Title: Developing attributes and attribute-levels for a discrete choice experiment on community preferences for micro health insurance: A qualitative study in rural Malawi

Authors: Gilbert Abotisem Abiiro\textsuperscript{1,2,*} (gilbert.abiiro@uni-heidelberg.de); Gerald Leppert\textsuperscript{1} (gerald.leppert@uni-heidelberg.de); Grace Bongololo Mbera\textsuperscript{3} (grace@reachtrust.org); Paul J Robyn\textsuperscript{1,4} (jakerobyn@gmail.com); Manuela De Allegri\textsuperscript{1} (manuela.de.allegri@urz.uni-heidelberg.de)

Authors’ institutional affiliation(s)

\textsuperscript{1}Institute of Public Health, University of Heidelberg, Germany.
\textsuperscript{2}Department of Planning and Management, University for Development Studies, Ghana
\textsuperscript{3}Research for Equity and Community Health Trust (REACH Trust), Malawi
\textsuperscript{4}The World Bank, Washington, D.C., USA

*Corresponding author: Gilbert Abotisem Abiiro, Institute of Public Health University of Heidelberg, INF 324, 69120, Heidelberg, Germany.

Email: gilbert.abiiro@uni-heidelberg.de. Tel: + 49 6221 35584
Abstract

Background: Discrete choice experiments (DCEs) are attribute-driven experimental techniques of eliciting stakeholders’ preferences to support the design and implementation of policy interventions. The validity of a DCE however depends on the appropriate specification of the attributes and their levels. There have been recent calls for greater rigor in implementing and reporting on the processes of developing attributes and attribute-levels for discrete choice experiments (DCEs). This paper responds to such calls by carefully reporting the systematic process of developing attributes and attribute-levels for the design of a DCE to elicit community preferences for micro health insurance in Malawi.

Methods: Conceptual attributes and attribute-levels were initially derived from a literature review which informed the design of qualitative data collection tools to identify context specific attributes and attribute-levels. Qualitative data was collected in August-September, 2012 from 12 focus group discussions with community residents and 8 in-depth interviews with health workers, both selected according to stratified purposive sampling. The material was tape-recorded, fully transcribed, and coded by three independent researchers. Attributes and relevant levels were identified through a three-step analytical approach.

Results: First, a consensus emerging from an individual level analysis identified 10 candidate attributes. Levels were assigned to all attributes based on data from transcripts and knowledge of the Malawian context derived from literature. Second, through further discussions with experts, four attributes were discarded based on a multiple criteria. The 6 remaining attributes were: premium level, unit of enrollment, management structure, health service benefit package, transportation coverage and copayment levels. A final step of revision and piloting confirmed that the retained attributes satisfied the credibility criteria of DCE attributes.

Conclusion: This transparent description of the attribute developments process of our DCE contributes empirical evidence to the limited methodological literature on this step in the DCE
development, thereby providing further empirical guidance for the design and implementation of DCEs, both within and beyond low- and middle-income countries.

**Key words:** Discrete choice experiment, attribute and attribute-levels development, qualitative study, micro health insurance, rural communities, Malawi

**Background**

There is a growing interest in discrete choice experiments (DCEs) as a means to elicit stakeholder preferences for healthcare interventions and policy reforms [1–3] to support the prioritization, design and implementation of such interventions [4,5]. In low-and middle-income countries (LMICs), particularly in Sub-Saharan Africa (SSA), this growing interest has yet to be matched by actual field applications [6], particularly in relation to healthcare financing reform options, such as health insurance. Previous DCEs within SSA have focused mainly on job preferences of health workers[7–10], hospital quality assessment [11], priority setting in resource allocation [12], and maternal health issues [13,14]. In general, only few DCEs, none of which in LMICs, have elicited community preferences for a health insurance product as an intervention in its entirety [15–22]. Specifically, the DCE methodology has not been used to elicit community preferences for micro health insurance (MHI), an innovative health insurance system which has received substantial attention in LMICs as a means of increasing access to care and securing better financial protection to low-income households working in the informal sector [23]. MHI is a private not-for-profit insurance system that relies mainly on the solidarity and risk pooling efforts of community residents or members of a socio-economic group or institution operating at the local level, charging premiums adjusted by average risk and often allowing for voluntary membership [24,25]. The need for a DCE to assist in configuring micro health insurance products within LMICs emanates from the absence of market for health insurance products in many of such
settings, making alternative product design and preference elicitation approaches that rely on market-oriented strategies less feasible in generating timely data to support the design and implementation of MHI interventions in such contexts [2].

In DCE, products or interventions are usually described by their characteristics, referred to as attributes, and each attribute is assigned a range of defined dimensions called attribute-levels [26]. The attributes of the interventions and their assigned levels are usually combined using experimental designs to produce a set of hypothetical choice alternatives [26]. Respondents are then presented with a sequence of two or more of these competing choice alternatives and are asked to choose which alternative they prefer [1,2]. The attribute-levels determine the utility respondents will attach to a particular characteristic of an intervention and hence their preferences [2].

Credible DCE attributes and attribute-levels must be consistent with the random utility theoretical foundation of DCE, policy relevant, and important to the study population [2,6,27]. DCE attributes must also be comprehensive, demand-driven, and measurable [2]. The attributes and their levels must be unambiguously framed, understandable to respondents [19], and appear both cognitively (perceptually) and statistically uncorrelated in the choice sets [28]. Additionally, the attribute-levels should be plausible given the study context [27], experimentally manipulable [28], and defined in a manner that gives room for trading between attribute-level alternatives [27]. This implies that the validity of a DCE largely depends on the researchers’ ability to appropriately specify attributes and their levels [6]. A misspecification of the attributes and attribute-levels has great negative implications for the design and implementation of DCEs and a risk of producing erroneous DCE results that can misinform policy implementation. To reduce the likelihood of researcher bias, attribute development has to be rigorous, systematic, and transparently reported [27].
Various methods have been applied to the development of DCE attributes. These include literature reviews, existing conceptual and policy relevant outcome measures, theoretical arguments, expert opinion review, professional recommendations, patient surveys, nominal group ranking techniques and qualitative research methods [2,27,29]. A recent review by Coast et al. [27] casts doubts on whether the process of attribute and attribute-levels development for DCEs is always rigorous, leading to the identification of credible attributes, given the brevity with which existing studies have reported on it. Acknowledging the limitations of deriving attributes from the literature, Coast et al. [27] argue that qualitative studies are best suited to derive attributes since they reflect the perspective and experiences of the potential beneficiaries. They insist on the need to accurately describe such qualitative studies, to allow the reader the possibility of judging the quality of the resulting DCE. There is, however, paucity of such descriptions in the existing literature, in high and low income countries alike [29,30].

Our study aimed at filling this gap by documenting the rigorous qualitative investigation informed by a literature review that was conducted to derive attributes and their levels for the design of a DCE to elicit community preferences for a MHI product in rural Malawi. The results from this study are intended to support the effective design and implementation of a potential MHI scheme within the study area.

**Methods**

**Study setting**
The study was conducted in the rural districts of Thyolo and Chiradzulu in Southern Malawi. Malawi is a low-income country in SSA with a population of about 15 million and a 2011 gross domestic product (GDP) per capita of US $900 [31]. The two districts include approximately 6.7% of the national population [32].

In Malawi, over 60% of all health services are provided by the government in public health facilities; 37% by the Christian Health Association of Malawi (CHAM); and the rest by individual private-for-profit health practitioners and traditional healers/herbalists [33]. In principle, healthcare is provided free of charge at point of use in public facilities (tax-funded) and subsidized in CHAM facilities, while private providers rely on user payments [34]. In practice, however, the provision of free healthcare is constrained by constant shortages of drugs and health personnel, poor infrastructure and equipment, resulting in poor quality, which is in turn reflected in poor health outcomes [34,35]. A considerable proportion of healthcare is still being financed through direct out-of-pocket payments [34].

The average total healthcare expenditure stands at US$ 34 per capita, equivalent to 11.7% of GDP [36]. There is no nationwide social health insurance scheme, and only very limited coverage of private and employer-based insurance schemes [33]. Due to inadequacies in the current tax-funded system and limited coverage of existing health insurance schemes, private not-for-profit institutions, such as microfinance institutions (MFIs), have expressed increasing interest in becoming active agents for the development of MHI with the aim of increasing social health protection for informal sector workers and rural populations.

The absence of evidence on community preferences for a MHI product within a predominantly tax-funded healthcare context like Malawi provided the rational for our study. The intention of the largest MFI in the country, the Malawian Union of Savings and Credit
Cooperatives (MUSCCO), to introduce MHI through its Bvumbwe Savings and Credit Cooperative (SACCO), in the southern region, provided the policy context for our study.

**Study design**

The overall DCE study adopts the instrument development variant of an exploratory sequential mixed methods design [37], in cognizance of the systematic stage wise nature of a DCE process [26]. In line with the methodological prescriptions of the exploratory mixed methods design, a qualitative design informed by an initial literature review was used in the first phase of the study to elicit the relevant attributes and attribute-levels to construct the DCE and an actual DCE was used to collect and analyze quantitative data in the second phase (see Figure 1 for illustration). This paper focuses exclusively on the first phase of the study, describing the qualitative component in detail.

**Initial literature review**

In line with recent methodological recommendations [6,27], the attribute development process began with a literature review aimed at identifying conceptual attributes relevant to a MHI product in the available published literature. PubMed, Google scholar, Science direct, EMBASE and Ebscohost databases were searched using as first level search terms: discrete choice experiment, conjoint analysis, best worst scaling, preferences elicitation, and design features/enrollment/retention/dropout, which were variously combined with second level search terms as: health insurance, health (care) financing, universal (health) coverage and Health Maintenance Organizations(HMOs). Only empirical papers or reviews, and theoretical/conceptual frameworks on healthcare financing systems and consumer choice behavior, published in English between 1980 and 2013 were considered. This paper does not discuss the detailed results from the literature review, but presents a summary of the conceptual attributes and attribute-levels which emerged from the extraction process, as only
those are relevant to the development of the qualitative data collection tools (Table 1). In the light of the specific circumstances of the Malawian context, the list of conceptual attributes was developed on the basis of four main inputs from the literature:

1. Kutzin’s framework which defines the four main components of any healthcare financing system as revenue collection, fund/risk pooling, service purchasing, and service provision [38];

2. Berki & Ashcraft’s) framework which identified direct insurance policy characteristics (benefit package, premium price and cost-sharing provisions such as deductibles, copayment, coinsurance and benefit ceilings) and delivery system characteristics (quality, spatial access, comprehensiveness and continuity) as the most important features that influence consumer choice when purchasing insurance [39];

3. Empirical literature on MHI product characteristics and their relationship to enrolment in MHI in SSA [23,24,40–43];

4. Attributes and attribute-levels used in previous DCEs on consumer preferences for health insurance [15–22].

According to Coast et al.[27], although easier to implement, identifying attributes and their levels exclusively on the basis of literature review may lead to the non-inclusion of some important attributes. In turn, this may lead to the formulation of less than optimal policy recommendations in a given context. This consideration compelled us to adopt the two-stage process of attribute-development [27] in which the (conceptual) attributes derived from the literature review were refined by the target population through the qualitative study (in this case the terminology used reflected local context) [6,27,30].

Qualitative field work
Study population and sampling: Qualitative data for attributes and attribute-levels development was collected in August/September 2012 using 12 FGDs with community members and 8 key informant interviews with health workers. Community residents (both MFI-members and non-MFI members) were included as potential target clients of the future MHI product in the concerned districts. Health workers were included as key informants because they observe the challenges communities currently face to access care. Triangulating community and providers’ views enhanced the study credibility. Since the study deals with a non-sensitive topic, FGDs were deemed appropriate for deriving attributes from community residents because of the potential of FGDs to yield large amounts of consensual information from a broad range of opinions on a specific topic over a relatively shorter period of time. Besides, it was relatively easier to organize community residents for FGDs than health workers who were scattered all over the study area and hence could only feasibly be studied through individual interviews. However, organizing FGDs required more resources and research expertise than that of interviews. In addition, there is always the risk that minority views might be compromised in FGDs.

Stratified purposive sampling was used to select both community residents and health workers and the overall sample size was determined by expected saturation point. For community residents, we applied purposive segmentation to achieve maximal variation taking into consideration possible diversity in opinions across geographic location, MFI membership status, and sex of community residents. First, five traditional authorities (TAs) were purposely sampled to ensure geographical spread across the two districts. Second, one rural community from each TA was selected relying on evidence of the presence of sufficient MFI members. Third, in each selected community, adult (18+) individuals were selected to participate in one of two FGDs, one including MFI members randomly selected from the MUSCCO-MFI membership list (with sex being held as sole purposive sampling criteria) and
one including non-MFI members sampled from the community. Men and women were separated in different groups. Since women are generally more involved as members in the local MFI than men are, a total of 7 women groups and 5 men groups were formed. Community leaders assisted to recruit 8 to 12 participants for each FGD.

Health workers from health facilities in the concerned areas were purposely selected to represent public, faith-based (CHAM), and private-for-profit providers. In each sampled facility, the most experienced (senior) health worker was selected for interview, resulting in a sample where almost all the 8 health workers were facility heads.

**Data collection**: The list of conceptual attributes developed on the basis of the existing literature served as the basis for the development of one single interview/discussion guide used to conduct all FGDs (see Appendix). The guide was adjusted to conduct the interviews with health workers. The use of a guide was necessitated by the limited familiarity of the concept of MHI among the study participants and hence a need to provide moderators/interviewers with a common instrument as a means of ensuring uniformity in the topics to be discussed across all groups. The interview/FGD guide was semi-structured around a list of open ended questions, including adequate probes. The guide comprised two main sections. The first section aimed at deriving attributes and hence it contained broad questions on: how participants experience the healthcare system and provision gaps; how participants would like a MHI scheme to be designed; the product attributes they would value as important when deciding whether to join or not; and the reasons motivating their responses. The second section aimed at deriving specific attribute-levels. Hence, using the comprehensive list of potentially relevant attributes as a guide (Table 1), participants were asked to identify probable options for each attribute.
All FGDs were conducted in the local language (Chichewa) by the two research assistants, one serving as facilitator and one as note-taker. Before the discussion, the facilitator provided respondents with a detailed explanation of the MHI concept, using as illustrations locally appropriate expressions and images (see Appendix). All FGDs were tape-recorded, transcribed, and translated into English for analysis. FGDs lasted on average 2 hours. All FGDs were conducted in secured enclosed places, such as schools or churches, free from external distraction.

All interviews with health workers were conducted in English directly by GAA, tape-recorded, and later transcribed. Each interview lasted between 45 minutes and one hour.

**Data analysis:** The analytical approach to identify attributes and attribute-levels included three steps.

Step one aimed at extracting the relevant information from the FGDs and the interview transcripts. To ensure inter-researcher reliability, analysis began with an independent reading, coding, and categorizing of the available material by three different analysts [45]. GAA analyzed the entire material using the computer assisted qualitative data analysis software NVivo. He relied on a pre-established coding scheme developed on the basis of the interview guide and the attributes identified in the literature, but allowed for new codes and categories to emerge as he proceeded through the reading. MDA and GBM manually analyzed two-thirds of the material. They approached the material inductively, letting codes and categories emerge as they worked their way through the transcripts. At a later stage, the three analysts compared the results of their analysis to obtain one single list of all elements identified by community and by providers as attributes and relevant levels. Discrepancies in interpretation were reconciled by returning to the text, “questioning” the transcribed material to identify which elements really reflected an attribute and which ones did not.
Step two aimed at reducing the attributes to a number manageable within a DCE by discussing the list of attributes compiled by the three main analysts with two sets of “informed people purposefully selected based on their experience with the DCE methodology. These discussions, served the purpose of ensuring that the selected attributes were consistent with the methodological postulations of DCE. The list was also discussed in a group setting with five researchers familiar with Malawi and with MHI. This was to ensure that the selected constructs appeared credible and realistic in the Malawian context, but also adequate to answer important pending research questions on community preferences for MHI in SSA.

Step three gathered the research team, to revise the list of attributes in the light of the feedback received during step two. This last step allowed for one last collective credibility and reality check on the list of retained attributes and levels. A pilot study of the overall DCE with 49 respondents enabled the assessment of the clarity of the wording, appropriateness of defined levels and local translations, and comprehensibility of attributes and levels within the choice sets [6]. A focus group discussion with the four research assistants who administered the pilot study on their experiences, observations and remarks made by respondents during the pilot enabled the confirmation and validation of the framing of the final attributes and attribute-levels.

Results

Step one: Qualitative analysis of the transcribed material and initial attribute identification

Table 2 displays the complete list of all attributes and attribute-levels identified by consensus among the three analysts during the initial triangulation process. They include: premium level, premium collection modalities, premium structure, unit of enrolment, geographical level of pooling, management structure, health services benefit package, transportation coverage,
copayment levels, and provider network (i.e. the type of health facilities to be contracted by the MHI).

Attribute-levels were extracted directly from the transcripts, as illustrated by the relevant citations (Table 2). Only the three most relevant attribute-levels were defined for each attribute to ensure design simplicity and easy recognition by respondents [6]. Only two attributes, premium level and health service benefit package deserve further explanation.

In line with existing methodological recommendations [28], levels for the premium were set to reflect the complete range of amounts mentioned in the FGDs, the assumption being that the later DCE should elicit a realistic marginal willingness-to-pay (WTP) value, rather than reflecting the actual cost of the MHI product (which needs to be subsidized in any case). Levels for the health service benefit package were derived by combining the single services mentioned during the FGDs (drugs, laboratory tests, surgery) into meaningful incremental clusters. Only services for which people identified a current lack of coverage through public provision were included in the benefit package. Services, such as maternity care, mentioned as important, but recognized as adequately provided by governmental facilities, were excluded from the benefit package, the rationale being that MHI will be set to fill gaps in coverage and not to substitute existing public service provision [23].

**Step two: Selecting relevant attributes in the light of experts’ feedback**

The iterative process of discussion with additional scientists led to the retention of 6 out of the initial 10 attributes identified in the qualitative material. The discussion was oriented to limit the number of attributes to between 4 and 8, to later allow the DCE to contain a manageable number of alternatives that will not overwhelm respondents [1]. The last column of Table 2 indicates whether an attribute identified during step one was retained in step two. The discussion with additional scientists also allowed to redefine the language used to describe
both the attributes and the relevant levels, often requiring that the core analytical team returned to the original text to identify the specific terminology used by the community. This was meant to ensure consistency with the Malawian context.

Multiple criteria guided the choice of attributes to be dropped. First, attributes and/or levels that overarched/overlapped other attributes were discarded in order to avoid cognitive inter-attribute correlation [28]. For instance, pooling levels overlapped management structure since both had a geographical dimension; or preferences for premium collection modalities will depend on the premium amount – see Table 2. Second, attributes for which clear preference was established in the FGDs for certain levels were dropped to avoid dominance. There was clear preference for: private-for-profit and CHAM facilities (as a proxy for quality of care); fixed rate premium payments; and pooling at the community level. Finally, attributes were dropped if in the FGDs, they had been identified as elements of secondary importance, such as pooling level, which entered the discussions only after persistent probing. However, fixed levels were defined for all discarded attributes as part of the introduction to the choice exercise. This reduces the tendency of respondents inferring levels for such attributes which can potentially introduce unobservable biases into the final DCE estimates [44].

Step three: Final attribute selection and revision in the light of results from the pilot study

After the reduction and revision process of step two had taken place, the research team discussed once again the relevance of the selected items, their feasibility, and comprehensibility in the local context. Only minor changes in terminology were applied to the attribute levels. This core team agreed that all attributes and levels selected during step two satisfied the essential characteristics of a DCE attribute, i.e., they reflected the characteristics of a MHI product deemed important by the community; were understandable; and mutually exclusive in nature [27], and retained them for the final DCE.
An analysis of the final DCE pilot results confirmed the theoretical validity of the defined attributes and levels since all had the correct expected signs though only few were significant, probably due to insufficient sample size ($n=49$). The pilot indicated no cognitive difficulties in identifying and understanding the attributes and their levels.

**Discussion**

This paper contributes to the literature on DCE attribute and attribute-level development [29,30], by explicitly reporting on the qualitative study component aimed at deriving attributes and attribute-levels for a DCE to identify preferences for a MHI product in Malawi. This study built on the initial identification of conceptual attributes from the literature to develop a detailed interview/discussion guide used to gather primary data at the community level in a systematic manner. A rigorous analytical process, characterized by three sequential steps, allowed for the identification of relevant attributes and their levels.

Basing the interview guide on the results of the initial literature review, spanning from conceptual to applied studies, allowed the research team to identify a preliminary broad series of attributes and attribute-levels that reflected all possible important components of a MHI product. Not limiting work to the literature review, but directly engaging with communities and health workers allowed the research team to work through this initial conceptual and very comprehensive list to select context specific attributes that were understandable and important in the eyes of the potential beneficiaries of the insurance scheme [27]. The citations that accompany the attributes and the relevant levels in Table 2 offer a clear indication of how decisions on attribute and levels selection were rooted in the voices of the potential beneficiaries. The qualitative process also provided a clear understanding of the likely order of preferences (most to least preferred) for the various attributes levels. This enabled the
design of DCE packages to actually compel respondents to make trade-offs in their choices [27].

This initial qualitative phase which included an attribute validation pilot study also offered the research team the added benefit of framing the final DCE choice sets in line with local concepts and terminology. This has the potential of maximizing respondent’s efficiency in our DCE, thereby enhancing the content validity of the study [1,2,6]. The qualitative process also offered the opportunity to identify and exclude attributes and levels that are potentially dominant, less tradable, less important, and perceptually correlated, from the choice sets, in order to fully satisfy the credibility criteria of DCE attributes and levels [2,27,28].

Four of the final attributes derived: premium level, management structure, health service benefit package, and copayment levels reflect what had been used in prior DCEs exploring preferences for insurance products in high income settings [15–22]. However, unit of enrollment as defined in our study and transportation coverage would not have been included had we relied on only the literature review. This supports the relevance of conducting qualitative studies to enhance the contextual appropriateness of DCE attributes and levels development [6,27,44].

Coast et al [27] argue that an iterative constant comparative approach to data collection and analysis is generally preferable for attribute derivation, because of its ability to constantly adopt the research questions in the light of emerging findings. Within the particular context of our study, however, such an approach would have not been feasible for a number of reasons. Geographical distance between the research team and the concerned communities as well as obvious language barriers made it impossible for the researchers themselves to engage in a constant iterative process during all phases of data collection and analysis. Feasibility concerns dictated the organization of the data collection and analysis phases. An iterative
constant comparative approach, however, was applied within an analytical process, supported also by the rigorous application of the triangulation principle in various phases of the analysis. Had the analysis revealed that saturation had not been reached, however, the research team would have returned to the field to gather more data [45]. The experience reported in this paper indicates that in the light of feasibility constraints of adopting a fully iterative approach to data collection and analysis, other rigorous qualitative approaches can yield equally relevant results for the development of credible attributes and attribute-levels.

Most prior qualitative studies aimed at deriving attributes were conducted among people who had experienced the phenomenon under consideration [18,30]. The limited exposure of our participants to health insurance schemes represented a major challenge. It compelled us to seek out innovative ways of explaining the concept of MHI using appropriate local images and diagrams, adjusting MHI social marketing concepts and illustrations from other SSA settings to fit local socio-cultural constructs (see Appendix ) [23]. The concern that the original framing of the FGDs might have influenced the participants’ responses, however, was dissipated by the fact that findings from the individual interviews with health providers largely confirmed findings from the FGDs. Since MHI represents one of the many financing options being discussed at a higher policy level, health workers, unlike communities, had already been exposed to the concept at the time of the study and could have not been influenced by our framing.

From the experience of this team, the analysis of the data generated from this type of qualitative studies is often not without challenges. This is because while qualitative studies often generate large volumes of data, attribute development only requires little information on what community members see as important attributes and levels. Given the amount of time and resources that is often spent to collect the data, there is often the tendency that the researcher could develop the impression that not all the data such as the detailed illuminations
and explanations of points provided by the study subjects during the FGDS and interviews has been adequately used. Besides, it is a common tradition in public health that scholars cherish results that are statistically representative of the study subjects [27]. A qualitative study is not always able to generate this “representative” information since such studies aim at illuminating complexities and revealing similarities and differences instead of counting opinions [45]. Selecting attributes and levels based only on qualitative studies like in our case could therefore attract criticisms from quantitative biased researchers who may argue that at least basic quantitative tools such as best-worst scaling and nominal group ranking techniques should be included within the qualitative approach in selecting attributes [29]. It could therefore be a good idea to use such simple quantitative tools after the rigorous qualitative exercise to support the scaling down of the potentially numerous attributes and levels that will be generated from the qualitative study to a number manageable within the DCE. In this case, it must still be guaranteed that the final attributes and levels selected are capable of being used within the DCE and this would still require qualitative reasoning and deductions.

**Conclusion**

This study complements existing literature on DCE attribute development by providing a detailed account of the scrupulous application of recently recommended approaches to attribute and attribute-level development and reporting [6,27]. Our applied approach is based on the adoption of literature as the starting point to inform comprehensive field qualitative data collection, followed by a rigorous analytical approach, based on a series of triangulation and validation exercises. As such, our study provides additional empirical guidance for the methodological design and implementation of DCEs both within and beyond LMICs. A transparent description of the attribute development process of DCEs provides useful grounds for the assessment of the rigor of this process in DCEs [27], and hence should receive more attention in future DCE studies. The potential of DCEs to support the design and
implementation of interventions therefore largely depend on the credibility of the attributes and attribute-levels used in the experimental design.

**Ethical approvals**

Ethical approval for the study was obtained from the Ethical Commission of the Faculty of Medicine of the University of Heidelberg in Germany and by the National Health Science Research Committee (NHSRC) in Malawi. Permission was also obtained from the district commissioners, the district medical officers, and the local authorities of the concerned communities before commencement of data collection. Written informed consent was obtained from all study participants.

**List of abbreviations used**

CHAM…. Christian Health Association of Malawi

DCE….. Discrete choice experiment

FGD….. Focus Group Discussion

GDP… Gross Domestic Product

HMO…. Health Maintenance Organization

LMICs….Low – and Middle-income countries
MFI….Micro finance Institution

MHI…Micro Health Insurance

NHSRC….. National Health Science Research Committee

MUSCCO… Malawi Union of Savings and Credit Cooperatives

SACCO…. Savings and Credit Cooperatives

SSA… Sub-Saharan Africa

TAs…. Traditional Authorities

US… United States

WTP…Willingness to pay

**Competing interests**

We declare that we have no competing interests

**Authors’ contribution**
GAA, GL and MDA conceptualized and designed the study and its data collection tools. GBM supported the design of the data collection tools. GAA administered and transcribed the interviews with health care workers, and supervised the data collection. GBM supervised the transcription of the FGDS. All authors participated in the data analysis. GAA wrote the first draft of the manuscript. GBM, PJR, GL and MDA revised the draft. All authors read and approved the final manuscript.

**Acknowledgement**

This study was supported by the German Research Society (DFG). We would like to thank Assistant Professor Aleksandra Torbica, Bocconi University; Dr. Nasir Umar, London School of Hygiene and Tropical Medicine; Dr. Aurelia Souares, and the Health Financing Group of the Institute of Public Health, University of Heidelberg for their scientific support in the design and implementation of the study. We are also grateful to the staff and field research assistants of Reach Trust, Malawi, in particular Mr. Helecks Mtengo and Mrs. Miriam Matengula, for their support during data collection.

**References**


15. Akaah IP, Becherer RC. Integrating a consumer orientation into the planning of HMO programs: an application of conjoint segmentation. *J Health Care Mark.* 1982, **3:**9–18.


21. Vroomen JM, Zweifel P. Preferences for health insurance and health status: does it matter whether you are Dutch or German? *Eur J Health Econ HEPAC Health Econ Prev Care.* 2011, **12**:87–95.


43. Twikirize JM, O’Brien C. Why Ugandan rural households are opting to pay community health insurance rather than use the free healthcare services. *Int J Soc Welf.* 2012, **21**:66–78.


**Additional Material (Appendix): Data collection instruments**
Figure 1: The mixed methods design of the DCE
### Tables and Captions

**Table 1: Conceptual attributes and potential levels compiled from literature (adopted to the Malawian context)**

<table>
<thead>
<tr>
<th>Functions [38]</th>
<th>Based on the frameworks of Kutzin [38], Berki and Ashcraft [39], literature on MHI enrollment in SSA and DCE</th>
<th>Policy Attribute</th>
<th>Plausible levels definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue mobilisation</td>
<td>Who pays the premium</td>
<td>Household members, employers [22], Government</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unit of charging premium</td>
<td>Individual, household [18], full family [15,19]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structure of premium</td>
<td>• Flat rate [15,19]</td>
<td>• Differential based on: income, employment, age, urban-rural</td>
</tr>
<tr>
<td></td>
<td>Premium price (level)</td>
<td>• Based on real cost of healthcare</td>
<td>• Based proposed/existing insurance premiums [15,21,22]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• based on WTP or qualitative studies [17–19]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forms of premium payment</td>
<td>• Cash [15–19,21,22]</td>
<td>• Material (farm produce) or both</td>
</tr>
<tr>
<td></td>
<td>Premium payment mechanisms</td>
<td>• Deduction from bank or payroll, institutional membership (MFI) account, salary</td>
<td>• paying through community agents</td>
</tr>
</tbody>
</table>
| Premium collection modalities | • Paying directly to insurance office  
| • Pay during wet, dry or all seasons  
| • Pay weekly, two-weekly [18], monthly [15], yearly [21], installment  
| **Fund and risk pooling** | **Unit of enrolment** | Individuals [18], households, families [15], microfinance institutional or occupational groups  
| **Dependents eligibility** | None, plus spouse, plus spouse and children [15]  
| **Extent of pooling** | Family/kin, community, Institutional(MFI) level, district, region, nation  
| **Nature of cross-subsidization** | • None  
| | • Based on income, employment, risk or geographical location status  
| | • Exemptions for poor and indigents  
| **Pooled fund Management and administration** | Who manages the pooled funds | • Names of insurance provider [18,19]  
| | • Community committees,  
| | • Microfinance Institutions,  
| | • NGOs, Health providers, Governmental organization  
| Quality of customer services | Good, bad [17]  
<p>|</p>
<table>
<thead>
<tr>
<th>Services purchasing</th>
<th>Benefit package</th>
<th>Comprehensive, medium, basic packages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low cost vs. high cost events</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low risk vs. high risk events</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequently occurring or rare events</td>
</tr>
<tr>
<td>a. Specific services coverage</td>
<td>Hospitalization due to medical treatment or surgery [18]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical Consultation (by phone) [18]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pharmaceuticals/drugs prescribed [17–19]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preventive care, wellness and education [19]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vision and hearing care [18,19]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergency services [18]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mental health services [18,19]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dental services [18,19]</td>
<td></td>
</tr>
</tbody>
</table>

| Enrollment procedure (paper work involved) | • No forms to complete, few forms, lots of forms [18] |

<p>| Insurance information communication | Not provided, weekly, monthly [18], yearly |</p>
<table>
<thead>
<tr>
<th>b. Cost sharing arrangements</th>
<th>Coverage ceiling (maximum liability) [20]</th>
<th>benefits within specific facilities, communities, district, national, international</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-payments levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Co-payments levels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Flat rate [15,22]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A percentage of cost (10%, 25%, 50%) [18,19]</td>
<td></td>
</tr>
<tr>
<td>Deductibles [16,20]</td>
<td>• Out-of-pocket payment for first visit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Insurance pays only at a certain quantum of cost</td>
<td></td>
</tr>
<tr>
<td>Benefit delivery</td>
<td>Cash less and re-imbursement</td>
<td></td>
</tr>
<tr>
<td><strong>Provision</strong></td>
<td><strong>Type of providers</strong></td>
<td><strong>Public, private, faith-based or all</strong></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Choice of provider (facility)</td>
<td>Choose any [19], limited to some, limited to one in the community [18]. gatekeeper model</td>
<td></td>
</tr>
<tr>
<td>Location of contracted provider</td>
<td>• Defined in terms of distance from home or average travelling time to provider [15,18]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Defined setting: urban, rural</td>
<td></td>
</tr>
<tr>
<td>Quality of care</td>
<td>• Bad, moderate, good, very good, excellent [17–19]</td>
<td></td>
</tr>
<tr>
<td>Reputation of affiliated providers</td>
<td>Outstanding, average, below average [15]</td>
<td></td>
</tr>
<tr>
<td>Waiting time for care</td>
<td>Defined in times of hours and minutes [18,21]</td>
<td></td>
</tr>
<tr>
<td>Opening hours of health facility</td>
<td>Only week days, weekend as well, nights and 24 hours [18]</td>
<td></td>
</tr>
<tr>
<td>Availability of providers</td>
<td>Yes/no [15]</td>
<td></td>
</tr>
<tr>
<td>Involvement in treatment decision making</td>
<td>Yes/no [17]</td>
<td></td>
</tr>
<tr>
<td>Attribute label</td>
<td>Lay terminology</td>
<td>Key quotations from qualitative data (mostly FGDs)</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------</td>
<td>-------------------------------------------------</td>
</tr>
</tbody>
</table>
| Unit of enrollment | How many family members will benefit from enrollment into the MHI scheme | • *If everybody in my family will benefit from this basket… it will be a good idea, … but if I am the only person to benefit since I will be the one contributing into the basket, then it is not a good idea since I will still be paying hospital bills for my dependents*” (Non-SACCO men)  
• *The head of the family should pay on behalf of the whole family* (SACCO women)  
• *If it offers a package covering them and their children, they will be more than happy to go for it*” (Health worker at district hospital) | • Entire extended family  
• Core nuclear family  
• Individual | Yes |
| Management | The managers of the common basket | • *Sometimes, just seeing the leaders who are managing this thing can make one to join or not* (SACCO men)  
• *There should be an elected committee to run the basket and trusted people* (SACCO women) | • Community committee  
• An external NGO  
• Byumbwe SACCO | Yes |
| Health service benefit package | The health services that the MHI will pay for | • *I will be happy if this basket is managed by the community for easy monitoring and accessibility* (Non-SACCO men)  
• *If the basket can be managed by the NGOs it can be a good thing because if it is managed by people of this community…. if they buy chicken with their own money, people might think that they are misusing the money from the basket* (Non-SACCO men)  
• *There are some drugs which cannot be found at public hospitals except private hospitals, so this basket should cover these situations (-non-SACCO men).*  
• *(It should cover) x-ray and drugs, no more things (services) because we can’t manage to pay* (Non-SACCO men)  
• *We have all agreed that medicine should be included in this basket (SACCO women).*  
• *They have to be sure that once they are putting money into this insurance, they are going to be covered properly* (health worker at private clinic) | • *Comprehensive:*  
Drugs, lab test/x-ray, and surgical operations  
• *Medium:* Drugs, lab tests/x-rays  
• *Basic:* Drugs only | Yes |
<table>
<thead>
<tr>
<th>Copayment</th>
<th>The proportion of health service bill that a MHI member is expected to pay out-of-pocket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• The basket should be assisting with half of the bill not the whole bill (SACCO women)</td>
</tr>
<tr>
<td></td>
<td>• It can happen that you are sick but you don’t have a single coin … the committee is telling you, you will only get 50% of your charge from the basket the other half will be paid by yourself… it will mean the basket will be of no use (Non-SACCO men)</td>
</tr>
<tr>
<td></td>
<td>• 25% (from the patient) is fair ….. because we should think of others who will also need the basket (non-SACCO men)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• I will join …… if I fall sick and this basket will cover transport to the hospital (SACCO Men).</td>
</tr>
<tr>
<td></td>
<td>• Private hospitals are very far from here so we need transport from this community to these private hospitals (SACCO women)</td>
</tr>
<tr>
<td></td>
<td>• Transport, because we have problems mainly in times of referral to Thyolo hospital (district hospital) (Non-SACCO Men)</td>
</tr>
<tr>
<td></td>
<td>• If they package involves offering transport to people from wherever they are to here, they will be more than happy to join (health</td>
</tr>
</tbody>
</table>

| None | 25% (quarter) | 50% (half) |

| Always from home to the health facility any time sick |
| Only during referral and emergencies |
| none |

| Yes |
| Premium per person per month | Membership contributions | • If the contributions will be unaffordable then I cannot join (SACCO women)  
• The amount of money to be contributed whether is it monthly or how often (health worker private clinic) | • MWK100  
• MWK300  
• MWK500 | Yes |
| Premium payment modalities | Frequency of premium contribution | • Here, most of us find money on a seasonal basis, so I think it would be ideal if we contribute at the beginning of each and every year (SACCO women)  
• Monthly contribution will help to have more money in the basket than annually (non-SACCO men). | • Once-off annual payment  
• Monthly payment | No |
| Provider network | Contracted healthcare facilities for service provision by | • When a person falls sick and goes to private hospital, he should use the money from the basket to settle the bills because there is a difference between public and private hospitals in terms of treatment (non-Sacco men)  
• They will like to go to private facilities (Health worker, public facility) | • Private –for-profit  
• Faith-based (CHAM) facilities  
• Public health facilities | No |
<table>
<thead>
<tr>
<th>Pooling level</th>
<th>Extent of geographical pooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Each and every village has to have their own basket (Women non-SACCO)</td>
</tr>
<tr>
<td></td>
<td>• I cannot be happy with district level (Men non-SACCO FGD)... there will be no trust and some will benefit from it while others will not benefit ....... unless it is at district level and managed by NGOs (Non SACCO men-)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Premium structure</th>
<th>Extent of dependency of contributions on an earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• It should be one figure because everyone whether one earns more or less can fall sick so it should be one figure (Men SACCO FGD).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community level</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Community level</td>
</tr>
<tr>
<td>• Traditional Authority</td>
</tr>
<tr>
<td>• District</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Premium structure</th>
<th>Extent of dependency of contributions on an earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Flat rate contributions</td>
</tr>
<tr>
<td></td>
<td>• Contributions based on earnings</td>
</tr>
</tbody>
</table>

| No | No |
Additional files provided with this submission:

Additional file 1: Appendix_FGD_interview guide.doc, 144K