country-specific results. The values shown in the star charts reflect the values (or partial utilities) given to each of the different attributes. Some of the values are positive (e.g., cost-effectiveness), meaning that interventions that are cost-effective have a higher value (or utility) than interventions that are not cost-effective. In contrast, some values are negative (e.g., age of beneficiaries $>$ 60 years in Cuba), meaning that interventions that would primarily be given to older adults have a lower value (or utility) than interventions given to younger people (children, in fact).

The star chart containing the *average* results of all countries (in the centre of Fig. 1) shows that all attributes are associated with the decision to reimburse; of these attributes, the most influential attribute is cost-effectiveness, while the least influential is the impact on poverty. A quick glance at the country-specific results reveals that cost-effectiveness is an influential factor in every country. However, the summary star chart masks important between-country differences regarding the weights placed on the different attributes. It also shows that while cost-effectiveness seems to dominate other attributes, they cannot simply be ignored and ruled out of the decision-making formula as the chart revealed significant weights for each attribute. Therefore, it is important to look at each country one at a time.

The pattern seen for Norway generally corresponds to the average pattern based on all countries, with cost-effectiveness as an influential attribute. However, we can see that the score for interventions targeting persons older than 60 years is very low, meaning a strong preference for interventions that target children. We can also see that disease severity is more important than the average across countries.

For Brazil, cost-effectiveness appears to be even more important than it is in Norway. Besides cost-effectiveness, other attributes (in decreasing importance) are total number of beneficiaries, size of individual benefits, disease severity, and age. The effect on poverty is not viewed as an important criterion.

In stark contrast to Brazil, the star chart for Cuba indicates that cost-effectiveness is the least important attribute. The most important are (in decreasing importance) the total number of beneficiaries, age of the beneficiaries, effect on poverty reduction, the size of the individual benefit, and cost-effectiveness. Interestingly, the interventions with a larger number of beneficiaries are given a reduced priority for coverage. One possible explanation for this is that the number of beneficiaries may have been construed as a proxy for budget impact.

The results for China suggest that only three factors are considered important: number of beneficiaries, age, and cost-effectiveness. One interesting feature of the MCDA study for China is that the analyses also examined whether the value that respondents gave to a particular attribute (like age) was associated with the characteristics of the respondents (i.e., sex, job type, and years of experience). This raises important issues about whose priorities should be considered when making reimbursement decisions.

Another way to arrange the results of the studies is to divide the attributes into two categories: (1) equity-oriented attributes, which includes disease severity, age group, and

income level of the beneficiaries; and (2) efficiency-oriented attributes, which includes the total number of beneficiaries, the extent of the individual benefit, and degree of cost-effectiveness. This categorisation, shown in Fig. 2, reveals important differences between the countries regarding their attitudes towards maximizing efficiency versus maximizing effectiveness. According to Mirelman et al. [22], Fig. 2 shows the preference levels for interventions with either all-equity or all- efficiency criteria compared with the baseline. Cuba for instance demonstrates a positive attitude towards all-equity criteria. In contrast, Norway demonstrates a positive attitude towards efficiency. More discussion about the above taxonomy and results can be found in Mirelman et al. [22].

In summary, the MCDA studies show important between-country differences regarding the value of different attributes and the trade-off between efficiency and effectiveness. However, they should not be viewed as a static set of results for these countries but rather as source material for a proper discussion about what should be considered in reimbursement decisions.

4 General Discussion

Coverage decision-making is complex. In general, the process of coverage decision-making can be divided into two phases: "assessment" and "appraisal." The assessment phase can be seen as consisting of the collection and analysis of the information and knowledge considered relevant for decision-making while the appraisal phase consists of the judgment based on those findings.

While various types of information can be collected, and analyzed during the assessment phase, many view the cost-effectiveness (for example, in incremental costs per quality life-year (QALY) gained) as the primary outcome since it encapsulates the overall goal of the policymaker of maximizing health with a fixed budge [27]. In its purest sense, that viewpoint involves the assessment phase of estimating the cost-effectiveness of the intervention being considered for reimbursement and an appraisal phase that involves determining whether the cost-effectiveness is above or below a given WTP threshold. However, others see cost-effectiveness as just one of the criteria to be considered in

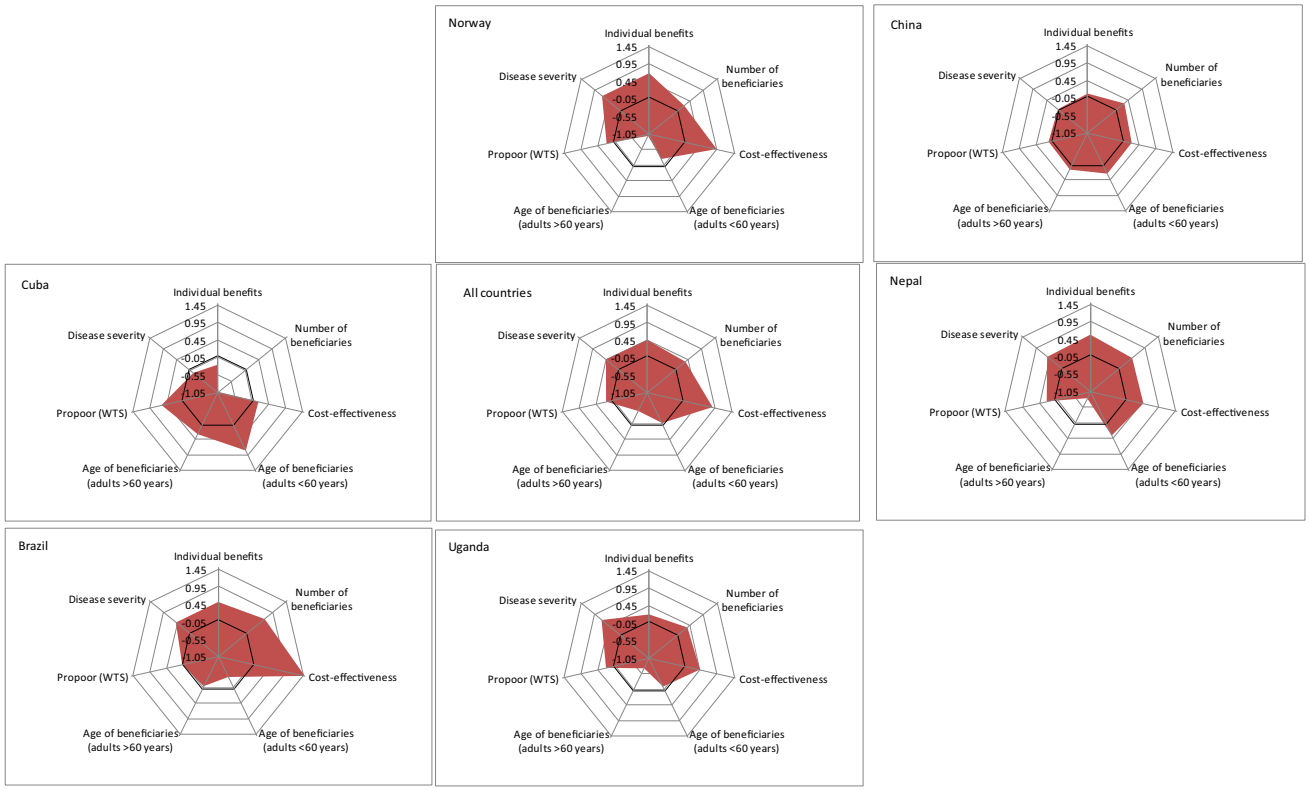

Fig. 1 *Star charts* showing the country-specific values on different attributes. The *numbers* in the chart reflect the values given to each attribute. Positive values mean that a specific level of an attribute as shown in Table 1 has scored higher than other levels of the same attribute. For example, cost-effectiveness is positive in most cases, which means that the cost-effective level of the cost-effectiveness attribute has a higher value (or utility) than the not cost-effective level. Negative values mean that a specific level of an attribute has scored less than other levels of the same attribute. For example, the level of age of beneficiaries >60 years in the age of target groups attribute as shown in Table 1 has scored less than the rest of the attribute's levels, meaning that interventions that would primarily be given to older adults have a lower value (or utility) than interventions given to younger people

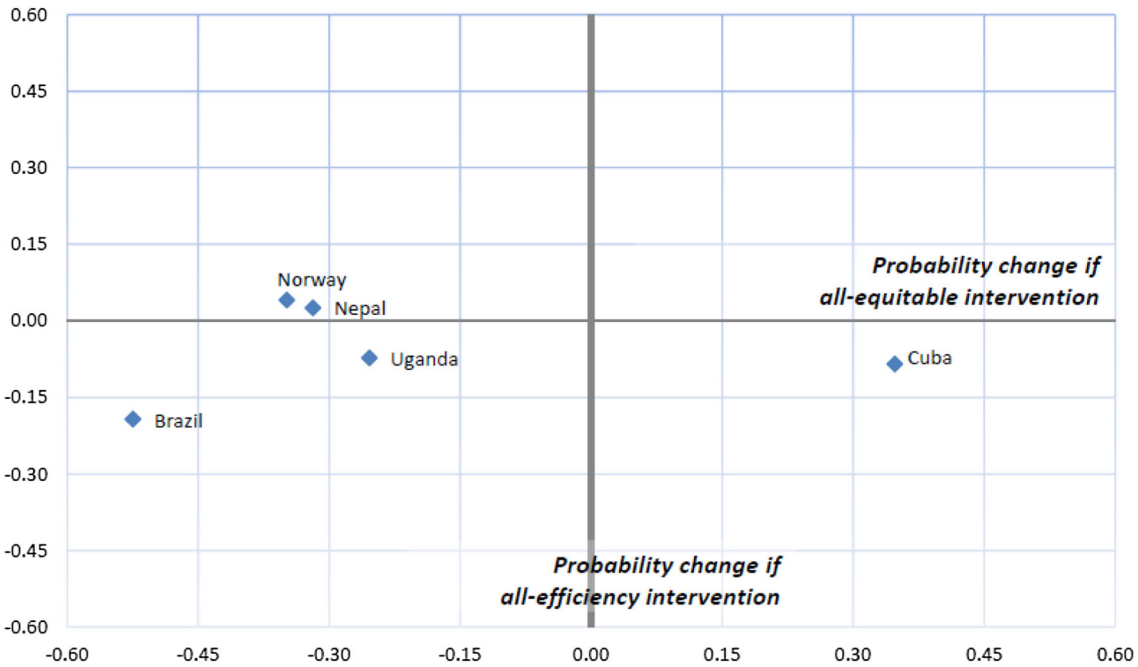

Fig. 2 Differences in probability of trade-off choice between equity and efficiency by country *Source* Mirelman et al. [22]

coverage decisions and there are plenty of examples suggesting that coverage decisions are based on more than just cost-effectiveness alone. Two general types of examples are organ transplants and orphan drugs [6]. In both cases, interventions are often reimbursed despite having incremental cost-effective ratios (ICERs) that are much higher than official or unofficial cost-effectiveness thresholds. This suggests one of two things: that policymakers are making a mistake when they reimburse them or that cost-effectiveness is not the only factor in coverage decisions. Even NICE, whom many believe uses absolute cost-effectiveness thresholds when making decisions about reimbursement, does not treat these thresholds as absolute. Moreover, one study of previous NICE reimbursement decisions revealed that other factors such as type of disease are associated with the chance of a positive decision [28].

Regardless of our viewpoint regarding the role of cost-effectiveness in coverage decisions, decision-making can be viewed as having three components: information, values, and resource constraints. Our values, which can be looked at and weighted differently, as shown in Fig. 1, determine which information we consider relevant when making decisions, and also determine how much weight we place on this information. For example, some countries place a higher value on interventions that target children than on interventions targeting adults.

There is no clean separation between the three components of decision-making. To start with, our values may affect which information we will collect and how we will interpret that information. For example, our decision about whether there is sufficient evidence of effectiveness of an intervention probably depends on other factors like budget impact, disease severity, public opinion, and political will [29]. In low income countries, resource constraints might influence—together with the value judgements—which information is relevant and how much it will influence the decision. A greater weight to efficiency-oriented attributes might be given not because equity-oriented attributes are undervalued, but because policymakers are faced with coverage choices that relate to basic needs with a very high opportunity cost of the last dollar to be used. The MCDA approach has the potential to reduce bias and would reveal which criteria have more influence when making coverage decisions.

The quality of a country's priority setting and coverage decisions could be improved by establishing the trade-offs that are unavoidable. One general trade-off is the equity-efficiency trade-off, and previous MCDA studies have revealed that there are measurable preference differences in equity-efficiency criteria between countries, as shown in Figs. 1 and 2. However, these differences can change over time. Monitoring preferences over time may help to understand the relationships between health and economic growth, although temporal changes in preference may occur due to other factors such as changes in the degree of influence of prominent individuals, political parties, and other organizations.

A review of high-income country practices concluded that when a country designs health plans or appraises its

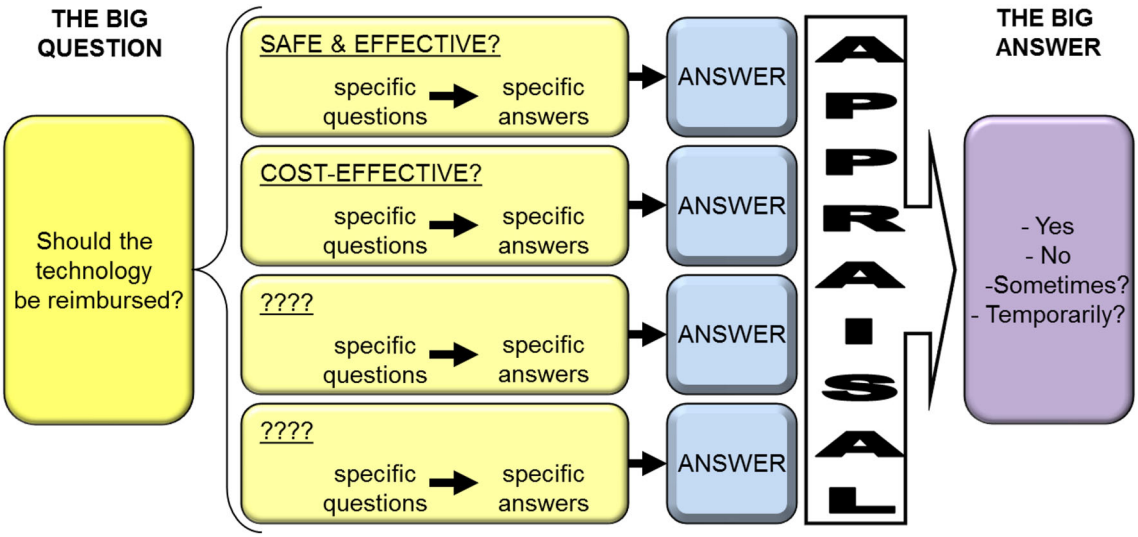

Fig. 3 A generic model of coverage decision-making *Source* Redekop [32]

health system performance in the light of the trade-off between both equity and efficiency, MCDA appears to be an important tool within the formal context of the process [30]. Moreover, transparency in disclosing the selected preferences may assist all stakeholders to make more well-informed decisions, and MCDA findings can help to develop a more rational and accountable policy process. At the very least, policymakers should study the findings of an MCDA study to see if modifications in coverage policy-making are worth considering.

The quality of reimbursement decisions can be improved in different ways. One way to improve quality is by making a list of the rationales that support reimbursement, like the economic rationales described above, and then applying them whenever a reimbursement decision has to be made. This could be viewed as a "reflect-then-decide" type of approach. Alternatively, one could use MCDA to ascertain the values that policymakers place on different attributes and then apply those values to make reimbursement decisions in the future. This could be viewed as a "measure-then-decide" type of approach. However, both approaches are suboptimal since the first approach presumes that all rationales can be worked out beforehand while the second approach presumes that the MCDA approach is sufficient and that the preferences of policymakers are appropriate. A better approach would be a combination of the two, which could address their inherent shortcomings. One could perform an MCDA and examine why certain attributes are given certain values. Do these values correspond with existing rationales based on economic theory? If not, could they be an artefact of the MCDA study, where the preferences of policymakers and not the preferences of the general public are studied? If the values are not expected based on existing rationales, then more discussion is needed to ascertain why they exist. These discussions could lead to the addition of new rationales that could be added to the current list of rationales. While new and existing rationales may be hotly debated (e.g., disease rarity, innovative treatment), these debates will likely lead to a better understanding of which of them could be included in reimbursement decisions in the future.

Figure 3 shows a generic model of coverage decision-making; the first assessment phase involves the collection of relevant information and evidence while the second appraisal involves making a decision based on that information. The MCDA approach described in this paper focuses on the appraisal phase in the effort to improve the consistency of coverage decisions. However, another important challenge faced by policymakers around the world is how to speed up the assessment phase without sacrificing quality; that is, how can the relevant information and evidence be gathered more efficiently? One way to achieve this is through international collaboration in data collection and evidence assessment and efforts made by international HTA agencies as INAHTA, EUnetHTA, and ISPOR AsiaNetHTA for example, demonstrate that collaboration is possible and beneficial.

Regardless of any successes in maintaining an HTA database on relevant information about technologies, there is still the need to conduct country-specific appraisals. For example, even if there is widespread acceptance that a new technology is safe and effective, each country will have to examine whether it is willing and able to reimburse (or implement) it. However, it would be worth exploring the similarities and differences in joint implementation of global health initiatives to support countries with too little capacity to collect the information they need to make good

coverage decisions and unable to appraise this information. Collective efforts to improve the efficiency of decision-making would also help these countries.

Between-country differences in decisions exist and will continue to exist, even if methods like MCDA are used appropriately [6]. This is not necessarily a problem. The main issue is not whether there is any variation in decisions but rather whether each country (or jurisdiction) is making the best decisions based on their specific capacity, resource constraints, and values. Transparency about the decision-making process will enable all parties to understand how decisions are being made. If a method like the MCDA is used together with a proper reflection on the results of an MCDA, publication of the criteria (and even their values) can help to show which information was used to make the decisions and which values were applied to this information. Obviously, the publication of the process will lead to heated debates, but this may eventually lead to more transparency and better policymaking. Policy developers and policymakers have two duties: to strive for good-quality policy decisions and to explain how they reached their decisions. Methods like the MCDA provide a coherent analytical framework to these purposes but have to be combined with a set of principles underlying reimbursement decisions. In that sense, MCDA can be viewed as a means to gain a better understanding of these principles.

5 Conclusions

It is undeniable that the economic analysis on efficiency and affordability (i.e., cost effectiveness and budget impact) supports and reinforces policymakers to make evidence-based decisions regarding the design of health plans. Our paper suggests that multi-criteria approaches appear to be an additional comprehensive decision-making tool for reimbursement policies and need further development.

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Compliance with Ethical Standards

Conflict of interest Francesco Paolucci, Ken Redekop, Ayman Fouda, and Gianluca Fiorentini declare they have no conflicts of interest.

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References

1. Colombo F, Tapay N. Private health insurance in OECD countries: the benefits and costs for individuals and health systems. OECD Health Working Papers. 2004;15:265–319.
2. Cutler DM. Equality, efficiency, and market fundamentals: the dynamics of international medical-care reform. J Econ Lit. 2002;40(3):881–906.
3. Hurst J. The reform of health care systems in seven OECD countries. Paper presented at the Second World Congress of Health Economics, Zurich (Switzerland). OECD; 1990 September.
4. OECD. Health at a glance 2013: OECD indicators. OECD Publishing; 2013. p. 153–66.
5. Kotlikoff LJ, Hagist C. Who's going broke? Comparing growth in healthcare costs in ten OECD countries. NBER Working Paper 2005(w11833)
6. Kanters TA, Hakkaart L, Rutten-van Mölken MP, Redekop WK. Access to orphan drugs in western Europe: can more systematic policymaking really help to avoid different decisions about the same drug? Expert Rev Pharmacoecon Outcomes Res. 2015;15(4):557–9.
7. EUnetHTA Work Package 8. EUnetHTA Handbook on Health Technology Assessment Capacity Building. Barcelona (Spain): Catalan Agency for Health Technology Assessment and Research. Catalan Health Service. Department of Health Autonomous Government of Catalonia; 2008.
8. Luce BR, Drummond M, Jönsson B, Neumann PJ, Schwartz JS, Siebert U, Sullivan SD. EBM, HTA, and CER: Clearing the confusion. Milbank Quarter. 2010;88(2):256–76. doi:10.1111/j.1468-0009.2010.00598.
9. Shah KK, Cookson R, Culyer AJ, Lettlejohns P. NICE's social value judgements about equity in health and health care. Health Econ Policy Law. 2013;8(2):145–65.
10. Beattie A, Yates R, Noble DJ. Accelerating progress towards universal health coverage in asia and pacific: Improving the future for women and children. BMJ Glob Health. 2016;1(Suppl 2):i12–8.
11. Paolucci F. Economic rationales for the design of health care financing schemes. In: Health care financing and insurance: options for design. Berlin: Springer; 2011. p. 13–32.
12. Stolk E, Busschbach J. Cost effectiveness of sildenafil calls for political discussion. Br Med J. 2000;321:510.
13. Stolk EA, van Donselaar G, Brouwer WB, Busschbach JJ. Reconciliation of economic concerns and health policy: illustration of an equity adjustment procedure using proportional shortfall. Pharmacoeconomics. 2004;22(17):1097–107.
14. Aizuddin AN, Sulong S, Aljunid SM. Factors influencing willingness to pay for healthcare. BMC Public Health. 2012;12(Suppl 2):A37.
15. Paolucci F, Schut E, van de Ven, WPMM. Economic rationales for the design of health care financing schemes. iHEA 2007 6th World Congress: Explorations in Health Economics Paper; 2007.
16. Cutler DM, Zeckhauser RJ. The anatomy of health insurance. In: Culyer AJ, Newhouse JP, editors. Handbook of health economics, vol. 1A. Elsevier: Amsterdam; 2000. p. 563–644.
17. Baltussen R, Niessen L. Priority setting of health interventions: the need for multi-criteria decision analysis. Cost Eff Resour Alloc. 2006;4:14. doi:10.1186/1478-7547-4-14.
18. Marsh K, Lanitis T, Neasham D, Orfanos P, Caro J. Assessing the value of healthcare interventions using multi-criteria decision analysis: A review of the literature. Pharmacoeconomics. 2014;32(4):345–65.
19. Mühlbacher AC, Kaczynski A. Making good decisions in healthcare with multi-criteria decision analysis: the use, current

research and future development of MCDA. Appl Health Econ Health Policy. 2016;14(1):29–40.
20. Angelis A, Kanavos P. Value-Based assessment of new medical technologies: towards a robust methodological framework for the application of multiple criteria decision analysis in the context of health technology assessment. Pharmacoeconomics. 2016;34(5): 435–46.
21. Thokala P, Duenas A. Multiple criteria decision analysis for health technology assessment. Value Health. 2012;15(8): 1172–81.
22. Mirelman A, Mentzakis E, Kinter E, Paolucci F, Fordham R, Ozawa S, Ferraz M, Baltussen R, Niessen L. Decision-making criteria among national policymakers in five countries: a discrete choice experiment eliciting relative preferences for equity and efficiency. Val Health. 2012;15(3):534–9.
23. Paolucci F, Mentzakis E, Defechereux T, Niessen LW. Equity and efficiency preferences of health policy makers in China—a stated preference analysis. Health Policy Plan. 2015;30(8):1059–66.
24. Keane MP, Wasi N. The structure of consumer taste heterogeneity in revealed vs. stated preference data. Economics Papers 2013-W10. Economics Group, Nuffield College, University of Oxford; 2013.
25. Schroeder DA. Discrete choice models. In: Accounting and causal effects: econometric challenges. New York: Springer; 2010. p. 77–95.
26. Colapinto C, Jayaraman R, Marsiglio S. Multi-criteria decision analysis with goal programming in engineering, management and social sciences: a state-of-the art review. Ann Oper Res. 2017;251(1–2):7–40.
27. Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG. Cost-effectiveness in health and medicine. 2nd ed. Oxford: Oxford University Press; 2016.
28. Dakin H, Devlin N, Feng Y, Rice N, ONeill P, Parkin D. The influence of cost-effectiveness and other factors on NICE decisions. HERC research paper 01/13. Health Economics Research Centre, University of Oxford; 2014.
29. de Groot S, Rijnsburger AJ, Versteegh MM, Heymans JM, Kleijnen S, Redekop WK, Verstijnen IM. Which factors may determine the necessary and feasible type of effectiveness evidence? A mixed methods approach to develop an instrument to help coverage decision-makers. BMJ Open. 2015;5(7):e007241.
30. Piniazhkho O, Németh B. An analysis of the criteria used in existing or proposed MCDA models PRM202. ISPOR 21st Annual International Meeting. May 2016.
31. Defechereux T, Paolucci F, Mirelman A, Youngkong S, Botten G, Hagen TP, Niessen LW. Health care priority setting in Norway: a multicriteria decision analysis. BMC Health Serv Res. 2012;12:39.
32. Redekop WK. Navigating the waters of economic evaluations of medical devices. ISPOR. Presentation at the annual meeting of the International Society of Pharmacoeconomics and Outcomes Research, Dublin, November 2013.