Performance of Existing Rural Cooperative Medical Scheme and Willingness to Pay for the Improved Scheme

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Introduction

A lot of economists believe that human capita through health care provision and education is a leading strategy to attack poverty (e.g., Skoed 1999). Health care provision is even more fundamental because poor health may not only adversely affect the performance of education, but also even force the students to drop out of school. Many developing countries have recognized this point and are implementing health reform. However, they are universally constrained by the limited governmental revenue. Thus, additional financial resources should be mobilized through a set of proper policy instruments. Health insurance is virtually a highly practical instrument that government can use to get itself out of the expensive business of providing subsidies for health care, thereby releasing funds for public health scheme and preventive and primary services that benefit the poor (Bloom 1998; Petretto 1999; Liu *et al.* 1999; Waters 2000). In urban areas health insurance can be readily established on the basis of employment. In contrast, the rural population in most developing countries is institutionally difficult to be covered by governmental health insurance scheme (Shaw and Griffin 1995).

Community based health insurance scheme (CBHIS) is an institutional innovation for the rural population in developing countries. There are internationally four types of CBHIS. China's rural cooperative medical scheme (RCMS) is one of the four types and is actually community prepayment scheme. It is usually organized at the village or town level with funds generated by villagers themselves. Typically, RCMS generates its funds from annual premium paid by individuals and annual appropriations from village and township collective funds. The premium is based on community rating so that all members, irrespective of their age, sex, education level or current health status, pay a fixed level of premium.

Although governments and communities have been eager for raising the enrolment rate of RCMS, rural population has a common concern over the performance of RCMS. There have been a lot of case studies on the performance of individual RCMS in China (e.g., Liu *et al* 1996; Hsiao *et al* 2001; Gao *et al* 2002; Jiang *et al* 2003). The primary conclusion drawn from the literature review is that the capacity of resource mobilization and effectiveness of financial protection vary tremendously across schemes in different regions (eastern developed region and middle-western underdeveloped regions). But so far there has been no systematic comparison and analysis of the whole country. So there is an imperative need to assess the performance of RCMS in achieving the goal of fairness and better health. Moreover, the past performance may have a direct impact on the willingness of the rural people to join and to pay for this scheme.

The paper has two major sections. In the first place, the performance of rural RCMS is assessed through three approaches. In the second, the households' willingness to join and to pay for RCMS with hypothetically better performance is estimated.

1 Performance of the rural cooperative medical scheme

Performance in the study can be conceptualized as the extent to which the rural cooperative medical system achieves its goals. The goals of rural cooperative medical scheme can be set at multiple levels. At the level of individual scheme the goal is to mobilize external resources and protect members from

costs of illness; at the level of administrative unit (e.g., town, county or nation) it refers to the improvement of health status. In this study we are to employ three methods to assess the performance of rural cooperative medical schemes in China: with-without comparative analysis between counties or towns (horizontal comparison), before–after comparative analysis of the country as a whole (vertical comparison) and analysis of individual schemes.

1.1With-without comparative analysis between counties

The dataset of the National Survey on Rural Health System (NSRHS) at county level is used to conduct the comparative analysis. There are 30 sample counties in the dataset, of which there are 13 counties with enrollment rate of 40% or above[1] (for simplicity, this type of county is called RCMS county, otherwise non-RCMS county). What interests us when analyzing the performance of RCMS are health outcome, intermediate health outcome, health infrastructure indicators and income. The four types of indicators in RCMS counties and non-RCMS counties are summarized in Table 1. Prior to the analysis of the role of RCMS we need to outline the basic relationship between the four types of indicators. Income in terms of GDP per capita is the rooted resource, which can be used to invest in health, but a high GDP neither sufficiently nor necessarily guarantees high health outcomes because the GDP can be distributed in different manners. The health infrastructure indicator is crucial to judging to what extent the government spent on health improvement in the past few years. Meanwhile, the health infrastructure (especially at the level of township) is also positively influenced by the establishment of RCMS. With a stable stream of consumers regulated by the rule of RCMS, the town health centers could earn more and be equipped better than it would be otherwise. The fiscal expenditure indicator reflects the latest distribution of fiscal revenue to health sector. The health outcome is the function of various health inputs purchased with income. Due to the lack of data on total medical care consumed at the county level, we have to circumvent health inputs and resort to average net income per farmer, the public expenditure on health and health infrastructure to explain the health outcome indicators.

Table 1 indicates that RCMS counties have much higher health outcome than the non-RCMS counties. Paired sample *t* test of the means shows that life expectancy, infant mortality rate (IMR) and maternal mortality rate (MMR) of RCMS counties are significantly different from those of non-RCMS counties. The difference in health outcome should result from the difference in health input. Obviously, the RCMS counties have significantly high per capita GDP and annual net income per farmer compared to non-RCMS counties. However, the GDP per capita is unlikely to be a direct determinant of the difference of health outcome. The fiscal expenditure on health improvement may play a decisive role in creating the difference in health outcome[2]. Despite the insignificance of per capita subsidies to RCMS between the RCMS and non-RCMS counties, we found that the two other items of fiscal spending show significant differences between the RCMS and non-RCMS counties. The health infrastructure indicators fail to reflect the difference sufficiently between the RCMS and non-RCMS counties because except the ratio of people with clean drinking water all other indicators have no significant differences.

Although the significant difference in health status can be seen between RCMS counties and non-RCMS counties, this difference needs not result from the high percentage of RCMS members. Only after the effects of other factors are controlled can the effect of RCMS be identified. Thus, a multiple

[1] Because the highest enrolment rate of RCMS at the county level is 80 percent, 40 percent is defined as the cutoff line.
[2] Fiscal expenditures on health improvement refer to three items of the fiscal expenditures: subsidies to RCMS, social welfare expenditures and fiscal spending on health care.

regression analysis is required. We shall probe the effect of RCMS in the following health production function by introducing a dummy variable of 'RCMS'.

$$lgH_i = a_0 + a_1 lg(NI_i) + a_2 lg(WFEXP)_i + a_3 lg(MCEXP)_i + a_4 lg(RURDR)_i + a_5 lg(DRNK)_i + a_6 (DCMS)i + \varepsilon_i \quad \text{(Eq. 1)}$$

where H_i = health outcome (IMR, MMR) in county i;
NI_i = average annual net income per farmer in county i;
WFEXP = welfare expenditure per capita in county i;
MCEXP = public expenditure on health (mainly including fund for family planning, public medical care, preventive medical care, women and child's health care and investment in improving rural drinking water)
RURDR = number of licensed rural doctors per 1000 person in county i;
DRNK = ratio of people accessibale to clean drinking water in county i;
DCMS = dummy variable of RCMS (1 if 40% or above of rural population insured) in county i.

Table 1 Comparison of selective indicators between RCMS counties and non-RCMS counties

Unit: Yuan

Indicators	RCMS counties Mean	Non-RCMS counties Mean	Ratio*	Significance
Income				
GDP per capita	9497.02	3681.51	2.58	0.001
Net income, yearly average per farmer	3356.21	2105.55	1.59	0.001
Fiscal expenditures				
Subsidy to RCMS per capita**	2.29	0.81	2.83	0.247
Social welfare expenditures per capita	14.73	7.51	1.96	0.004
Fiscal spending on health sector per capita	12.67	6.72	1.89	0.028
Health infrastructure				
Hospital beds per 1000 persons	1.72	1.48	1.16	0.320
Health professional per 1000 persons	26.47	23.36	1.13	0.396
Licensed rural doctors per capita	0.51	0.75	0.67	0.283
Ratio of people of clean drink water	0.89	0.65	1.36	0.046
Number of village health stations	477.46	383.94	1.24	0.332
Health outcome				
Infant mortality rate (per 1000 live births)	13.14	20.68	0.64	0.015
Maternal mortality rate (per 10000)	2.73	12.46	0.22	0.081
Average life expectancy (years)	72.08	69.72	1.03	0.003

Source: computed from NSRHS by CASS 2001
Note: *Ratio=indicators of RCMS counties/ indicators of non-RCMS counties
** Per capita subsidy to RCMS is computed by dividing aggregates subsidies to RCMS by the total population in stead of the number of members in the county.

Table 2 Estimation results of health outcome indicators: log-linear model

Dependent variables	IMR		MMR	
	Coefficients	t	Coefficients	t
(Constant)	4.06***	4.97	7.12**	3.42
Log welfare expenditures per capita	-0.24**	-2.63	-0.20	-0.85
Log average annual net income per farmer	-0.80***	-3.29	-1.99**	-3.20
Log public spending on health care per capita	0.05	0.80	0.34**	1.85
Log licensed rural doctor per capita	-0.12	-1.60	-0.37	-1.09
Log ratio of people with clean drinking water	0.10	0.74	0.32	1.00
Dummy of 40% villagers of RCMS	0.01	0.10	-0.05	-0.27

Source: computed from NSRHS by CASS 2001

Estimate results shown in Table 2 demonstrate that that over 40 percent of the rural insured by RCMS does not make a significant difference in health outcome after the control of effect of income, whether in terms of IMR or MMR. Moreover, the health outcome is closely related to the farmer's net income, and government's public expenditure on health and welfare. It is noteworthy that public spending on health care per capita bears a sign contrary to the expectation that increase in public spending on health should lead to decrease in MMR. A possible explanation is that many counties have made a remedy fiscal spending in the survey year because of the lower IMR and MMR in the past years. The increased public spending in health cannot enhance the IMR and MMR immediately. Thus what we observed is this contradictory result based on the cross sectional data.

In conclusion, the small amount of money mobilized by RCMS does not sufficiently explain the improvement of IMR and MMR. It is also important to note that welfare expenditure is as important as net income per farmer in lowering the IMR and that public spending on health care is as important as net income per farmer in reducing MMR.

1.2 After-before comparative analysis of the whole country

Many studies have suggested the possible close relation between the breakdown of the rural cooperative medical system and the deterioration of rural health care conditions in China. For example, the World Bank (1997) pointed out that the under-five child mortality rate (U5CMR) in China declined steadily until the early 1980s and then stagnated until 1991. The decline and stagnation of U5CMR coincided with the breakdown of RCMS in time. Experience from other countries suggests that U5CMR need not plateau as China's did in late 1980s (as measured by census and survey data).

A 300-poverty-stricken-county study seems to confirm this relation (Liu *et al* 1996). Despite the low economic growth rate, the poverty-stricken counties had experienced steady economic growth after economic reform. Per capita GDP in real term increased in the late 1980s. However, the health status of people in poverty-stricken counties shows a sign of deterioration. For example, median IMR in the surveyed poor counties increased from about 50 to 72 per 1000 live births during the same period of time.

IMR is actually an important indicator to monitor the health status because it is officially investigated consecutively. As shown in Table 3, the change in IMR ratio of the rural to urban population does not coincide with the change in income ratio of the rural to urban. Though the gap in income between the rural and the urban was narrowing, the gap in IMR broadened from 1.65 in 1981 to 3.35 in 1991. Obviously, the private resources of households cannot fully explain the enhancement of IMR. This phenomenon emerged after RCMS broke down in the period from 1979 to 1981. We then try to introduce a new explanatory factor—public resource mobilized through RCMS.

Table 3 Infant mortality rate in China's urban and rural areas

Unit: deaths in the first year of life per 1000 live births

Year	Rural area	Urban area	IMR ratio of rural to urban	Per capita income ratio of rural to urban
1981	40.5	24.5	1.65	1:2.57
1991	58.0	17.3	3.35	1:2.40
1995	41.5	14.0	2.96	1:2.50
2000	37.0	11.8	3.14	1:2.79

Source: National Statistic Bureau (2002); MOH (2002)

To investigate the significant role of RCMS in enhancing the health status of rural people, one practical way is to compare the scale of external resources mobilized through RCMS before its collapse with that afterwards. However, there is no item of resources mobilized in the Statistics Yearbook. We have to make this comparison indirectly. Though RCMS broke down in 1981, there is

likely to be a time lag between collapse and the change of the health indicators and hence it is rational to use indicators a few years after the collapse. Meanwhile, the availability of data is another consideration. Thus, health indicators and incomes in1981 with those in 1991 are compared.

Before the comparison, some fundamental assumption should be made. Health production is theoretically the function of medical care and consumption of other goods. Empirically the income that represents constrains of the health production function is widely used as explanatory variable. Many studies have shown a positive correlation between income and health status, both on cross sectional and longitudinal bases (Jack 1999 and literature cited therein). In addition to farmer's own resources, the government and community can also mobilize some external resource for health inputs through particular fiscal expenditure, public program and RCMS. Thus, the private health resources measured by income per farmer and public resource measured by resources mobilized from external sectors are two main explanatory variables of health outcome. The health production function is assumed to be a log-linear function of income per farmer and average money per capita mobilized from other sectors (see Eq. 2). It is also implicitly assumed that technology coefficient of health production holds constant within the time period such that all the difference in health outcome is created by the health input, whether over time or across the urban and rural areas.

$$\text{Eq. 2} \quad \lg H = c + \alpha \lg I + \beta \lg S$$

where H = health indicator, here it refers to IMR in particular
I = income per capita
S = resource mobilized from external sectors
c = technology coefficient (e.g., education and knowledge of mother)
α and β are the parameters of income and external money respectively.

Based on the features of production function, α, β should be more than 0 and less than 1. To verify the larger resource per capita (S_b) mobilized from the external sector before 1981 than after the breakdown (S_a), we only need to transform the equation (2), using H and I to express S. The large external resource mobilized by RCMS before the reform relative that after the reform can be proven but omitted in the paper due to the limit of length. Results of calculation suggest that the urban/rural ratio of public resource mobilized through health care financing mechanism in 1991 is higher than that in 1981. There are two possibilities for the higher ratio in 1991: much larger resources were mobilized for the urban health sector in 1991 or much less resources mobilized for the rural health sector. We know that health care financing mechanisms in urban area had almost not changed from 1981 to 1991, but health care financing mechanisms in rural area had changed dramatically. Thus the conclusion may be drawn now that the public resources mobilized for the rural health sector before the breakdown of RCMS is larger than that afterwards. The RCMS did play a significant role in narrowing the gap of IMR between the urban and the rural.

1.3 Case study on the performance of RCMS in Sichuan

We conducted a focus interview with two officials who were in charge of rural cooperative medical scheme in Meishan prefecture and Dongpo District (originally named Meishan county). Dongpo district is medium-sized, medium-developed county located on the Chengdu Plain. By the year 2001, the total population is 8.15 million and the rural residents account for 73.7% of the population, GDP per capita is 5279 yuan ($638.33) and average annual net income per farmer is 2524 yuan. The health infrastructure in this county is also relatively good. There are 33 towns and 56 town health centers. On average, each town has nearly two health centers. The hospital beds and health professionals per thousand people are 1.8 and 2.6 respectively, which are very high relative to other

counties in Sichuan province. Every village has functioning health station. The relatively good health infrastructure is believed to be attributable to RCMS under persisting operation.

Meishan County has been famous for its health insurance experiment undertaken by Rand Corporation of the United States in collaboration with Ministry of Health of China in 1980s, whereby it became the model of implementing RCMS. One of the interviewees took part in that research program and has been engaged in the administration of RCMS since then. The major interview results can be summarized as follows: first of all, the number of towns/townships with RCMS and covered population was decreasing. There were 19 towns in 1999 and 14 in 2000 out of 33 towns in the Dongpo district operating RCMS. The number of RCMS members diminished from 399 thousand in 1999 to 343 thousand in 2000. Secondly, compared with the ratio of premium to per capita income of the urban (6 %), premium of RCMS is lower than 1% of the annual net income per farmer. Thirdly, as long as a town had RCMS, the enrollment rate of the rural was quite high (96%). Fourthly, the benefit package also included health inspection for those households that had not had any hospitalized members over the past two years. Every household participating in the schemes could enjoy direct benefits. Finally, 7.6 million yuan was mobilized through RCMS; 6.8 million yuan was indemnified to 11890 patients who had been hospitalized and 2.9 percent of participants made claims to insurance funds in 1999. However, the total premiums were only 2.15 million in 2000.

Then we select the RCMS in the town of Shiqiao out of 14 RCMS for performance assessment, following an approach proposed by Arhin-Tenkorang (2001). The relevant evaluating indicators can be seen in Table 4. The results indicate that either the capacity of resource mobilization or effectiveness of risk protection is weak. The ratio of "health care expenditure" to "revenue from contribution" is 1.04 and the ratio of "average expenditures on individual" to "average individual contribution" should be as high as 1.25. In reality the ratio in 2000 was only about 1.10 in the town of Shiqiao. The small difference between the ratio and unity indicates that the capacity of resource mobilization is quite weak. In terms of effectiveness of financial protection, as measured by the ratio of premium net income per farmer, the financial protection is rather ineffectual. In most townships the ratio is only 0.2%, much lower than the rate (1-2%) recommended by the WHO, not to mention the rate of urban employee health insurance scheme (6%). Furthermore, the low premium can afford only low coverage, which subsequently leads to a low willingness to pay for this type of scheme.

Table 4 Performance of health insurance scheme in the town of Shiqiao

Resource mobilization capacity indicators	Value	Effectiveness of risk protection indicators	Value
Premium (Y/Year. capita)	5	Ratio of premium to net income per farmer	0.2%
Costs of inpatient services consumed by the members	113866.8	Payment schedule	Once a year
Magnitude of external subsidy	0.3 Y per member	Rate of cost recovery	55%
Size of risk pool	10378 persons	Size of risk pool	10378
Ratio 1=HCEXP/REV	1.04	Completeness of benefit package	Similar to private health insurance
Ratio 2=AVEXP/PREM	1.10	Co-payment rate	45%

Source: computed from ZEF survey 2002

2 Willingness to pay for the improved RCMS in Sichuan province

The contingent valuation (CV) approach was firstly utilized by Davis in his study on environmental economic issues in 1964. The approach had then been extended to other disciplines such as health economics, educational economics etc. The essence of the CV approach is to ask people to provide in

a hypothetical setting a monetary value for a good for which the market is missing. The advantage of CV method is that it can create a hypothetical market for non-market goods and public services so that the non-market goods' prices are readily observed and hence make it possible for economists to conduct cost-benefit analysis and for agents to make sound decisions. In the mean time, some economists argued that real transactions are much more reliable indicators of value than self-reported behavioral intention (e.g., Randall 1997). Suspicion about the reliability arose because of the "hypothetical answers to hypothetical questions" which may deviate from the "true" valuation to certain extent. Concretely speaking, the deviation comes mainly from 'response effect biases', according to Carson (1997). However, The validity of the contingent valuation approach is a question that must be resolved empirically. Notwithstanding the deviation from the real value, CV studies can produce estimates reliable sufficiently to be the starting point for a judicial or administrative determination of natural resource damages—including passive use values (Arrow *et al* 1993).

The contingent valuation approach will be employed in this study to estimate the potential demand for RCMS in China and identify the factors affecting the willingness to pay (WTP). This approach has already been widely used in the area of health economic studies. The studies included WTP for disease treatment and management, new technology, and efficacy evaluation of health care and health programs (e.g., Walraven 1996; Zethraeus 1998). There are also a few studies dealing with the issues of health care financing in developing countries (Asenso-Okyere *et al* 1997; Asfaw 2002; Mathiyazhagan 1998). Theory and empirical evidences suggest that studies undertaken in developing countries could obtain valid and reliable health-related WTP results (Russel *et al* 1995). The most commonly used methods have been the bidding game, the payment card and the take-it-or-leave-it (TIOLI) (Diener *et al* 1998; Klose 1999). Nevertheless, careful design and procedural implementation is essential to increase the validity and reliability to a satisfactory extent.

2.1 Conceptual and analytical framework

2.1.1Theoretical model of willingness-to-pay

Willingness to pay can be defined as the maximum amount that individuals are willing to pay in order to acquire a certain benefit package provided by the hypothetical health insurance scheme. This sum is the amount of money that would make an individual indifferent between contributing to the scheme and subsequently getting reimbursement when health care costs incurred and not contributing to the scheme while keeping the money. Household utility is defined as a function of the consumption of a compound good Z and the security of health insurance scheme, HI, given by:

Eq.3 $U = U(Z, HI) \qquad Uz > 0 \text{ and } Uhi > 0$

In this case the utility is increasing with *Z* and *HI*. Solving the consumer problem, one can obtain the indirect utility of an individual who joins the community based health insurance scheme given by:

Eq.4 $$V_1 = V_1(Y - WTP \mid HI > 0, X, \mu)$$

where Y is the household income, WTP is a money amount that makes HI non zero, X is a vector of the household's observable characteristics and μ is a vector of non-observable characteristics. In technical terms, WTP refers to the amount of money that equates indirect utility functions with and without the existence of a certain scheme. Mathematically,

Eq.5 $$V_1(Y - WTP^* \mid HI > 0, X, \mu) = V_0(Y \mid HI = 0, X, \mu)$$

Next, assuming that $V_1(\lambda, WTP|HI > 0, X, \mu)$ is increasing in λ, there exists an inverse function $\psi(v, X, \mu)$ which makes $\psi(V_1(\lambda, WTP|HI > 0, X, \mu), X, \mu) = \lambda$. Therefore, the willingness to pay can be expressed as:

Eq.6 $$WTP^* = Y - \psi(V_0(Y|HI = 0, X, \mu), X, \mu) \equiv WTP^*(Y, X, \mu)$$

2.1.2Decision procedure and econometric specification

The rural households' decision to pay for a hypothetical RCMS could be decomposed into two steps. First, the households have to make up their mind to join or not on the basis of the expected utility of two options, namely, willingness to join (WTJ); next, conditional on the decision to join they decide how much to pay for a specific benefits package, namely, willingness to pay (WTP). Based on this two-step process, the WTJ and WTP's decision models are going to be estimated independently. A Logit model is applied to simulate the willingness to join (WTJ).

Eq.7 $$\log\frac{\Pr ob(join)}{1-\Pr ob(join)} = \alpha_i Y_i + \beta_i X_i + \mu$$

where X is the vector of household attributes, and Y is household income.

A multiple regression equation is used to model how much one is willing to pay for the hypothetical RCMS once one decides to participate in the scheme, namely, $WTP > 0$.

Eq.8 $$(WTP)_i = \alpha_i Y_i + \beta_i X_i + u_i$$

The explanatory variables in Eq.8 are not necessarily just the same as those in Eq.7.

Alternatively, a less frequently used method is to derive the WTP values from estimated health care demand equations. However, unless unconditional health care demand functions are estimated this method suffers from adverse selection problems since the demand functions are basically estimated on the basis of the data from those who already had some health problems and sought health care.

2.2 Data

This study is based on a Health Insurance Survey in Rural Sichuan (HISRS) conducted at the beginning of 2002. The study areas of WTP are five sample counties in Sichuan Province. We selected 300 households out of 10 villages of 10 towns in five counties in a way of multiple-stage sampling.

The CV interviews were designed as an open-ended questions format to ask the respondents directly how much they were willing to pay for the benefit package provided by the proposed CBHIS. The advantages of the open format are that (i) the answer can be directly taken as the maximum WTP; (ii) WTP can be measured as a continuous variable and hence is easy to be analyzed with simple statistical methods such as OLS; (iii) it requires a relatively small sample. Its shortcoming includes the difficulty of answering, high non-response rate, unreliable answers and high liability to strategic response behavior of respondents (Asfaw 2002).

2.3 Results

2.3.1 Willingness to join an improved RCMS and its determinants

Results demonstrate that 208 of 300 households (69.3%) are willing to join the hypothetical RCMS immediately, while 16.0 percent of households are unwilling to join (UWTJ) and 14.7 percent still in hesitation (IH). Diagram (b) shows that the most frequent reason cited by respondents is 'distrust of the management of the insurance fund', which accounts for 36.7 percent of the reluctant

(UWTJ & IH). Twenty-five respondents (27.8%) said they had no money for the premium. The percentage of WTJ is not so optimistic as expected considering that many of the sample communities had once established a successful RCMS. Also it is much lower than percentage of WTJ in Ethiopia (94.7%), while slightly higher than that of Ghana, 64 percent (Asfaw 2002; Asenso-Okyere *et al* 1997).

The description of the variables that are used in the econometric analysis is presented in Table 5. A logit model is estimated through three specifications and the estimation results are reported in Table 6. In the first model county difference and risk aversion are not introduced. Estimation results demonstrate that seven variables, ethnicity, household head's education, mother's education, land area, cash income and whether a household has migrant workers, are identified as significant factors affecting willingness to join. Five of the seven variables bear expected signs. For instance, the Yi people are much more likely to be willing to join the hypothetical RCMS. The more households earn cash income, the more likely they are willing to join. However, age and education of the household head bear signs that are inconsistent with theoretical expectation. Generally speaking, the aged and educated are more likely to join the hypothesized scheme. The possible reason for bearing opposite signs may be that the aged and educated heads are more capable of making use of alternative risk management instruments such as formal insurance and private transfer the within extended family.

Table 5 Definition of variables for WTJ Binary Logit model

Variables	Definition of variables	Mean
Dependent variable		
WTJ_01	Willingness to join: y=1 if one is willing to join; y=0 otherwise	0.694
Independent variables		
Head attributes		
ETHNICT	Ethnic group dummy: 1 if the household head belongs to minority people; 0 otherwise	0.214
HEADAGE	Age of household head in years	42.923
HEADEDU	Education of household head in schooling years	5.439
SPOUSEDU	Education of house wife in schooling years	4.203
Household attributes		
HHSIZE	Household size: number of members of a household	4.148
INDRADE	Ratio of independents to dependents	2.689
JOBBER	Dummy: whether a household has member being migrant worker, 1 if yes; 0 otherwise	0.458
DISTANS	Distance of home from the town center in Kilometers	4.040
Income		
LANDAREA	Land area owned by a household in Mu	7.217
LG_INCCS	Logarithm of cash income of the household last year (yuan)	3.748
Health risk magnitude		
LG_HLCST	Logarithm of health care costs of the household last year (yuan)	1.705
Experience		
CBHISEXP	Dummy: whether a household has any member having once joined RCMS, 1 if yes; 0 otherwise	1.528
Risk aversion	Reference group=non smoking	
CIGAR_FW	Dummy: 1 if household head smokes below 1 packet a day and 0 otherwise	0.638
CIGAR_MN	Dummy: 1 if household head smokes over 1 packet a day and 0 otherwise	0.192
County	Reference group=Dongpo county	
CTY_JG	County dummy: 1 if one household is in Jiange and 0 otherwise	0.177
CTY_FS	County dummy: 1 if one household is in Fushun and 0 otherwise	0.192
CTY_YY	County dummy: 1 if one household is in Yanyuan and 0 otherwise	0.214
CTY_HY	County dummy: 1 if one household is in Hanyuan and 0 otherwise	0.203

As stated before, we cannot use the coefficients of the logit model to make a marginal analysis because the equation is nonlinear. The marginal effect coefficients are computed on the basis of the equation (4-18). The marginal effects of significant coefficients in logit models are also shown in Table 5-11. Now a change in any one of the independent variables has an impact on the probability of willingness to join. For instance, a one-year increase around the mean of mother's education would lead to an increase in probability of WTJ by 2.7 percent. Likewise, for dummy variable "ethnicity", being minority would enhance the probability of WTJ by 27.2 percent. With respect to cash income, the marginal effect is actually the elasticity of WTJ because both the dependent and independent variables are in form of logarithm. It can be explained that one percent increase in cash income will lead to 0.6 percent of increase in probability of WTJ. As the comparison of all the parameters shows, income is a strong determinant only second to ethnicity. This indicates that the rich households are more likely to join. Estimation results also indicate that the migrant jobber is significantly negative related to the willingness to join. The reason is evident, it is inconvenient for these migrant workers to reimburse the medical bill, and the high health care costs in coastal cities make the small amount of repayment less attractive.

Table 6 Estimation results of WTJ the improved RCMS: Logit model

Variable	Coefficient	Std. Error	Marginal coefficient	Coefficient	Std. Error	Marginal coefficient
	(1)			(2)		
Head attributes						
ETHNICT	1.761***	0.606	0.272			
HEADAGE	-0.036**	0.016	-0.006	-0.042**	0.017	-0.007
HEADEDU	-0.162***	0.058	-0.025	-0.206***	0.066	-0.036
SPOUSEDU	0.172***	0.055	0.027	0.178***	0.060	0.031
Household attributes						
HHSIZE	0.047	0.158	0.007	0.153	0.166	0.026
INDRADE	0.067	0.056	0.01	0.062	0.060	0.011
JOBBER	-0.894***	0.319	-0.138	-0.751**	0.350	-0.130
DISTANS	-0.046	0.041	-0.007	-0.033	0.046	-0.006
Income						
LANDAREA	0.203***	0.056	0.031	0.039	0.049	0.007
LG_INCCS	0.598**	0.28	0.092	1.192***	0.346	0.206
Health risk magnitude						
LG_HLCST	-0.04	0.107	-0.006	-0.101	0.119	-0.018
CBHISEXP	-0.414	0.334	-0.064	-1.144**	0.486	-0.198
Risk aversion						
CIGAR_FW				0.317	0.444	0.055
CIGAR_MN				-0.587	0.572	-0.101
County						
CTY_JG				1.307*	0.776	0.226
CTY_FS				-2.214***	0.540	-0.382
CTY_YY				2.634***	0.909	0.455
CTY_HY				-0.809	0.640	-0.140
Number of observations	271			271		
Log likelihood function	-136.17			-121		
Restricted log likelihood	-165.29			-165.30		
Chi-squared test	58.24			88.56		

Source: computed from ZEF survey 2002

Next, let's turn to specification (2). The risk aversion measured by the numbers of cigarettes the household heads smoke and county dummies are introduced into the model. Estimation results demonstrate that the risk aversion measured by cigarettes smoking does not affect the willingness to join significantly. The reason may be that the measurement is not accurate enough to reflect the difference of risk attitudes of households. In addition, the introduction of new variables can be viewed as a test of sensitivity. As a result, the model is stable because all the coefficients almost do not change after the introduction of new variables. Concerning county dummies, their introduction increases the log likelihood function and value of Chi-squared largely. Dongpo county being the reference group, the households in Jiange and Yanyuan counties show significantly large WTJ while the households in Fushun county show significantly small WTJ the hypothetical RCMS.

2.3.2 Willingness to pay and its determinants

To see what types of benefits package are desirable and demanded most, three benefit packages are designed, namely, complete coverage without co-payments, complete coverage with half co-payments and inpatients services coverage. The sample households are willing to pay on average19.57 Yuan per year per capita for coverage of inpatients service. For a complete benefit package without co-payment the sample households are willing to contribute on average 58.08 Yuan per capita per year and for a complete benefit package with 50% co-payment they are willing to contribute 32.50 Yuan per capita per year. One point to note is that willingness to pay for the RCMS with half co-payment exceeds half of WTP for the RCMS with no co-payment. This indicates that the RCMS with half co-payment is more desirable than the others.

Now that the data of WTP we acquire from open-ended question can be treated as continuous variable, we may estimate the multiple regression models by ordinary least square (OLS). The correlation matrix of variables was used to test the collinearity, one of any pairs of variables that have perfect (R^2=1) and highly close ($R^2 \geq 0.7$) collinearity was excluded. Willingness to pay, income, health care costs, and other variables that are skewed are transformed with the logarithmic form. The positive infinite value of the variables (ratio of dependents to independents) was replaced with the second maximal value. After the logarithmic transformation of dependent variable and part of independent variables, the estimation is actually a semi-logarithmic regression.

The estimation results of determinants of WTP for zero co-payment schemes are shown in Table 7. We use two specifications. First, only the household head attributes, household attributes, income, measurement of adverse selection and so on are allowed to enter the model, while the regional difference is ignored temporarily as shown in estimation (1). Results indicate that seven variables are significantly related to WTP for non-co-payment scheme. Household cash income is positively related to WTP for non-co-payment scheme. The coefficient of logarithm of cash income is 0.41, implying that WTP for non-copayment scheme increases by 0.41 percent as the income rises by 1 percent, other conditions being constant. Mother's education is also a highly significant determinant. A one-year increase in mother's education will raise WTP by 6.1 percent, other conditions being held constant.

Ethnic group and whether or not a household has a migrating worker affect WTP significantly, i.e. two dummy variables. However, if the dependent variable is logarithmic, the relative change in mean Y for the dummy variable can only be obtained by taking the antilog (to base ten) of the coefficient of a dummy variable and subtract 1 from it (Gujarati 1995). The households in the Yi community are thus willing to pay 2.24 Yuan more, everything else held constant. Migrant workers are quite common for the rural households in Sichuan. The result indicates the negative relationship. The households with at least one migrant worker now or in the past are willing to pay 0.48 Yuan less than those households without migrant worker. The possible reason is the inconvenience of reimbursement and

inability to cover the costs of health care in case an illness incurs in costal city; another reason is that those who work in a city far from hometown have increased difficulty in monitoring the operation of the fund, namely, they have more distrust in the scheme. This gives rise to severe problems with the reconstruction of RCMS in Sichuan.

Since the decision to pay for a scheme needs to be made on the basis of the whole household, it is reasonable to test the impact of household's characteristics. As a result of estimation, the regression coefficients bear positive signs, providing contradictory evidence to our hypothesis. The impact, however, is not only quite slight but also has no statistical significance.

In the specification (2), the county difference is taken into account to see if the large variation in the above variables comes from different counties and how large the marginal effect of willingness to pay is. We have 4 dummies of counties but due to the problem of high collinearity between the ethnicity and CBHIS experience versus the county dummies, the dummy variables of ethnic group and RCMS experience are kicked out in the least square estimation. Estimate results demonstrate that the WTP in county Jiange is significantly lower than the reference county, Dongpo. The willingness to pay of Hanyuan households is significantly higher than the reference county. The other two variables of county are not statistically significant. The F tests have verified that each of the two models is valid in general; the explanatory variables do help explain the variation of WTP about its mean. Goodness-of-fit can be shown by adjusted R square.

Table 7 Determinants of WTP for RCMS with zero co-insurance rate

Dependent Variable: Log(WTP)	Coefficient	Standard Error	Coefficient	Standard error	Mean of X
Explanatory variables:	(1)		(2)		
Head attributes					
ETHNICT(1=minority)	0.526***	0.196			
HEADAGE	0.010*	0.005	0.010*	0.005	42.626
HEADEDU	0.007	0.017	0.010	0.016	5.504
SPOUSEDU	0.061***	0.017	0.047***	0.017	4.326
Household attributes					
HHSIZE	0.035	0.045	0.017	0.043	4.165
JOBBER(1=with migrant)	-0.169**	0.097	-0.114	0.095	0.452
DEP_IND	-0.042	0.084	-0.058	0.082	0.748
LG_DIST	0.220**	0.085	0.000	0.098	1.424
Income					
LG_LANDA	-0.309***	0.078	-0.072	0.099	1.825
LG_INCCS	0.407**	0.158	0.275*	0.159	3.756
Health risk magnitude					
LG_HLCST	-0.012	0.032	-0.016	0.031	1.770
CBHISEXP	-0.052	0.107			
Risk aversion					
CIGAR_FW	-0.180	0.123	-0.244**	0.119	0.613
CIGAR_MN	-0.065	0.154	-0.062	0.149	0.191
County					
CTY_JG			-0.291*	0.160	0.213
CTY_FS			-0.124	0.166	0.143
CTY_YY			0.313	0.220	0.226
CTY_HY			0.497***	0.172	0.209
Constant	1.811	0.676	2.311	0.638	
Number of observation	229		229		
Adjusted R-squared	0.172		0.231		
Model F test	4.38		5.30		
Durbin-Watson Statistic	1.981		2.066		

Source: computed from ZEF survey 2002

3 Summary and recommendation

The comparative analyses show that RCMS as a whole played a significantly big role before the reform in mobilizing resources and hence enhancing the national health status while the present RCMS seems to have no significant role in enhancing the health status on the county level due to the low coverage. However, this preliminary conclusion needs further investigation.

To make RCMS more desirable, an improved RCMS was hypothesized and willingness to join and to pay was investigated. Findings show that WTJ (69%) is not high in consideration of the high enrolment rate (over 90%) of RCMS in the 1960s and 1970s. But the percentage of WTJ is high sufficiently to sustain the operation of RCMS in a town. Among three hypothetical benefit packages of RCMS: inpatient services coverage, complete coverage with half co-payment and complete coverage with no co-payments, the second benefit package is most desirable because WTP for it exceeds WTP for complete coverage with no co-payment. Although WTP for hypothetical RCMS with half co-payment has a reimbursement ratio similar to the present RCMS, the mean of WTP (32.50 yuan) is much higher than the premium of the present RCMS (6 yuan). The hypothetical RCMS with half co-payment distinguishes itself from the existing RCMS by its strict insurance fund management and enlarged benefits (outpatient services covered). Thus, the capacity of risk protection and fund management is crucial to enhancing WTP. Moreover, attributes of household head (age, mother's education and ethnic group), household attributes (distance from center, whether with migrant worker) as well as income are closely related to WTJ and WTP.

On the basis of the survey results and econometric analysis, what the government and community need to do is to enlarge the capacity of RCMS to mobilize resource, and protect risk against costs of illness. To fulfill this task, the rural cooperative medical scheme should be designed with complete coverage with half co-payment, private contribution of over 30 Yuan per capita per year, strict management of insurance funds and enhanced subsidies from local and central governments, especially for the rural people in the underdeveloped provinces in Middle and Western regions. In the process of reviving RCMS, the central, provincial and county government should play an active role in subsidizing, guiding and regulating and the town government and village should be major executive agencies and administrators.

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