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# Value-Based Evaluation of Chinese Provincial Health Insurance Policy Schemes

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## Abstract

Since 2011, an international group of health policy experts has been working on a value-framework to be used for pharmaceutical policy decisions based on multicriteria decision analysis (MCDA). This tool can be easily adapted to a local decision-making context through a facilitated workshop format. Several workshops have been conducted in emerging markets to test the acceptance and feasibility of using MCDA in local decision-making. In China, national policy goals for expanding health-care coverage pressure the provincial governments to implement more comprehensive coverage schemes. This chapter demonstrates the adaptation of a global value-framework to the local policy environment. In September 2018, nine leaders from provincial health insurance bureaus responsible for the urban employee basic medical insurance (UEBMI) participated in a 1-day workshop to build a consensus on the most important objectives for the health-care reform and to translate these into measurable criteria. The participants ranked the criteria by importance and MCDA methodology was used for weighing the importance of each criterion in the final decision. The model driving this process will be presented and discussed by comparing two policy options for health-care reform.

**Keywords:** China, multicriteria decision analysis, MCDA, insurance policy, decision-making, stakeholder engagement, medical savings account

## 1. Introduction

### 1.1 Provincial insurance schemes in China

In 1998, the State Council of China issued a decision on establishing the basic medical insurance system for urban employees [1].

As a consequence, a universal medical insurance system (UMIS) was designed to improve access to medical services and reduce out-of-pocket (OOP) costs for all Chinese citizens [2]. By 2014, 97.5% of the population had some form of insurance coverage. The key options are the urban employee basic medical insurance (UEBMI), the new rural cooperative medical scheme (NRCMS), or the urban resident basic medical insurance (URBMI). The differences are in the type of population covered (e.g., in 2014, 283.3 million urban employees, 736 million rural citizens, or 314.5 million urban residents), in the annual premium per capita

(in 2014, 2841 RMB for UEBMI, 411 RMB for NRCMS, or 409 RMB for URBMI) and consequently, the scope of available funds and coverage [2].

All employing units (employers) and their employees in cities and towns are intended to participate in the UEBMI. The expenses of basic medical insurance shall be shared by employers and employees. The basic system includes the combination of social coordination funds and individual medical saving accounts (MSAs).

The basic medical insurance premiums are paid by individual employees with a 2% payroll tax and by employers with 6% payroll tax. About 30% of the contributions of employers are paid into the personal MSAs, while the remaining 70% of the basic medical insurance premiums are collected as coordination funds. Individual MSAs are used for outpatient payment, the coordination funds are used for hospitalization and to provide for coverage of some special diseases with high medical costs in outpatient departments [3]. The maximum ceiling payment is limited at four to six times the average annual wage of local employees. The excess cost can be insured by commercial medical insurance or government medical assistance. In 2010, these basic medical insurance principles were included in the Social Insurance Law of the People's Republic of China [4].

## **1.2 Why is change needed?**

Although all provinces have implemented provincial solutions for the basic medical insurance for employees, a few shortcomings have been observed over the years. These include the risk that the funds in the MSAs are not always used efficiently and may not suffice to cover a comprehensive outpatient care. In consequence, patients may prefer to use inpatient care facilities, which however, lead to higher overall costs [3, 5]. Simply put, individual choices on use of health-care funds are done with the short-term individual or family advantage in mind, whereas with pooled HC funds, decisions can be made based on overall health outcome of the population, and supply cost can be negotiated or managed accordingly. Not every individual owner of an MSA has the capability to invest in that HC service, which maximizes health outcomes with the available funds, and there is a risk that individual choices favor delayed treatments at more advanced stages of disease and to worse outcomes. An international study on the efficiency of MSA across different countries (China, Singapore, South Africa, and the United States of America) concluded that “the available evidence suggests that MSA schemes have generally been inefficient and inequitable and have not provided adequate financial protection” [6].

In addition, many healthy people or high-income employees do not use the savings in the personal accounts and therefore, they accumulate over time in the personal MSAs and are not available for the financing of current health-care services [7]. For example, in the Liaoning Province, the recent average proportion of health-care funds accumulated in individual accounts reached 40%, resulting in almost half of medical insurance funds being accumulated as surplus held in the MSAs. The same situation as was observed in Shanghai in 2015, with 40.3% of premium surplus accumulated in medical savings accounts [8]. In a model with a pooled fund administered across the whole membership, the entire budget could be allocated for health-care services across the members as needed. Thus, at any time, the money which is not spent by healthy people can be used for the treatment of sick people.

In terms of equity, a high variation in scope of coverage is also observed [9]. For access to medicines, distorted funding mechanisms create financial barriers for access to medicine in China [10, 11]. Research in 2014 on the impact of the UEBMI on equity revealed improved equity for inpatient services, but inequity growth for outpatient services [12].

Affordability of medicines, a major part of outpatient care, is also still of concern [13]. There is a high regional variability in the scope of coverage and reimbursement methods [13]. For example, in some cities, the coverage for pharmaceuticals lies within the general outpatient coverage scheme; in others a range of “regulated diseases” are defined for coverage, whereas in other cities, a secondary drug reimbursement lists exist.

Due to these challenges and shortcomings, provincial insurance authorities want to improve their insurance policies for UEBMI by raising reimbursement for outpatient care services and products. This will in turn improve utilization of all available funds to increase the overall efficiency of healthcare.

### **1.3 A format to facilitate policy decisions**

In China, the responsibility for transferring nationally formulated policy objectives into the provinces is decentralized and lies with the provincial administration. There are many options on how the provincial policies can be formulated and applied. Alignment of the overall central policy is important to ensure consistency and equity in health-care access for the Chinese population. However, new policies are in the responsibility of the provincial insurance authorities, and therefore, the policy decision has to be made in each province under consideration of the national policy priorities and the provincial political and health-care context. In such complex situations, decision support tools may help the provincial authorities to prioritize possible insurance options.

Among the plethora of decision support tools, multiple criteria decision analysis (MCDA) was chosen because this method can help to assess multiple, and sometimes conflicting, criteria to evaluate alternatives [14–16]. It originates from operational research supporting single decision-makers [17] but is increasingly also used to structure decision alternatives, to prognose their consequences, and to facilitate dialog on the benefits and harms of decisions in a multistakeholder context in order to enhance procedural quality in the decision-making process [18]. MCDA methods are used across many branches of science and policy-making including environmental, infrastructural, and health-care policies, prioritization, and planning [15, 19, 20].

Next to MCDA, other methods are existing to inform strategic decisions between alternative option and much can be learned from the world of business management [21]. Some of these lead to increasing complexity such as strategic options development and analysis (SODA), a comprehensive cognitive mapping of individual stakeholder views. Others, such as a “strengths, weakness, opportunity, and threat” (SWOT) analysis, structure the thinking and accumulate facts and data, but the interpretation and weighing is left to the decision-makers. Pure deliberation of the alternatives in the discussion among decision-makers and experts often lead to decisions of low transparency and may lack consistency. Simulating the impact of a new policy in a health economic models or trade-off models would limit the factors to be considered.

MCDA is an umbrella term for decision support tools which can be used in situations like presented here for the Chinese insurance policies, where (1) there are one or several clearly stated objectives that stakeholders groups and/or decision-makers value differently [20], (2) there are several alternative options how to fully or partially reach these objectives, and (3) there multiple criteria, which can be integrated into a calculable composite measure of the benefit or worth of the various alternatives [21]. Among the MCDA methods are the analytic hierarchy process, weighed sum and weighed product models, or ranking and simple multiattribute rating techniques (SMART) as described below [22, 23].

A taskforce of the International Society of Pharmacoeconomics and Outcomes Research (ISPOR) has described the MCDA process for the use in health-care decisions [24, 25]. Generally, the process includes six steps, and is adapted based on the specific decision problem, objective, and context. The definition of the decision problem is the first step. Subsequently, agreement needs to be reached among the stakeholders to determine which criteria are useful to determine the alternative option that will best solve the decision problem. If the importance of these defined criteria differs, the stakeholders also should agree on the weight (relative importance) of each criterion in the assessment of the alternative options.

Finally, in the assessment of the alternatives, each criterion is scored separately and contributes with the predetermined weight, to the composite score that reflects the overall performance of each alternative. As decisions in healthcare often impact a wide range of stakeholders, the criteria may also be chosen to accommodate different stakeholder perspectives [26]. MCDA is being used widely across health-care systems to inform decision-making in healthcare, including benefit-risk assessment of medicines, formulary listings, purchasing, or reimbursement decisions [25, 27–29]. MCDA has specifically been suggested as an evidence-based health technology assessment (HTA) tool for evaluating off-patent pharmaceuticals in developing countries [30]. Examples for using MCDA in decision-making for off-patent medicines in developing countries are emerging in several countries such as China, Thailand, Indonesia, or Egypt [31–34].

A short explanation of MCDA in lay language (English) can be viewed in the online material to this book and via the Internet (<https://www.youtube.com/watch?v=7OoKJHvsUbo>).

## **1.4 Policy initiative in China**

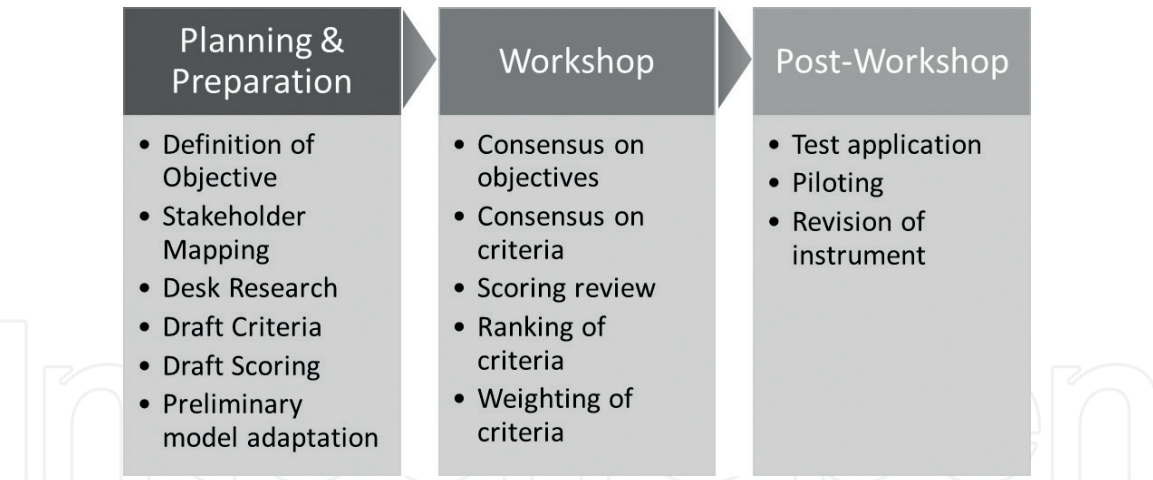
The objective of this initiative was to collaborate among provincial insurance policy leaders in China to create an MCDA tool to evaluate insurance policy options across China. This collaborative process was intended to provide a transparent prioritization of insurance models to guide provinces in the decision process. A secondary objective was to adapt a globally validated MCDA in a local environment to address a specific decision problem.

## **2. Process for adaptation of a global format**

MCDA is a method to support decision-making, while allowing for adaptation to a specific decision problem. The methodology, framework, and process applied in the workshop followed a previously developed and validated model (**Figure 1**) [30, 33] for adaptation to a new decision problem and context. Each of the phases will be described in detail below.

### **2.1 Workshop preparation**

To achieve broad buy-in and acceptance for the tool, many of the important stakeholders should be included. Through participation in an interactive workshop, individual stakeholders will be able to see exactly how the tool was developed and can contribute their perspective to shape the new tool. In order to limit the workshop to less than 1-day preparation prior to the workshop is important. Ideally, the definition of the decision problem should occur prior to the workshop. For the initiative described here, decision problem was the assessment of health-care policy options across China (see Section 1.4).



**Figure 1.**  
*Process applied for adapting a previously developed MCDA tool and framework to the decision problem of developing new insurance policies in China.*

2.1.1 Stakeholder engagement

One of the core principles of designing and implementing change is that the key stakeholders are considered throughout the process according to their respective position in the context of the change. The design and implementation of the new insurance policies will be the responsibility of the provincial insurance authorities under the conditions outlined by the national policy framework. They will not only have to be convinced by the new insurance model and its feasibility, but they will also have to defend any new design versus the outside stakeholders such as provincial policy-makers, provincial urban employers, and provincial urban employees, and toward the inside stakeholders who will be charged with the implementation.

In this initiative, the analysis started by listing all impacted stakeholders who hold influence over the proposed change in program. Each of the stakeholders was rated by their level of interest in the insurance policy and the level of influence (power) they have in relation to the new policies.

For the development of the decision tool, these medical insurance representatives were invited to participate in the workshop. In addition, academic policy influencers and public health experts participated in the presentations and discussions.

In the subsequent steps of piloting, validation, and full implantation (beyond the described workshop), a broader range of stakeholders has to be involved or managed to ensure that their interests are represented, and the decision principles are accepted by expanded stakeholders.

2.1.2 Adaptation of global format to the decision problem

As outlined in the introduction (see Sections 1.1 and 1.2), the national policies could benefit by improvements in the insurance coverage scheme for urban employees. To accommodate the comparison of alternative insurance policies a multicriteria decision tool was created to test how well each insurance option addressed national and provincial requirements.

For this, a set of requirements was identified through desk research and discussion with policy-makers and academic health policy experts before the workshop by the core team, which led to the base set of evaluation criteria.

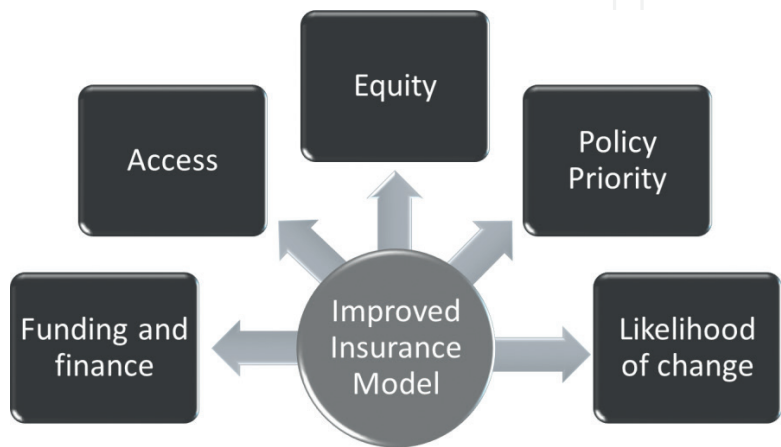
2.1.3 Proposed decision criteria

Preliminary criteria were identified in the five domains presented in **Figure 2**: (1) funding and finance, (2) access, (3) policy priority (access), (4) equity, and (5) likelihood of change. Each of the domains contained two or three criteria as defined below with a total number of 11 criteria. Of the five domains, two ((2) access and (3) policy priority) were related to access. While more criteria had been considered, it was important to manage the number of criteria. The relevance and feasibility of the proposed criteria was further challenged in the workshop by the participating stakeholders.

Under the domain of “funding and finance,” two criteria were proposed. The criterion “financial impact for insurance” should help to roughly estimate the financial risk of a potential future health policy on health-care expenditure to be covered by the insurance scheme in comparison to the current insurance expenditure. To estimate the impact of a future insurance model on overall extent of insurance expenditure would be available as funding for healthcare, a criterion “mobilization of funding for outpatient healthcare (HC)” was proposed.

To assess the impact of a future policy on overall “access” for patients to health-care, three criteria were predefined. With the criterion “access to pharmaceuticals,” the impact of a new insurance model on patient access to ambulatory pharmaceutical therapies as compared to the current system should be assessed. As most of the ambulatory care is made up by pharmaceuticals, which currently are to a large extent paid by the patients out-of-pocket, improvement in this area would be a major achievement. To compare the expected impact of the new model on overall coverage for healthcare in the outpatient setting, the second criterion “outpatient coverage” was suggested. The third criterion “economic burden for patients” was introduced to assess the impact of the potential future health policy on the patients’ finances in comparison to the current system.

A separate domain named “access/policy priority” was put forward for discussion in the workshop to emphasize the need of meeting the policy priorities set by the national government policy. The first priority to be addressed is “timely interventions” (care when it is needed) to assess the impact of the future model on time to care (initiated by patient, family member, or insurance model). The intent here is to decrease the hurdles or improve the motivation for searching for healthcare early in the disease process instead of waiting until reaching more severe disease states before seeking care. The second criterion in this domain, “primary care utilization” is meant to help determine the impact of the future policy on the use of primary care in comparison to the current system. The policy objective emphasized



**Figure 2.**  
*Five domains for assessing the impact of insurance policy options on the intended outcomes of the policy changes.*

by this criterion is to shift care more toward the primary care level with much lower hurdles for patients as opposed to the current practice of accessing care mostly through specialized hospital services.

Two criteria were attributed to the domain of “equity.” “Solidarity for outpatient HC” appeared an important criterion to compare the impact of the new policy system on the solidarity principle. Full solidarity would mean equal health-care cost to everybody independent from personal health status. Furthermore, the impact of the future insurance model on health-care equity as compared to the current situation should be captured under the criterion of “equity.” This could potentially also imply higher contributions for people with higher income.

An important aspect to look at is the feasibility of introducing a new insurance policy model. This was to be addressed by the domain of “likelihood of change.” The criterion “ease of transition,” required an estimate of the smoothness of transitioning from the current to the future model. A specific criterion “acceptability to stakeholders” was proposed to account for the resistance of key stakeholders toward changing from the current to the potential future system. The final domains and their related criteria are presented in **Table 2**.

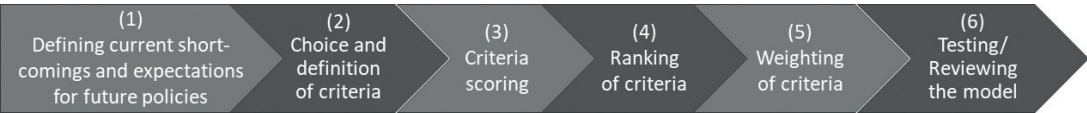
#### 2.1.4 Proposed scoring for the decision criteria

For each of the proposed criteria, a scoring scale was developed. The scoring definitions were mostly qualitative assessments and nonlinear. For example, the possible outcomes and related scores for “financial risk for insurance” were *high risk of nonmanageable cost increase* (exclusion), *increased but manageable cost increase* (25%), *minimal cost increase expected* (50%), *same cost as current* (75%), *decreased cost to insurance expected* (100%). In this example, exclusion means that an insurance option would be immediately excluded which can, with reasonable certainty, be expected to lead to massive financial impact to a degree which may bankrupt the insurance. Another example of a proposed scoring is the criterion of “equity” with the possible outcomes of “high degree of HC differences within population” (0%), “limited improvement of HC equity” (25%), “(limited) improvement of HC equity” (50%), “HC equity is mostly satisfied” (75%), “HC is the same for everybody” (100%).

Except for the score “exclusion,” all scores are expressed in percentages. This method provides for a normalization within the scoring system even if each score does not have the same number of scoring levels. This also allows for differentiation between the importance of the possible outcomes. The final score for each criterion will be calculated from the score (in percentage) and the maximum score achievable by this criterion (described in Section 2.3).

## 2.2 Interactive stakeholder workshop

The interactive stakeholder workshop took place in Beijing, China, on September 14, 2018 under the leadership of Professor Shanlian Hu (Fudan University). The agenda started with introductory presentations on the policy changes which triggered the initiative. The view on the initiative from different perspectives (e.g., academic, policy, industry) was presented through a moderated discussion of participants’ expectations and viewpoints on upcoming changes and the expected improvements in health insurance schemes. This was followed by an interactive component to develop a common general decision model following a validated MCDA calculation model and process for local adaptation [30, 35]. This portion of the workshop was moderated by two international health-policy advisors.



**Figure 3.** Six-step process for developing the MCDA tool in a workshop with key decision-makers for prioritizing insurance policy options in China.

Because the workshop facilitators spoke English, the entire workshop was supported by simultaneous translation to ensure involvement, understanding, and contribution of all participants. All materials were made available in the both languages. The flow of the interactive part of the workshop is depicted in **Figure 3**.

2.2.1 Discussion change objectives

Each insurance representative had the opportunity to address shortcomings of the current system and their expectations for an improved insurance scheme. The key statements resulting from this discussion are summarized in **Table 1**. These shortcomings and expectations were well aligned with those proposed by the core team during the workshop preparation. Overall, there was high concordance among the participants.

Finally, participants shared a common voice that the workshop would yield a tool to choose the most rational insurance system to meet the needs of their provincial environments, while still maintaining national consistency.

Gaps in current health-care coverage and insurance systems	Expected improvements with a future insurance policy
<b>Equity</b> <ul style="list-style-type: none"><li>• There is a high difference of levels of care between the provinces (cross-provincial inequity)</li></ul>	<b>Equity</b> <ul style="list-style-type: none"><li>• Improve the use of effective therapies</li><li>• Achieve equality in access</li></ul>
<b>Funding/finance</b> <ul style="list-style-type: none"><li>• Ineffectiveness of personal savings accounts</li><li>• Wasteful spending behaviors for resources in personal savings</li><li>• Nontargeted and no purposive dissipation of funds due to individual administration of personal savings accounts</li></ul>	<b>Funding/finance</b> <ul style="list-style-type: none"><li>• Better allocate funding to more effective therapies</li></ul>
<b>Access</b> <ul style="list-style-type: none"><li>• Rudimentary organization of outpatient care</li><li>• Coverage breadth is very narrow/limited</li></ul>	<b>Access</b> <ul style="list-style-type: none"><li>• Expanded coverage in more disease areas</li><li>• Doctors have more choice for prescribing the best suited therapies for each patient</li></ul>
<b>Policy priorities</b> <ul style="list-style-type: none"><li>• Lack of a coordinated management system for policy changes</li><li>• Overuse of tertiary hospitals</li><li>• Current focus on procuring what is demanded for</li></ul>	<b>Policy priorities</b> <ul style="list-style-type: none"><li>• More holistic and integrated view on health-care decisions</li><li>• Striking the balance between good care and financial feasibility</li><li>• Supplying effective therapies needed by the patients</li></ul>
	<b>General</b> <ul style="list-style-type: none"><li>• Allow for more flexibility by having a solid decision system and guidance</li><li>• Allow for pilot schemes in hospitals and pharmacies</li></ul>

**Table 1.** Summary of current insurance system shortcomings and expected improvements for future policies.

2.2.2 Discussion and refinement of criteria

Each domain and their related preliminary criteria were presented and discussed with workshop participants. The participants confirmed the relevance of all proposed domains and criteria except under the domain funding and finance. The criterion “mobilization of funding for outpatient HC” was dropped as participants stated that concept was covered by the “financial impact for insurance” criterion. Thus, these 2 criteria were merged into one and that resulted in 10 criteria across 5 domains as listed in **Table 2**.

2.2.3 Discussion and refinement of scoring

The proposed scoring for all criteria was reviewed and general agreement was reached that the scoring should systematically apply the same number, levels, and results of possible scores. A consistent five-level scoring for each criterion was developed, whereby the first criterion would always result in exclusion of that insurance option. The scoring is defined in **Table 3**.

2.3 Model construction

A multicriteria decision analysis was demonstrated in Excel (Microsoft™). Although the model was programmed before the workshop based on the predefined

Domain	Criterion	Definition
Funding and finance	Financial impact and funding for insurance	To estimate the financial impact of a potential future health policy on health-care expenditure to be covered by the insurance scheme in comparison to the current expenditure
	Access	To estimate the impact of a new insurance model on patient access to ambulatory pharmaceutical therapies as compared to the current system
	Coverage for outpatient HC	To compare the expected impact of the new model on overall coverage for ambulatory care
Policy priority	Affordability: economic burden for patients	To assess the financial impact on out-of-pocket cost for the patients or family
	Timely interventions	To assess the impact of the future model on time to care (initiated by patient, family member, or insurance model)
	Primary care utilization	To estimate the impact of the future policy on the use of primary care in comparison to the current system
Equity	Solidarity for outpatient HC	To compare the impact of the new policy system on the solidarity principle. Full solidarity = equal HC cost to everybody independent from personal health status
	Equity	To estimate the impact of the future insurance model on health-care (HC) equity as compared to the current situation
Likelihood of change	Ease of transition	To estimate the smoothness of transitioning from the current to the future model
	Acceptability to stakeholders	To estimate the resistance of key stakeholders toward changing from the current to the potential future system

**Table 2.**  
*Domains and criteria with definitions as determined in the workshop.*

Criteria name	Possible outcomes	Score (%)
Financial Impact and Funding for Insurance	High risk of non-manageable increase	0%
	Cost Increased without improved funding	25%
	Cost Increased but manageable	50%
	Same cost, without improved funding	75%
	Decreased cost to insurance, improved funding	100%
Access to pharmaceuticals	Reduced	0%
	Same as now	25%
	More people have access than now	50%
	Greatly reduced barrier to access	75%
	Free access without barrier	100%
Coverage for outpatient HC	Coverage reduced versus today	0%
	Same as now	25%
	Limited to medical savings	50%
	Improvement over current	75%
	High degree of coverage for all	100%
Affordability: Economic burden for patients	Affordability for patients reduced	0%
	Same as now	25%
	Affordability for patients slightly improved	50%
	Affordability for patients much improved	75%
	Solid foundation for tiered healthcare system	100%
Timely interventions: care when care is needed	Reduced versus current	0%
	Same as current	25%
	Partially improved	50%
	Greatly improved	75%
	Foundation for political steering mechanisms	100%
Primary care utilization	Increases use of high tier hospitals	0%
	Unchanged	25%
	Increased primary care utilization compared to now	50%
	Efficiently guide more orderly tiered system	75%
	Builds foundation for tiered system	100%
Solidarity for outpatient HC	No incentives for solidarity (below 20% of cost)	0%
	Solidarity 20-40% of cost	25%
	Solidarity 41-60% of cost	50%
	Solidarity 60-80% of cost	75%
	Solidarity >80% of cost	100%
Equity	Very high HC differences within population	0%
	Limited improvement of HC equity	25%
	Much improvement of HC equity	50%
	HC equity is mostly satisfied	75%
	HC is the same for everybody	100%
Ease of transition	Not feasible	0%
	High degree of system-change; large investments required	25%
	High degree of system change	50%
	Some minor changes required	75%
	Easy, no system or behavior change required	100%
Acceptability to stakeholders	High resistance to be expected	0%
	Resistance expected from a few stakeholders groups	25%
	Minor resistance expected from few stakeholders	50%
	Highly acceptable	75%
	Fully acceptable	100%

**Table 3.**  
*Outcomes definitions and scoring for each decision criterion.*

domains, criteria, and scoring, there was continuous adaptation throughout the workshop to reflect the input of the participants. The final model integrated all results from the workshop.

Once agreement had been reached on the domains, criteria, and scoring functions, the participants were guided through the process of ranking the criteria and subsequently weighing them for their relative importance.

This involved an anonymous voting with an audience response system (Ombea<sup>®</sup> with OMBEA ResponsePad<sup>™</sup>) for defining the decision priorities among the list of 10 criteria (step 4 in **Figure 3**) and the relative importance of each of the criteria in the overall decision (step 5 in **Figure 3**) following the modified simple multiattribute rating technique (SMART) method for ranking and swing weighing of the criteria [29]. For each vote, the result was computed as a median value. The resulting model was tested and reviewed using two test cases (step 6).

### 3. Testing the model

The first step in validating a decision model is testing the model with either known or extreme alternatives. During the workshop, there was limited time for testing; therefore, we will present two high-level insurance policy options to compare using the resulting model from the workshop.

#### 3.1 Potential insurance scheme options

A concern raised during the introduction was that the insurance funds allocated to medical savings accounts (MSAs) are not used efficiently. Therefore, a key component of health-care reform should include a more effective use of MSA funding.

The goals of a future reform would be to (1) increase the population solidarity and foster a more rational use of medical insurance premiums both from the perspective of the employee and the employer and thus (2) increase the efficiency of how the funds are utilized. In addition, the new policies should support key government (national) health-care policy priorities such as (3) a shift health-care utilization from tertiary to primary care services, and thus (4) incentivize earlier use of health-care services instead of delaying until more expensive inpatient services are required (timely interventions).

##### 3.1.1 Insurance model option 1

The scope of payment for personal MSAs would be expanded to include additional services such as deductible (user fees) of hospitalization medical expenses, or for the medical expenses of other family members, paying the premiums of commercial medical insurance participation. Thus, insured employees would have more options for MSA spending and would still make individual decisions on when and how the money would be spent. This option would not provide an incentive to increase the use of outpatient care.

##### 3.1.2 Insurance model option 2

A pooled outpatient funding system for the urban employees' medical insurance would be established, similar to how current inpatient service is funded. This

would create a gradual transition of payments into the coordinated population fund instead of the MSA and ultimately absorb the remaining funds in current MSAs. In this option, the decision on funding allocation would be made by the insurance authority or government across the entire insured population for both outpatient and inpatient care. Proactive funding of outpatient care would be intended to decrease inpatient care down the road.

### 3.2 Comparison of options

Four members of the project team and two additional Chinese health-care experts used the MCDA model to independently rate the two insurance policy options. Their answers were evaluated using the following rules:

- a. If three or four of the raters answered identically, this was taken as the result for that attribute;
- b. If the answers were distributed, the median result was used;
- c. If the median was between two scores, the answers from the Chinese respondents were given a higher weight;
- d. If the result was between two scores, the more conservative response was chosen.

Following this approach, insurance option 2 was rated with a total of 78.0 points as the superior policy as compared to insurance option 1 with a total of 53.95 points. The detailed results are shown in **Table 4**. Insurance option 1 scored better for the attributes relating to “financial impact and funding for the insurance,” “access to pharmaceuticals,” coverage for outpatient healthcare, “affordability/economic burden to patients,” “timely interventions,” “primary care utilization,” “solidarity,” and “equity.” In the final two attributes “ease of transition” and “acceptability to stakeholders,” insurance option 1 was rated higher.

This example shows that there is a trade-off in any decision-making process—in this case between the domain “likelihood of change” where option 1 scored higher and for the other four domains, where option 2 scored higher. The model highlighted these trade-offs and made them more transparent. Once policy-makers agree on their final decisions, they are also more aware of what resistance may be expected and therefore may be better prepared to consider preventive measures to minimize such resistance.

### 3.3 Model observations

The intention of model testing was to understand (A) ease of use of the model for those using the model and (B) to see how consistent the answers are between different users.

To answer the first question, the users were specifically asked about their experience. The model was rated to be very easy (1) or easy (2) and neutral by two raters.

The interrater consistency varied depending on both the attributes and the insurance option. For most questions, there was a clear preference for one score. The highest response variability was observed for option 1 in relation to “financial impact and funding for insurance,” “primary care utilization,” “ease of transition,” and “acceptability to stakeholders.” The responses for option 2 had less variability.

In order to improve the interrater variability, two improvements were suggested: (1) provide the raters with a more detailed description of the meaning of

an attribute and a score and (2) provide more a more detailed description of the two insurance models. An additional step of deliberation where a discussion could be led between the raters could give the rational for their individual ratings and consensus could be developed in the process. The latter approach would help to

Criterion	Weight of criterion	Option 1		
		Assessment	Attribute Score (%)	Weighted score (points)
Financial Impact and Funding for Insurance	26.88	Cost Increased but manageable	<div><div></div></div> 50%	13.44
Access to pharmaceuticals	3.35	More people have access than now	<div><div></div></div> 50%	1.68
Coverage for outpatient HC	13.71	Improvement over current	<div><div></div></div> 75%	10.28
Affordability: Economic burden for patients	10.55	Affordability for patients slightly improved	<div><div></div></div> 50%	5.27
Timely interventions: care when care is needed	4.83	Same as current	<div><div></div></div> 25%	1.21
Primary care utilization	4.02	Increased primary care utilization compared to now	<div><div></div></div> 50%	2.01
Solidarity for outpatient HC	8.11	Solidarity 20-40% of cost	<div><div></div></div> 25%	2.03
Equity	6.76	Limited improvement of HC equity	<div><div></div></div> 25%	1.69
Ease of transition	2.58	Some minor changes required	<div><div></div></div> 75%	1.94
Acceptability to stakeholders	19.20	Highly acceptable	<div><div></div></div> 75%	14.40
Overall score				53.946

Criterion	Weight of criterion	Option 2		
		Assessment	Attribute Score (%)	Weighted score (points)
Financial Impact and Funding for Insurance	26.88	Decreased cost to insurance, improved funding	<div><div></div></div> 100%	26.88
Access to pharmaceuticals	3.35	Greatly reduced barrier to access	<div><div></div></div> 75%	2.52
Coverage for outpatient HC	13.71	High degree of coverage for all	<div><div></div></div> 100%	13.71
Affordability: Economic burden for patients	10.55	Affordability for patients much improved	<div><div></div></div> 75%	7.91
Timely interventions: care when care is needed	4.83	Greatly improved	<div><div></div></div> 75%	3.62
Primary care utilization	4.02	Efficiently guide more orderly tiered system	<div><div></div></div> 75%	3.02
Solidarity for outpatient HC	8.11	Solidarity 60-80% of cost	<div><div></div></div> 75%	6.09
Equity	6.76	Much improvement of HC equity	<div><div></div></div> 50%	3.38
Ease of transition	2.58	High degree of system change	<div><div></div></div> 50%	1.29
Acceptability to stakeholders	19.20	Minor resistance expected from few stakeholders	<div><div></div></div> 50%	9.60
Overall score				78.013

This is the best Option

Table 4.  
Scoring of option 1 and option 2 in the MCDA model for the comparison of insurance models in China as rated by six test persons (four Chinese, two international).

improve the cross-rater understanding as a part of the implementation and training process and enhance the consistent use of the model over time.

Two raters proposed to reduce the numbers of criteria for some of the options, because it may be difficult to determine the exact response if the gradual differences between the possible answers become too small.

We would propose when applying this model to a decision problem the interrater variability should be monitored throughout the introduction phases. The results of these evaluations will help to improve the model over time.

## **4. Implementation process**

Before releasing the model to provincial insurers, further pilot testing would be recommended. Ideally, a selected group of insurance experts would be asked to use the model in the assessment of their own insurance options and, in parallel, the two “standard” options as described above.

After the evaluation, the pilot users should be interviewed for their experience in the process and suggestions for improvement. This feedback could be used for building a next version tool, which could then be presented to the State Medical Insurance Bureau and released to a broader user group. In addition, guidance and training material should be developed to support interrater consistency in the application of the model. Dissemination could happen via various channels such as the State Medical Insurance Bureau or presentations and workshops at provincial or national conferences where insurance policy experts come together.

As mentioned above, the use of the model should be accompanied by an ongoing collection for user feedback (e.g., in an online survey format) and regular revision of the tool for further adaptation to new application requirements.

## **5. Discussion**

### **5.1 Transferability within China**

At the end of the first workshop, participants found high value in the MCDA approach toward building a criteria-based decision tool. In particular, they appreciated the experience with the MCDA methodological approach which can be applied to decisions in technology assessment based on predefined requirements.

Yu et al. warned in a recent publication that “if supply-induced demand is not effectively controlled, a universal and uniform social health insurance may be more harmful than beneficial in China” [36]. By substituting the existing fee-for-service design with bundled provider payment policies, there can be more integrated approaches for smaller population groups that exist in China [37]. However, this is only possible, if allocation of funds for outpatient services is made by health-care decision-makers, guided by considerations of equity, access, and efficiency in public healthcare. Tools such as MCDA will improve transparency and consistency in health-care decision-making. Although the decision on the future UEBMI policy will be made on a provincial level, the evaluation tool will assist the decision-makers to go through a set of rational decision considerations (criteria) before selecting the most appropriate option. A consensus process, validated through a pilot testing phase, will provide a high level of legitimacy to the decision-making process.

UEBMI is the insurance system for urban employees. The other insurance options for urban residents (URBMI) or for rural citizens (NRCMS) could use similar tools for further developing their insurance options or to design a merged

insurance policy [38]. However, it should be noted that the three systems vary in terms of financing mechanisms, funding extent, and coverage policies and would require a full adaptation of the model. In addition, the stakeholders involved in the process might differ. For example, consumers or patients could be included as important stakeholders, because URBMI and NRCMS are voluntary systems and not mandatory by employment.

The described methodology could also be transferable to other types of decisions in China, such as which products should be listed or reimbursed, or which of the available alternatives should be purchased [30]. Such an application is presented in another chapter of this book at the example of purchasing off-patent pharmaceuticals in hospitals in Thailand [39]. However, successful adaptation of the methodology for each new type of application requires a thorough process described in **Figure 1** of this report, including preparation, involvement of the decision stakeholders, and phased implementation [33].

## 5.2 Country transferability

Many countries moving toward Universal Healthcare Coverage are building up their health-care systems and coverage policies. They will face similar decisions throughout this process. Although the instrument described here has been developed for the needs of the Chinese stakeholders in the context of the current insurance policies, the process and the principles can be transferred to other countries. This structured and transparent approach for planning and implementation can provide learnings for improvement of health-care insurance policies.

## 5.3 Key learnings, challenges, and limitations

By using a structured and previously validated process for developing a decision support tool [33], we were able to work with key stakeholders from several provinces in China during a 1-day workshop to apply the tool to a decision problem. The resulting MCDA spreadsheet model can be used by UEBMI insurance policy-makers in the provinces of China to compare new options of insurance policies.

A few key components in the process are essential for successful implementation. The most important is the engagement of the stakeholders impacted by the decision. Through the engagement of all stakeholders, a variety of factors can be considered and an open exchange is possible through a workshop format to incorporate all perspectives [40]. In addition, stakeholders, who are part of the “inner circle,” or the guiding coalition, can further to convey the momentum for change. This becomes of utmost importance once full implementation is realized [37, 40, 41]. In our example, the decision to limit the stakeholders to insurance experts and academic health policy leaders was purposeful to reflect the current decision-makers. However, a broader range of stakeholders may be involved in the testing phase of individuals’ provinces or countries.

Another key success factor is to clearly define the decision problem at the outset of the stakeholder collaboration. If there is a general agreement on the objective of the new policy, and on the criteria, which help to measure whether the objectives can be achieved, the MCDA tool offers an opportunity for increasing transparency of the decision process. Increased transparency may also contribute to a higher trust in the policies by the public in China [42].

The participants in the workshop cautioned that it may be necessary to adapt such a model in their respective provinces to address provincial health-care priorities, which may differ from province to province. A practical implication was use of the domains and criteria as a checklist for the design of new insurance policy options.

Finally, for the long-term success of any future policy change, measurement of outcomes is important. The criteria used in the selection process could become key performance indicators around population health and economics as used in other evaluations [2, 5, 43].

Some limitations or pitfalls of using MCDA as a decision support tool need to be considered. First, there is a risk of bias in the MCDA when the criteria overlap and therefore overemphasize certain aspects of the evaluation. In our example, the participants felt this to be the case with the two finance-related criteria which were originally proposed. They, therefore, decided to merge the two criteria into one. Second, the ranking and weighing methodologies can have a high impact on the “resolution” capability of the decision support tool. In this chapter, we have used a modified SMART approach to MCDA which has been recognized broadly as practicable [23, 39]. It should also be emphasized that decision-makers may be tempted to use the summary score as “the decision argument.” Instead, decision-makers should deliberate and compare the entire rating profile to confirm, that the instrument and the summary score have validity in the specific comparison. This will allow a more differentiated argumentation and documentation why a specific decision has been taken and which preventive measures should be taken to overcome the areas of weaknesses of the chosen option, which are those criteria, where it scored low.

There are also a few limitations to our proposed process. In our workshop, only a limited number of stakeholders were represented. Future programs should aim to achieve a good balance between all relevant stakeholders to maintain an active dialog during the workshop and manage the number of participants to avoid limitation of discussion. Preparation through stakeholder research, including mapping and assessment of appointments, is important to strike this balance.

Another limitation was the need to work with translators during the entire process, which was due to the international composition of the project management and moderating team. To minimize the risk for misunderstanding, the workshop was simultaneously translated and all materials, including the model, were available in both English and Chinese language.

## **6. Conclusions**

In this report, we have demonstrated how an internationally developed and validated process based on MCDA methods was adapted to decide which funding model should be selected for the future UEBMI insurance policy in the provinces of China. The processes included extensive stakeholder analysis and engagement as well as an interactive workshop for building consensus on objectives of the reforms, the criteria for success, and the measures for scoring such criteria.

The advantage of combining stakeholder driven cocreation with the principles of multicriteria decision analysis was to build a model with the input and final consensus of key stakeholders that still allows for local adaptation of criteria, weighing, and scoring. Using such a structured decision model fosters consistency and transparency across all decisions and allows for documentation of the decision process and evaluation of the impact.

We would like to end this report with a specific concluding comment of one of the workshop participants: “It is hard to predict the future; but using a rational method to approximate the future needs for insurance models will help me to convince my constituents.”

Conflict of interest

This initiative has been funded by Abbott Products Operations AG in Switzerland: DB received funding for moderating the workshop and for the travel expenses; APH received funding for planning and facilitating the workshop and for writing the manuscript. The open access fees for the book chapter were also paid by the company.

Abbreviations

HC	healthcare
HTA	health technology assessment
ISPOR	International Society of Pharmacoeconomics and Outcomes Research
MCDA	multicriteria decision analysis
MSA	medical saving accounts
NRCMS	new rural cooperative medical scheme
OPP	out-of-pocket costs
RMB	Renminbi, Yuán (currency of the People's Republic of China)
UEBMI	urban employee basic medical insurance
UMIS	universal medical insurance system
URBMI	urban resident basic medical insurance

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