Eliciting Preferences for Micro Health Insurance in Rural Cambodia:
A Discrete Choice Experiment

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Abstract

The objective of our study is to evaluate the demand for different attributes of micro health insurance (MHI) and identify which MHI is more acceptable in Cambodia, where 40% of the population is relatively poor and not covered under any health insurance scheme. To that end, we estimate the "willingness-to-pay" (WTP) for the different attributes, by employing the Discrete Choice Experiments.

To pinpoint alternative MHI schemes that might induce customers to purchase insurance, we designed alternative attributes that include treatment of chronic diseases and dental surgery and glasses, treatment in private clinics, and an improved management and monitoring system. We then evaluated the WTP for these improved attributes of the MHI scheme by applying mixed logit model, and examined the cost performance of the scheme.

The results suggest that if we add the services in national hospital, and private clinic, the services for chronic diseases, dental surgery and glasses, and the improvement of meeting & monitoring methods to the previous MHI scheme, WTP of potential insurance customers is over the costs. This implies that the new MHI scheme can be accepted by the potential purchasers and the take-up rate may increase.

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1. Introduction

Poor households in developing countries often suffer from ill health and injuries, which can become a considerable economic expense for them. To alleviate this impact and complement existing informal risk-coping mechanisms, various types of community-based health insurance (CBHI) programs have been introduced. However, generally, the take-up rates for these programs have been low and even declining in some countries, although the potential demand for micro health insurance should be high due to a worldwide expected increase in the relatively poor population who are vulnerable to unexpected health shocks (De Janvry and Sadoulet, 2016). To grow the number of customers who purchase micro health insurance (hereafter MHI), we need to investigate not only the reasons behind the low take-up rate, but, given the existing CBHI scheme, also examine what alternative insurance schemes could induce more customers to purchase MHI.

A growing body of literature has investigated the reasons behind the low take-up rate. However, regarding alternative MHI, few studies have investigated whether any alternative insurance schemes could induce potential customers to buy insurance (Nostratnejad *et al.,* 2016; Khan, 2013; Mulupi *et al.,* 2013; Harms, 2011). Among those, some are qualitative studies which do not facilitate analytical investigation. Others include approaches where respondents choose new insurance schemes altogether rather than augmented ones. Such methods do not enable a detailed analysis of the tradeoffs respondents make between insurance attributes.

To rigorously analyze tradeoffs, discrete choice experiments (DCEs) are widely used as helpful methods in the field of healthcare preference studies (De Bekker-Grob *et al.,* 2012; Clark *et al.,* 2014).

Limited studies have applied DCEs to analyze the choices among alternative micro health insurance schemes. Abiiro *et al.* (2016) and Obse *et al.* (2016) apply discrete choice models for rigorous quantitative analysis of alternative MHI schemes in Malawi and Ethiopia, respectively, accounting for the tradeoffs among the attributes of the insurance schemes.

However, the heterogeneity of consumer preferences affects the purchase decision as suggested by Adebayo *et al.* (2015). As a result, in consumer preference research, handling the heterogeneity of preferences is crucial (Swallow *et al.,* 1994) ; therefore, the heterogeneity of consumer preferences for MHI should be taken into consideration as well. Regarding this point, Abiiro *et al.*'s (2016) study is the only one that investigates the heterogeneity among socio-demographic characteristics that determine the preference for one of two types of MHI by using DCE and mixed logit models.

The objective of our study is to evaluate the demand for different attributes of micro insurance and identify which MHI is more acceptable in Cambodian where 40% of the population is relatively poor and not covered under any health insurance scheme (Cambodian Ministry of Health, 2016). To that end, we estimate the "willingness-to-pay" (WTP) for different attributes, employing the DCE.

In Cambodia, MHI has been available to poor households since 1998. At the initial stage, it was only the voluntary type which had been funded and assisted by donors. Since 2000, the Cambodia Health Equity Fund (HEF) for the population under the poverty line was started, receiving financial support by donors. Under HEF, the poor can get free medical services. After 2008, HEF has been funded by government. Around this time, foreign donors have withdrawn from MHI projects and the operation of HEF for the poor and voluntary MHI for the relatively poor had been transferred to local NGOs until 2017 when the Cambodian government has stopped providing subsidies to nongovernmental organizations (NGOs) that have operated HEF and voluntary MHI programs because of the low take-up rate since 2017. Therefore, after 2018, NGOs have ceased the operation of MHI programs due to lack of fund.

The standard MHI in Cambodia today consists of six attributes: benefit package coverage, the service providers, the management system, participation by the non-poor and discounting, the contract term, and timing. Notably, treatment of chronic diseases and dental care have been excluded generally from the benefit package, even though the demand for such treatments is strong (Bigdeli *et al.,* 2016). In addition, although the potential patients trust private medical providers (Ozawa and Walker, 2011), private

clinics have not been included among the service providers. Further, existing MHI programs have had problems with the unfair treatment of the insured by doctors and nurses in public hospitals, and with explanations that should have assisted potential purchasers in fully understanding the insurance[1)] . Therefore, if the six attributes are improved, MHI could potentially attract more insurance purchasers.

To pinpoint alternative MHI schemes that might induce customers to purchase insurance, we designed alternative attributes that include the treatment of chronic diseases and dental care, treatment in private clinics, and an improved management system. We then evaluated the WTP for these improved attributes of the MHI scheme by applying mixed logit model, and examined the cost performance of the scheme.

The rest of this article is organized as follows. Section 2 describes our data collection method. Section 3 discusses our results. Finally, Section 4 presents a discussion of feasibility and policy implications.

2. Methodology

2.1 Data collection

We selected the Angkor Chum District of Siam Reap Province, Cambodia where 35,000 households had participated in CBHI program, as the study area.

We conducted a field survey in September 2019 in 12 villages from three communes in this district. We selected the communes by using stratified random sampling where the MHI was available. Then, we randomly selected 257 sample households from the lists of village households from the village chiefs. In our analysis, we used data from the 255 households with complete information.

The descriptive statistics of sample households characteristics is shown in Table 1.

1）According to interviews with MHI NGOs, changes in the premium discount system, contract term, and the timing of the contract may have affected take-up rates（Yagura, 2014）.

Table 1. Household and Individual Characteristics of Sample Households

Characteristics	Mean	SD
Age of Household Head（years）	45.6	12.1
Educational Years of Household Heads（years）	2.2	2.8
Remittances（USD）	213.6	575
Number of Family Members（persons）	4.4	1.6
Number of Family Laborers（persons）	2.5	1.3
Number of Family Members under 5（persons）	0.5	0.7
Owned Land Area（m2）	20,206.7	35,987.5
Estimate Valus of Total Asset excluding land（USD）	10,661.2	12,225.8
Outstanding Loan（USD）	2,052.7	5,866.6
Experience of MHI purchase（=1, if purchased）	0.19	
ID Poor or not（=1, if ID Poor）	0.24	
Obs.	255	

Sources: The authors' socio-demographic survey.

2.2 Experimental design

To evaluate the preferences for different insurance scenarios, we applied the DCE, using questionnaire surveys with hypothetical choice situations to analyze preferences for alternative insurance contracts. Here, we used a table with six alternative insurance contract scenarios and asked the respondents to choose the insurance contract they preferred. In DCE studies, the appropriate selection of the attributes and their levels that create these hypothetical scenarios is important. The alternative scenarios had different combinations of attributes. Based on the information derived from the literature (Bigdeli *et al.,* 2016; Ozawa and Walker, 2011; Yagura, 2014), we selected the following six attributes: per capita premium, medical service providers, exclusion of benefit, management system, and coverage (outpatient, inpatient, drugs, tests). Each of the attributes has two to four levels. The definitions are detailed in Table 2. We created a D-optimal design of a linear model using a package in STATA (Hole, 2015).

In the questionnaire, we presented the respondents with a choice set (profile) with two scenarios and asked them to select the most preferable one. Using random number table selection, the two scenarios were chosen from 24 profiles including the current

Table 2. Alternative Micro-insurance Scheme

Attribute	Level	Definition
Premium:	1	1-person family: 1,000 riels/family/month
	2	1-person family: 4,000 riels/family/month
	3	1-person family: 7,000 riels/family/month
	4	1-person family: 10,000 riels/family/month
Providers:	1	RH（District Hospital),PH（Provincial Hospital),and HC（Health Center）
	2	1+National Hospital
	3	1+Local Private Clinic
	4	1+National Hospital+ Local Private Clinic
Excluding:	1	Chronic Diseases, Dental Surgery, and Glasses
	2	Chronic Diseases
	3	Dental Surgery & Eye Glasses
	4	None
Managemen	1	Pre-existing system
	2	Current system + Doctors & Nurses join the meetings to explain MHI scheme
	3	Current system + Doctors & Nurses join the meetings to explain MHI scheme +Monitoring medical service providers by NGO staff
Covering		
Out-patient	1	90%
2	2	100%
In-patient	1	90%
	2	100%
Drugs	1	90%
2	2	100%
Tests	1	90%
1	2	100%

Note:
Chronic: Chronic diseases, Dental: Dental care & Eye glasses
DH: District hospital, PH: Provincial hospital, NH: National hospital, PC: Private clinic
Default: Existing management system
Meeting: Doctors & nurses participate in explanatory meeting
Monitoring: Monitoring the behaviors of doctors & nurses by NGO staffs
Outpatient: outpatient services
Inpatient: inpatient services
Drugs: Prescription drugs
Tests: Laboratory tests & diagnostics:

insurance profile. Thus, we created six profiles per respondent and randomly presented these to the respondents（Table 3）. The respondents who did not have any preferable choice set had an opt-out option.

Table 3. Example of Profiles for DCE

Q1.

Attributes	Premiums	Exclusion	Provider	Manage-ment	Coverage Outpatient	Inpatient	Drugs	Tests
Insurance A	10,000	Chronic	PC	Meeting	100%	100%	100%	90%
Insurance B	1,000	All	Default	Monitoring	90%	90%	90%	100%
Insurance C				Not buy				
Which insurance do you choose?								

Q2.

Attributes	Premiums	Exclusion	Provider	Manage-ment	Coverage Outpatient	Inpatient	Drugs	Tests
Insurance A	1,000	Default	PC	Meeting	90%	90%	100%	100%
Insurance B	10,000	Dental	All	Monitoring	90%	100%	90%	100%
Insurance C				Not buy				
Which insurance do you choose?								

2.3 Analytical Model: Conjoint Analysis with Mixed Logit Model

We constructed a conditional logit model based on the random utility theory, and extended to mixed logit model (Train, 2003). Following Hole (2007), the probability that participant n chooses the i th alternative on choice occasion t is expressed as

$$L_{nit}(\boldsymbol{\beta}_n) = \frac{exp\left(\boldsymbol{\beta}_n^{'} \mathbf{x}_{nit}\right)}{\sum_{j=1}^{J} exp(\boldsymbol{\beta}_n^{'} \mathbf{x}_{nit})} \quad (1)$$

where $\mathbf{x}_{njt}$ is the vector of participant n's i th alternative with the aforementioned attributes and alternative specific constants (asc) basing the opt-out option. $\boldsymbol{\beta}_n$ is a vector of coefficients for corresponding attributes, for which density is denoted as $f(\boldsymbol{\beta}|\boldsymbol{\theta})$, where $\boldsymbol{\theta}$ are the parameters of distribution.

$$S_n(\boldsymbol{\beta}_n) = \prod_{t=1}^{T} L_{ni(n,t)t}(\boldsymbol{\beta}_n) \quad (2)$$

where $i(n,t)$ is the alternative chosen by the participant n on choice occasion t. The unconditional probability is given by integration of conditional probability by β as follows.

$$P_n(\boldsymbol{\theta}) = \int S_n(\boldsymbol{\beta}_n) f(\boldsymbol{\beta} \mid \boldsymbol{\theta}) d\boldsymbol{\beta} \quad (3)$$

The log likelihood for the model, $\ln L = \sum_{n=1}^{N} P_n(\boldsymbol{\theta})$, is maximized by the maximum simulated likelihood estimation (Train, 2003). The maximization is implemented in STATA using mixlogit (Hole, 2007).

3. Results and Discussion

The results of the mixed logit model are shown in Appendix Table. As shown, the coefficient of premium is significantly negative and the coefficients of full benefit and any hospital provider, are significantly positive. This indicates that when the insurance purchasers can take medical services from all public providers and private clinic,

Appendix Table. Estimation Results

Variables	Coeffcient	SE
Premium	−0.0001692	0.0000188 ***
Chronic Diseases	−0.3618371	0.2164548 *
Dental Surgery & Eye Glasses	0.2075946	0.239
Excluding None	1.000274	0.1996099 ***
National Hospital	0.1038112	0.220784
Private Clinic	0.6285684	0.177474 ***
All the Providers	0.8070861	0.2601794 ***
Meeting	0.2976802	0.2055899
Meeting & Monitoring	0.4787009	0.2493995 *
OPD 100%	0.0213093	0.1811201
IPD 100%	0.2229218	0.1298135 *
Drug 100%	−0.0735786	0.1390968
Tests 100%	0.0890046	0.1314613
Log-likelihood	−1,373.7651	
Prob>chi2	0	
LR chi2 (14)	419.78	
Obs.	4,590	

Note: *,and *** denote statistical siginificance at the levels of 10%, and 1% respectively.

and can take any benefit including chronic diseases, and dental & eye treatment, the probability of insurance take-up improves. By contrast, if the premium increases, the probability declines. Alternative specific constants are insignificant, and thus the purchasers are indifferent to every alternative including opt-out options. It follows that the purchasers are not willing to pay for the minimum contents of the current insurance scheme.

We present the marginal WTP (MWTP) calculated from the estimation results of the parameters and the estimated cost for implementing the new scheme (Table 4). The left side of Table 4 shows the attribute evaluation results from the parameters in the mixed logit model and the right side shows the cost.

According to this table, we can find if we add the services from national hospital and

Table 4. Benefit and Cost of Alternative MHI (monthly, per person: riels)

Alternative Scenario	MWTP		Cost
Chronic Diseases	−2,137		1,792
Dental Surgery & Eye Glasses	1,227		0
Excluding None	5,911	***	1,792
National Hospital	613		25
Private Clinic	3,714	***	4,445
All the Providers	4,769	***	4,470
Meeting	1,759		795
Meeting & Monitoring	2,829	*	1,573
OPD 100%	126		−
IPD 100%	1,317	*	−
Drug 100%	−435		−
Tests 100%	526		−

Sources: Costs are estimated from authors' survey. MWTPs are calculated from the estimation results.
Note 1) Cost of Health Center, Out-patient services, National Hospital, and Management are calculated on the basis of the data provided by Social Health Protection Association.
Note 2) Cost of Private Clinic, Chronic Diseases, and Dental Surgery & Eye Glasses are calculated on the basis of information about actual cost from June 2016 to May 2018 in Takeo Province. The information was collected from our respondents, in May 2018.
Note 3) *, and *** denote statistical significance at the levels of 10%, and 1%.

private clinic, the services of medical treatment for chronic diseases, dental surgery, and eye glasses, and the improvement of meeting & monitoring to the previous default scheme, the additional implementation costs are lower than the additional benefits.

The subsidized monthly premium per person in previous scheme which was accepted by the local people was 933riels which was much lower than the actual cost estimated by government, 5,000riels.

However, even if we assume the WTP of previous MHI scheme is equal to 933riels which is the lowest estimate of WTP, total cost of new scheme, 12,835riels is a little lower than the total benefit of new scheme, 14,442riels.

The respondents gave the highest evaluation to an addition of private clinic in the providers of medical services. This suggests that potential clients have a strong demand for medical services from local private clinics, consistent with the findings of Ozawa and Walker (2011).

4. Conclusion and policy implications

This study applies a mixed logit model to evaluate the demand among potential customers for MHI attributes to identify more acceptable insurance schemes for rural Cambodia. The main findings are as follows.

If we add the services in national hospital and private clinic, the services for chronic diseases, dental surgery and glasses, and the improvement of meeting & monitoring methods to the previous MHI scheme, WTP of potential insurance customers is over the costs. This implies that the new MHI scheme can be accepted by the potential purchasers and the take-up rate may increase.

In addition, our findings suggest that potential insurance customers who would have purchased MHI accounted in our study area, even if the premium increased by 3.5USD per person per month. This implies that if improving the MHI scheme does not cost more than 3.5USD per person per month, a considerable number of customers would purchase it. Thus, our results can be used to support improvements in existing CBHI to attract more CBHI customers. This, then, will have a cascade effect of reducing health spending among the poor in Cambodia (Levine *et al.,* 2016).

Our findings contribute to the literature by adding to the limited evidence about individual preferences for attributes of MHI in developing countries. Our study also offers valuable information that can be used by healthcare authorities and development assistant agencies to provide health insurance to the relatively poor population who account for a large percentage of the total population and are not covered by health insurance in low- or middle-income countries like Cambodia.

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