

# Determinants and Health Impacts of Purchasing Community-based Health Insurance: A Case Study in Rural Cambodia<sup>1)</sup>

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福井清一・三輪加奈：コミュニティーを基礎としたマイクロ・インシュランス（CBHI）の購入決定因と健康への影響 カンボジア農村の事例より

発展途上国における貧困家計の所得平準化を目的として、CBHI の導入が図られているが、購入者の割合は依然として低い。本論文は、カンボジアにおける CBHI 購入を規定する要因と、保険を購入し利用することによる健康への影響を検証することを目的とする。そのため、カンボジア農村において収集した家計データを用い、リスクや時間選好を考慮して、選択モデルによる購入決定因の分析と、保険を購入し利用することが家計員の健康状態におよぼす影響について単純な回帰分析の手法を用いて分析した。分析の結果は、CBHI の購入と利用が家計員の健康に負の影響をおよぼすこと、過去における疾病経験、高齢者の割合が保険購入に有意な正の影響をおよぼすこと、および、時間割引率が低いほど保険を購入する傾向があることを示している。

## 1. Introduction

In rural Cambodia, poor households often suffer from ill health and injuries, which can cause them considerable economic damage (Yagura 2005). To alleviate the impact of such shocks and complement existing informal risk-coping mechanisms, a French NGO (Non-Governmental Organization), GRET, introduced a community-based health insurance (CBHI, or micro health insurance) program known as SKY to Cambodia's rural poor in 1998 (GRET 2011). Since 2012, a local NGO has taken over this program and continues to provide CBHI under new schemes.

Several kinds of micro-insurance, including crop, life, and health insurance, have been introduced to poor households in developing countries (Dercon and Kirchberger 2008), but the take-up rate of CBHI remains very low in most areas. Many studies have investigated the reasons behind this low take-up rate. Factors considered determinants of CBHI purchase have included experiences of health shocks (Harms 2011), premium levels (Dercon et al. 2012), risk aversion (Ito and Kono 2010; Harms 2011), hyperbolic time preferences<sup>2)</sup> (Ito and Kono 2010), household characteristics (e.g., income and assets, gender, and household size; Bendig and Arun 2011; Macha et al. 2014), and confidence in the insurance agency and

healthcare facilities (Dercon et al. 2012; Harms 2011). Dercon et al. (2012) and Khan (2012) also showed that whether or not people are educated about insurance products influences their purchase decisions.

Regarding risk aversion, results have been conflicting. Ito and Kono (2010) argued that, based on prospect theory, those who are risk-loving in evaluating losses were less likely to purchase insurance. In contrast, Lammers and Warmerdam (2010) concluded that high levels of risk aversion explained high insurance take-up rates. Here, we consider two possible types of risk-averse behavior: avoiding the risk of suffering from illness or injury and avoiding the risk of poor treatment caused by moral hazard on the part of service providers and/or insurance agencies.<sup>3)</sup> Within the context of CBHI, previous researchers have focused only on the first type of risk. However, researchers have examined the second type of risk in the context of agricultural micro-insurance, finding a negative relationship between risk aversion and take-up rates (Gine et al. 2008; Kouame and Komenan 2012).

Regarding the risk caused by unscrupulous insurance scheme, Dercon et al. (2012) suggested that potential clients' distrust of insurance agencies and healthcare facilities may help explain lower insurance take-up; Harms (2011) found no significant relationship. In Cambodia, there is considerable distrust of public health facilities (Ozawa and Walker 2011). If distrust of insurance agencies and/or health facilities is an issue, we must take into account the risks related to their contractual defaults.<sup>4)</sup>

In addition, if individuals decide to buy insurance by comparing current costs (payment of a monthly premium) to future losses caused by illness, their time preferences might influence their decisions. Ito and Kono (2010) showed that a potential insurance buyer with a hyperbolic time-discounting rate (i.e., who prefers consuming now to saving for the future) has a strong incentive to avoid future risk and is thus more likely to buy CBHI. No other studies have validated this relationship between time preferences and insurance purchase.

Health status may also affect people's decisions to purchase insurance; Lammers and Warmerdom (2010), and Ito and Kono (2010) have considered this effect. Both studies found that individuals with health problems are more likely to be enrolled in health insurance. Macha et al. (2014) used qualitative analysis to show that households including people with disabilities or chronic diseases are more likely to join CBHI schemes. Combining these results with the assumption that people in ill health may be more likely than healthy people to suffer from illness in the future suggests that there is an adverse selection problem in voluntary insurance schemes.

As for the impact of using CBHI, numerous past studies have examined the effects of health insurance on health-seeking behavior (for a comprehensive review, see Ekman 2004), and

several researchers have investigated the impact of using health insurance on health outcomes (Fink et al. 2013). However, only a few studies have directly investigated the effect of health insurance on health outcomes of insurance purchasers. Pham and Pham (2012) found health insurance reduced the adverse effects of serious illness and injury. Wagstaff and Pradhan (2005), Levine, et al. (2014), and Fink et al. (2013) analyzed the effect on health outcomes, assessed by indicators such as BMI (Body Mass Index), height and weight, or mortality rate.

The objectives of this study are to investigate the determinants of purchasing CBHI in rural Cambodia, taking into consideration the impacts of risk and time preferences, to test whether an adverse selection problem arises, and to assess the effects of insurance on the health outcomes of clients, using the econometric methodologies.

We use a measure of health outcomes in our analysis: self-reported health. We also assess the effect of income stability on the decision to purchase insurance because our survey data suggests that those in households with unstable incomes are more likely to be concerned about the constant need to pay premiums; this might be a reason why the poor are less likely to purchase insurance.

The paper proceeds as follows. We first explain the SKY insurance program and describe our survey methods. Then we explain our analytical framework. After presenting summary statistics of the data and showing differences in characteristics between households that do and do not buy insurance, we show and discuss the estimation results, focusing on the determinants of the utilization decision, adverse-selection, and the impacts of CBHI on health outcomes. Finally, we summarize our main findings and draw from them some policy implications.

## 2. Methods

### 1) The SKY Program

SKY (“Sopapheap Krousat Yeugn,” or “Health for Our Families” in Khmer) is a CBHI program for the rural poor in Cambodia that was created by a French NGO, the Groupe de Recherche et d’Echanges Technologiques (GRET), in 1998. In 2007, the Ministry of Planning (MoP) implemented the Identification of Poor Households Programme (ID Poor). Households who are identified as poor are able to obtain free treatment from public healthcare facilities by presenting their ID Poor card.<sup>5)</sup>

In 2012, the SKY program was taken over by a local NGO, “Buddhism for Health,” with support from the MoP and the Ministry of Health (MoH); the name of the insurance and

some of its schemes were changed. Under the new scheme, two programs, ID Poor (offering free health insurance for the rural poor, originally known as the “Health Equity Fund”) and the reformulation of the former SKY program (i.e., voluntary health insurance for the non-poor) have been combined.<sup>6)</sup>

If a household joins SKY (i.e., purchases health insurance), its members must pay a monthly premium but can receive free and unlimited primary and emergency care at local health centers and/or public hospitals that have contracts with SKY. After buying CBHI, people can receive services<sup>7)</sup> from different public healthcare facilities: a health center located in each commune, a district hospital, or a provincial hospital. SKY cannot be used, however, for long-term hospitalization or special operations. A household member must consult with a health center and receive a medical referral letter in order to receive free medical care at district or provincial hospitals. To expand the program, sales staffs from the NGO visit each household, explain the details of the health insurance, and encourage the household to purchase it. Households are able to renew their contract every six months or every year.

According to the Cambodia Socio-Economic Survey of 2009, a rural household seeks treatment for illness and/or injury an average of 0.3 times per month. Among households receiving treatment, treatment costs for each household averaged about 67,619 riels (US\$17) per time. The monthly SKY premium per household is \$1 for a one-member household, \$1.88 for 2-4 members, \$2.38 for 5-7 members, and \$2.75 for a household with eight or more members. In the first type of contract, the fees are almost half those of the second one. In addition to free and unlimited primary and emergency care at local public health centers, SKY also offers financial support for the costs of funerals and urgent transport. Taken together, there is thus an economic incentive for a household to buy the CBHI.

## 2) Survey Methods and Sampling

We selected Tram Kak District of Takeo Province as the study area because the province was the main target area of the SKY project and the district had the highest take-up rate in the province. We conducted a field survey in 12 villages from three communes within this district in September-October 2012 and a follow-up survey in February-March 2013. We used stratified random sampling, randomly selecting three communes in which the SKY program was operating and, within these communes, 12 villages from the set of villages in which the take-up rate was relatively high. After we selected the villages, taking into consideration the sample-to-population ratio used in the Cambodia Socio-Economic Survey (0.38% of households), statistical theory on appropriate sample size, and cost constraints, we determined the number of sample households in each village, which was nearly proportional to

the total number of village households. Then, we randomly selected the sample households from the village chiefs' lists of village households.

The average health insurance take-up rate in the surveyed villages was only 15%, potentially too small to undertake appropriate analyses. Therefore, we intentionally raised the ratio of insurance buyers to 30% in order to obtain statistically valid results.<sup>8)</sup> We divided all households in the villages into two groups based on a list of households: insurance buyers (insured) and insurance non-buyers (uninsured). Then we randomly selected 128 households (around 30% of the total 448-household sample) from the group of insured households and 320 households (70% of 448 households) from the group of uninsured households. In our analysis, we use data from the 443 households with complete information.

Within each household, we conducted an interview to collect information on household characteristics and health conditions of household members and then asked the respondent to play experimental games to measure risk aversion and time preferences, following the methods of Schechter (2007) and Kirby et al. (2002). The risk aversion measure in Schechter (2007) is comparable to other constant relative risk aversion measurements, while Kirby et al. (2002) invented a method for consistent measurement of time discount rates with hyperbolic discounting.

### 3. Analysis

To assess the impact of CBHI on health status of household members, we employ the following models.

$$\begin{aligned} Self\ Health_i = & \beta_0 + \beta_1 \cdot SKY_i * UsedSKY_i + \beta_2 \cdot IDPoor_i + \beta_3 \cdot Recentill_i + \beta_4 \cdot Pastill_i \\ & + \beta_5 \cdot Elder_i + \beta_6 \cdot Asset_i + \beta_7 \cdot HHeduc_i + \beta_8 \cdot HHage_i + \beta_9 \cdot HHgender_i \\ & + \beta_{10} \cdot Group_i + \beta_{11} \cdot Risk\ aversion_i + \beta_{12} \cdot Time\ preference_i + \beta \cdot Village_i + u_i \end{aligned} \quad (1)$$

We use the dependent variables to measure of health outcomes for adult members of household  $i$ ;  $Self\ Health_i$  is the average value of a subjective self-reported indicator of health (1=Very bad, 2=Bad, 3=Average, 4=Good, 5=Very good).

We consider the impact of buying insurance on health status via an interaction term  $SKY_i * UsedSKY_i$ , where  $SKY_i$  is a dummy variable that takes 1 if household  $i$  is a SKY member and  $UsedSKY_i$  is 1 if the household has ever used SKY.

Experiences of illness and injury, both past ( $Pastill_i$ ) and recent ( $Recentill_i$ ), may be linked to health outcomes and are thus included as control variables. If the proportion of elderly

members in the household is higher, the average health status may tend to be lower. To control for this, we include the portion of household members who are aged 60 or older ( $Elder_i$ ) as an explanatory variable. Household characteristics (asset holdings,<sup>9)</sup> land ownership, and participation in a savings, fertilizer, or other group), household head characteristics (years of education, age, and sex), and village-level dummy variables are also included. In our sample, we find that health indicator is directly affected by degrees of risk aversion and time preferences; we thus include these measures when estimating equations (1).

To estimate a determinant function of the interaction term  $SKY_i * UsedSKY_i$  (i.e., purchasing and using SKY), we use a logit model. The variables used in this model include the dummy variables for being an ID poor household (=1 if the household is identified as a poor household), the occupation of the household head (=1 if household head is not a wage worker), and having a child younger than 5 years old (=1 if household has a child aged under 5) as well as the square of the age of the household head, except for the explanatory variables used in equation (1).

As we mentioned in the Introduction section, there may be an adverse selection problem in voluntary insurance schemes: individuals with health problems are more likely to be enrolled in CBHI. Given this, we use experiences of past illness, the ratio of elderly members (who tend to be at greater risk of illness or poor health) in the household, and the presence of an elder member in the household as explanatory variables to test this problem when analyzing the determinants of buying insurance.

In our analysis, we focus on the health status of family members aged 17 years old or older. However, the number of adult members in a household varies from one to seven. To account for this, we estimate regressions weighted by the portion of household members who are adults.<sup>10)</sup> In addition, to focus on the impact of purchasing CBHI on household members' health status, we exclude households who answered "Do not know about SKY/Do not know the details of SKY" during the interview. In other words, our empirical analysis only uses data from households that knew about the SKY program before the survey.

## 4. Results

### 1) Characteristics of Insured and Uninsured Households

Column 1 in Table 1 shows the characteristics of the sample. 79% of household heads are engaged in agricultural activities, followed by permanent wage labor (such as working as a government officer) and self-employed business operators. Agriculture is rain-fed, and cul-

tivated areas are relatively small, making it difficult to live on agriculture alone. Therefore, many households earn extra money on the side, such as by operating a small enterprise, undertaking daily wage labor (mainly in construction), or sewing. The average education level of household heads is approximately equivalent to completing primary school.

Due to increasing opportunities to borrow money from microfinance institutions (MFI), especially ACLEDA Bank and AMRET, the amount of debt is relatively high (an average of about \$1,010 in the prior five years). Rural development projects run by NGOs or the government in our sample villages encourage villagers to organize savings groups and/or fertilizer groups, and about 40% of households are members of these groups. Information about informal insurance (risk coping) mechanisms is limited, but 26% of sample households had borrowed money and/or received gifts from relatives and friends in the five years prior to the survey.

Take-up rates of SKY were low in the surveyed villages, even though it is economically rational to buy SKY, even for the rural poor, as already mentioned. The most frequent reason households offered for not buying SKY was that the premium was too expensive: 60% of households, excluding those that did not know about SKY or gave no response, cited this reason. This finding implies that the decision to buy health insurance is influenced by unstable household income, risk aversion of poor households, and time preferences for consuming more now rather than saving for future medical expenditures. Other reasons cited for not buying SKY are shown in Table 2.<sup>11)</sup>

Columns 2 to 4 in Table 1 show the results of t-tests between SKY participants (insured) and non-participants (uninsured). Household size and labor, household head's age, land area, asset values, and some group membership rates are significantly higher for SKY households than for non-SKY households. SKY members are also more likely to engage in permanent wage employment.

If debt and the degree of credit constraint are negatively correlated, then the significant difference in debt between SKY members and non-members implies that SKY members tend to face fewer credit constraints. We found no significant differences in informal mutual insurance mechanism usage between SKY purchasers and non-purchasers.

Table 1. Characteristics of Sample Households

|                         | (1)     | (2)         | (3)             | (4) <sup>b</sup> |
|-------------------------|---------|-------------|-----------------|------------------|
|                         | All HHs | SKY members | SKY Non-members | T-tests:         |
| (Number of sample HHs)  | (443)   | (128)       | (315)           | (2) vs. (3)      |
| ID Poor households (%)  | 15.80   | 3.13        | 20.95           | 4.771 ***        |
| Household size (people) | 4.35    | 4.64        | 4.23            | 2.163 **         |

|                                                                                     |         |         |         |           |
|-------------------------------------------------------------------------------------|---------|---------|---------|-----------|
| Household labor <sup>a</sup> (people)                                               | 2.28    | 2.57    | 2.17    | 3.788 *** |
| Household head's age (years)                                                        | 47.37   | 50.38   | 46.14   | 3.158 *** |
| Household head's gender (1=male)                                                    | 0.76    | 0.77    | 0.76    | 0.154     |
| Household head's education (years)                                                  | 5.89    | 5.64    | 5.99    | 1.007     |
| Main occupation of household head (%)                                               |         |         |         |           |
| Agriculture                                                                         | 79.23   | 74.22   | 81.27   | 1.660     |
| (Non-agri.) self-employed business                                                  | 3.84    | 3.13    | 4.23    | 0.497     |
| Driver, carpenter, repairperson                                                     | 3.61    | 5.47    | 2.86    | 1.335     |
| Permanent wage labor                                                                | 6.32    | 10.16   | 4.76    | 2.121 **  |
| Daily wage labor                                                                    | 4.51    | 4.69    | 4.44    | 0.111     |
| Others                                                                              | 2.48    | 2.34    | 2.54    | 0.120     |
| Area of owned agri. land (m <sup>2</sup> )                                          | 7587.05 | 9050.68 | 6992.30 | 3.404 *** |
| Agricultural assets (thousand riels)                                                | 5191.30 | 6138.21 | 4806.53 | 2.826 *** |
| Durable goods (thousand riels)                                                      | 4821.43 | 5996.77 | 4343.83 | 2.128 **  |
| Remittances received (thousand riels)                                               | 1849.75 | 1760.38 | 1886.07 | 0.287     |
| Debts (thousand riels, past 5 years)                                                | 4039.14 | 5073.99 | 3618.64 | 2.440 **  |
| Formal loans                                                                        | 3599.97 | 4807.16 | 3109.43 | 2.857 *** |
| Informal loans                                                                      | 439.18  | 266.84  | 509.21  | 2.005 **  |
| Savings / Fertilizer group (1=member)                                               | 0.43    | 0.52    | 0.39    | 2.725 *** |
| Informal quasi-credit                                                               |         |         |         |           |
| (1=household received informal loan or gifts from relatives/friends after suffering |         |         |         |           |
| from illness or injury)                                                             | 0.26    | 0.24    | 0.30    | 1.307     |
| Risk preference - bet amount (riels)                                                | 1581.26 | 1488.28 | 1619.05 | 1.268     |
| Time discount rate                                                                  | 0.22    | 0.21    | 0.22    | 0.343     |

Note: Asterisks denote statistical significance at the \*10%, \*\*5%, and \*\*\*1% levels.

<sup>a</sup> This variable is defined as the number of household members who were working at the time of survey.

<sup>b</sup> The figures in column (4) show t-statistics from tests of a difference in characteristics between SKY members and SKY non-members.

Source: Household survey data.

Table 2. Reasons for Not Purchasing SKY Insurance (Multiple answers possible)

| Reasons                                                                          | Cases |
|----------------------------------------------------------------------------------|-------|
| Premium is too expensive / Household income is not enough to pay monthly premium | 140   |
| Rarely suffer from illness (rarely go to a health center/hospital)               | 16    |
| Able to obtain same medical treatment without buying SKY                         | 30    |
| SKY agency and healthcare facilities offer poor support (distrust)               | 10    |
| Do not know about SKY / Do not have enough information about SKY                 | 26    |
| Identified as ID Poor (having an ID Poor card)                                   | 17    |
| Not interested in SKY (or other health insurance)                                | 13    |
| Other responses                                                                  | 13    |
| No response                                                                      | 54    |

Source: Household survey data.

## 2) Determinants of enrolment in CBHI

The definitions and summary statistics of all variables we used in the empirical analyses are in Table 3.

Table 3. Descriptive Statistics (Weighted)

| Variable                                                                                  | Definition                                                                                                                       | Mean    | SD      |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| <i>Adult Health</i>                                                                       | Average self-rated health assessment of adult household members                                                                  | 3.431   | 0.643   |
|                                                                                           | Average BMI of adult household members                                                                                           | 20.929  | 2.311   |
| <i>SKY * UsedSKY</i>                                                                      | 1 if household is purchasing SKY and used SKY, 0 otherwise                                                                       | 0.077   |         |
| <i>Recentill</i>                                                                          | 1 if household suffered from illness/injury in 2012, 0 otherwise                                                                 | 0.375   |         |
| <i>Pastill</i>                                                                            | 1 if household suffered from illness/injury before 2012, 0 otherwise                                                             | 0.819   |         |
| <i>Elder</i>                                                                              | Ratio of elderly (age 60 or over) members in household                                                                           | 0.111   | 0.214   |
| <i>Asset</i>                                                                              | Categorized into quintiles based on the level of household assets (first quintile, the lowest asset group, is the base category) |         |         |
| <i>Land</i>                                                                               | Log of the area of land owned by the household                                                                                   | 8.583   | 0.886   |
| <i>HHeduc</i>                                                                             | Household head's education                                                                                                       |         |         |
| <i>1-6 yrs</i>                                                                            | 1 if household head has 1 to 6 years of education, 0 otherwise                                                                   | 0.437   |         |
| <i>7-9 yrs</i>                                                                            | 1 if household head has 7 to 9 years of education, 0 otherwise                                                                   | 0.365   |         |
| <i>10 yrs +</i>                                                                           | 1 if household has 10 years of education or more, 0 otherwise                                                                    | 0.106   |         |
| <i>HHage</i>                                                                              | Age of the household head (in years)                                                                                             | 45.609  | 12.505  |
| <i>HHgender</i>                                                                           | 1 if household head is male, 0 otherwise                                                                                         | 0.745   |         |
| <i>Group</i>                                                                              | 1 if household is a member of at least one group (savings, fertilizer, or other), 0 otherwise                                    | 0.421   |         |
| <i>Village</i>                                                                            | 11 village dummies (Mrum is the base village)                                                                                    |         |         |
| <i>Risk aversion</i>                                                                      | Risk preference (in thousand riels) <sup>a</sup>                                                                                 | 1.562   | 0.952   |
| <i>Time preference</i>                                                                    | Time discount rate                                                                                                               | 6.108   | 2.651   |
| <b>Explanatory variables used only in estimating the decision to purchase and use SKY</b> |                                                                                                                                  |         |         |
| <i>IDPoor</i>                                                                             | 1 if household is identified as ID Poor, 0 otherwise                                                                             | 0.196   |         |
| <i>HHage<sup>2</sup></i>                                                                  | Square of the age of the household head                                                                                          | 2236.26 | 1235.77 |
| <i>HHjob</i>                                                                              | 1 if household head is not a wage worker, 0 otherwise                                                                            | 0.937   |         |
| <i>Child</i>                                                                              | 1 if household has a child aged under 5 years old, 0 otherwise                                                                   | 0.431   |         |

Note: All values are weighted.

Source: Household survey data.

Table 4 shows the results of the regression estimating the determinants of utilizing SKY. In Table 4, experiences of illness and injury and the percentage of elderly family members have significant impacts on the decision to utilize SKY insurance.

The coefficients on *IDPoor* are -2.74 and significant at 1% level. This suggests that households identified as poor (i.e., those that have an ID Poor card) are less likely to join the SKY program. The results in Table 4 suggest that households with higher education and relatively large agricultural landholdings are more likely to join the SKY program, though the coefficients on these variables are not significant.

The negative effect of the time preference measure (the coefficient is -0.14 and is significant at the 10% level) indicates that the lower the time discount rate, the more likely the household is to use health insurance. We found no significant effect of risk preferences on the decision to utilize CBHI.

### 3) Impacts of CBHI Utilization on Health Outcome

Table 5 shows the results of the regressions of equation (1).

In the result of Table 5, the coefficient on *SKY\*UsedSKY* is negative and significant. This implies that if a household utilizes SKY insurance, its members' health status is likely to be worse than for households that do not utilize the insurance.

The past and recent experiences of illness and injury tend to decrease the average value of the subjective self-reported health indicator by 1.4-1.5 points (significant at 5% levels)—i.e., recent ill health makes family members' self-reported health status worse. This suggests the possibility that the CBHI program has not worked well so far. If a household has a larger portion of elderly members or the household head is older, the average health status of the household tends to be about 0.42 points worse.

The coefficients on the risk aversion and time preference variables show positive and significant impacts on the self-reported health measure (the coefficients are 0.11 and 0.02, respectively). This suggests that adult family members in households where the heads have lower risk-aversion and/or higher time-discounting rates tend to have better health status.

### 4) Discussion

The estimation results suggest that households with poorer health status are more likely to utilize insurance. This finding is consistent with Lammers and Warmerdom (2010) and Ito and Kono (2010) and implies that adverse selection may be a problem in the study area. We also considered two kinds of risk faced by potential health insurance clients: the risk of suffering from illness or injury and the risk of being victimized as the result of a service provid-

Table 4. Determinants of Purchasing & Utilizing SKY

| Model                             | Logit       |             |
|-----------------------------------|-------------|-------------|
| Variable                          | Coef.       | Robust s.e. |
| Intercept                         | -28.061 *** | 6.133       |
| <i>Recentill</i>                  | 0.325       | 0.505       |
| <i>Pastill</i>                    | 1.766 ***   | 0.600       |
| <i>Elder</i>                      | 1.782 *     | 0.938       |
| <i>Asset</i>                      |             |             |
| Second quintile                   | -3.103 ***  | 1.069       |
| Third quintile                    | 0.284       | 0.718       |
| Fourth quintile                   | -0.186      | 0.892       |
| Fifth quintile                    | -0.941      | 1.176       |
| <i>Land</i>                       | 0.720       | 0.469       |
| <i>HHeduc</i>                     |             |             |
| 1-6 yrs                           | 2.233       | 1.563       |
| 7-9 yrs                           | 1.830       | 1.481       |
| 10 yrs +                          | 2.519       | 1.671       |
| <i>HHage</i>                      | 0.060       | 0.141       |
| <i>HHage</i> <sup>2</sup>         | -0.0004     | 0.001       |
| <i>HHgender</i>                   | -0.027      | 0.695       |
| <i>Group</i>                      | 0.042       | 0.516       |
| <i>Risk aversion</i>              | 0.026       | 0.202       |
| <i>Time preference</i>            | -0.148 *    | 0.077       |
| <i>IDPoor</i>                     | -2.740 ***  | 0.856       |
| <i>HHjob</i>                      | -0.396      | 0.974       |
| <i>Child</i>                      | 0.430       | 0.503       |
| Village dummies                   | Yes         |             |
| F test for three IVs <sup>a</sup> | 11.15       |             |
| Observations <sup>b</sup>         | 414         |             |

Notes: All values are weighted. Intercept and village dummies included. Asterisks denote statistical significance at the \*10%, \*\*5%, and \*\*\*1% levels.

<sup>a</sup> Four instrument variables are *IDPoor*, *HHage*<sup>2</sup>, *HHjob* and *Child*.

<sup>b</sup> Regressions are estimated using only households with complete information.

Table 5. Adult Health Status: Self-reported Health Assessment

| Model                     | (A)<br>OLS |             |
|---------------------------|------------|-------------|
| Variable                  | Coef.      | Robust s.e. |
| Intercept                 | 4.395 ***  | 0.370       |
| <i>SKY * UsedSKY</i>      | -0.287 **  | 0.122       |
| <i>Recentill</i>          | -0.151 **  | 0.063       |
| <i>Pastill</i>            | -0.141 **  | 0.061       |
| <i>Elder</i>              | -0.418 *** | 0.141       |
| <i>Asset</i>              |            |             |
| Second quintile           | 0.336 ***  | 0.101       |
| Third quintile            | 0.384 ***  | 0.101       |
| Fourth quintile           | 0.484 ***  | 0.115       |
| Fifth quintile            | 0.509 ***  | 0.107       |
| <i>Land</i>               | -0.063     | 0.042       |
| <i>HHeduc</i>             |            |             |
| 1-6 yrs                   | -0.140     | 0.133       |
| 7-9 yrs                   | -0.007     | 0.139       |
| 10 yrs +                  | -0.047     | 0.148       |
| <i>HHage</i>              | -0.013 *** | 0.003       |
| <i>HHgender</i>           | -0.164 **  | 0.069       |
| <i>Group</i>              | 0.147 **   | 0.064       |
| <i>Risk aversion</i>      | 0.108 ***  | 0.028       |
| <i>Time preference</i>    | 0.018 *    | 0.011       |
| <i>Village dummies</i>    | Yes        |             |
| Observations <sup>b</sup> | 406        |             |

Note: All values are weighted. Intercept and village dummies included. Asterisks denote statistical significance at the \*10%, \*\*5%, and \*\*\*1% levels.

<sup>a</sup> The variable *SKY\*UsedSKY* in the IV model is the estimated probability obtained in the first-stage logit model.

<sup>b</sup> Regressions are estimated using only households with complete information.

er's moral hazard. The estimation results show that risk aversion does not affect a potential client's utilization decision. This is not consistent with findings that less-risk-averse people are less likely to buy insurance (Lammers and Warmerdam 2010).

We find the positive and significant impacts of the risk aversion and time preference on the self-reported health measure (Table 5). In the context of rural Cambodia and the self-reported health measure, we interpret this result to indicate that a decrease in risk aversion and increase in time preference will lead people to routinely go to a health center or hospital to treat whatever illness or injury they face, even if it is fairly light. They are thus willing to pay higher out-of-pocket expenditures for healthcare, if they are able, to keep their current good health status without considering saving for the future in order to cope with unexpected risks.<sup>12)</sup>

The results of our analysis indicate that the purchase of health insurance has a negative impact on self-reported health. Taking into consideration information collected from the villagers, we posit that this is partially because SKY members can receive treatment only in local public hospitals, which offer poorer-quality medical services than local private clinics, at which patients must pay for treatment in cash (see also Ozawa and Walker 2011). Another possible interpretation is that medical staffs tend to give unfair treatment (e.g., long wait times) to patients who use the insurance; as a result, these patients' health conditions may worsen.

The self-reported health assessment may depend on the other factors that lead to improvements in health status. For example, home renovations and the installation of sanitation facilities (e.g., building a new toilet or digging a well), often observed in the study area recently, improve people's living environment and health conditions. As in Table 5, household assets have a positive and significant effect on self-reported health.

Although this paper has made a significant contribution to improving understanding of the significance of CBHI, it has limitations. First, the sample size is relatively small (though it still has sufficient power for statistical tests). To raise the accuracy of the statistical analysis, it would be desirable to have a larger sample, balancing the expense of data collection against the benefits of increasing accuracy. Second, we used the hyperbolic discount rate of Kirby et al. (2002) as the time preference indicator but did not take into consideration "present bias" due to time and budget constraints; these effects should be examined in future work.

Finally, considering the findings that risk aversion and time discount rates have negative and positive impacts, respectively, on adult health status, we explained these results by hypothesizing that less risk-averse and less patient people are more likely to visit health centers or hospitals when experiencing even mild symptoms of illness. However, we were unable to provide sufficient evidence to support this hypothesis. These open questions thus remain as challenges for future research.

## 5. Conclusion

The findings of this study illustrate that the purchase of CBHI has a significant negative effect on self-reported health. We also found that this voluntary insurance scheme in Cambodia is characterized by an adverse selection problem. This suggests that even if the voluntary CBHI program were adopted more widely, the health status of CBHI users would not necessarily be improved and any positive impact on health status might be undermined by adverse selection.

To increase the utilization of CBHI in Cambodia, the insurance management organization must improve the current insurance scheme; an alternative scheme, however, might be difficult to create, and planners are likely to face adverse selection problems. On the other hand, it is apparent that increasing household assets could improve health and nutrition status. Under Cambodia's current medical care system, an income-enhancement program for rural households might be a more promising way than CBHI to improve rural households' health and nutrition status. Finally, our findings suggest that the impacts of risk and time preferences must be taken into consideration when investigating the adoption and health impact of CBHI programs.

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## Note

- 1) The contributions of two authors are equivalent.
- 2) Hyperbolic time preferences are time preferences describing individuals who prefer consuming now to saving for the future.
- 3) As for the incredibility to service providers by potential clients in Cambodia, see Ozawa and Walker (2011).
- 4) In our survey area, although the insurance sales staff and health centers differed across communes, we were unable to find significant cross-commune differences in terms of the degree of distrust or quality of services. However, we implicitly test this hypothesis by examining the impact of risk attitude on the participation decision.
- 5) Even though ID Poor households can get free treatment at healthcare facilities, some ID Poor households

still choose to join the SKY program.

- 6) Under the voluntary health insurance scheme, the non-poor can choose one of two kinds of insurance: (1) receiving care only from public hospitals with a low premium or (2) receiving care from any public healthcare facility, as in the earlier program, with the same premium.
- 7) The benefit package covers all kind of in-patient and out-patient services, and prescribed drugs in public medical institutions, excluding long term treatment of chronic disease, basic dental care, glasses, and prothesis.
- 8) In robustness tests, we found no effect of increasing the ratio of insurance buyers in our sample.
- 9) Household assets include agricultural tools, durable goods, housing, and others. We listed households in order of the total value of their owned assets, then divided them into quintiles, with each group containing 20% of households. Each of the five dummy variables, “first quintile” to “fifth quintile,” is one if the household falls in that group, zero otherwise.
- 10) The average ratio of adults to total household members is 0.651. We calculate the weights as  $(0.651 \div \text{number of adult members in household } i)$ .
- 11) There were 87 households in the sample who had previously been SKY members but stopped before the survey period.
- 12) Due to data limitations, we cannot show evidence of this interpretation. However, observations in our survey area suggest this would be one possible reason why risk aversion and time preferences are related to the self-reported health measure.