

Community-based health insurance in poor rural China: the distribution of net benefits

HONG WANG,¹ WINNIE YIP,² LICHENG ZHANG,³ LUSHENG WANG⁴ AND WILLIAM HSIAO⁵

¹Global Health Division, Yale University School of Public Health, New Haven, CT, USA, ²Department of International and Population Health, Harvard School of Public Health, Boston, MA, USA, ³Beijing University School of Public Health, Beijing, China, ⁴National Health Economics Institute, Ministry of Health, Beijing, China and ⁵Department of Health Policy and Management, Harvard School of Public Health, Boston, MA, USA

The collapse of China's Cooperative Medical System (CMS) in 1978 resulted in the lack of an organized financing scheme for health care, adversely affecting rural farmers' access to health care, especially among the poor. The Chinese government recently announced a policy to re-establish some forms of community-based insurance (CBI). Many existing schemes involve low premiums but high co-payments. We hypothesized that such benefit design leads to unequal distribution of the 'net benefits' (NB) – benefits net of payment – because even though low premiums are more affordable to poor farmers, high co-payments may have a significant deterrent effect on the poor in the use of services in CBI. To test this hypothesis empirically, we estimated the probability of farmers joining a re-established CBI using logistic regression, and the utilization of health care services for those who joined the scheme using the two-part model. Based on the estimations, we predicted the distribution of NB among those who joined the CBI and for the entire population in the community. Our data came from a household survey of 4160 members of 1173 households conducted in six villages in Fengshan Township, Guizhou Province, China. Three principal findings emerged from this study. First, income is an important factor influencing farmers' decision to join a CBI despite the premium representing a very small fraction of household income. Secondly, both income and health status influence enrollees' utilization of health services: richer/sicker participants obtain greater NB from the CBI than poorer/healthier members, meaning that the poorer/healthier participants subsidize the rich/sick. Thirdly, wealthy farmers benefit the most from the CBI with low premium and high co-payment features at every level of health status. In conclusion, policy recommendations related to the improvement of the benefit distribution of CBI schemes are made based on the results from this study.

Key words: community-based health insurance, health care utilization, equity, rural health care, China

Introduction

In China, more than 500 million rural residents lack adequate basic health care and risk impoverishment if they become seriously ill. Before the 1980s, China emphasized prevention and public health for rural health care, making essential drugs and basic health care widely available, and creating an organized three-tiered health care delivery system of village health posts, township health centres and county hospitals. The rural Cooperative Medical System (CMS), a form of community-based health insurance (CBI), was established in 90% of the communes where the commune organized and funded the services. With the transition from the collective to the individual household land leasing and farming system in 1978, the CMS also collapsed (Hsiao 1984; Gu et al. 1993). The rural population covered by any form of insurance dropped from 92.6% to 6.1% between 1976 and 1990 (Feng et al. 1995), and a 1998 China National Health Service Survey indicated that more than 87% of farmers did not have any health insurance coverage and had to pay full medical expenses out-of-pocket (Ministry of

Health PRC 1999). The survey further showed that the two-week outpatient utilization rate reached only 13% in poor, rural areas (22% lower than the average level in rural areas), and 71% of farmers recommended by a doctor to be admitted to hospital were unable to use inpatient services due to their inability to afford high hospitalization expenses (Ministry of Health PRC 1999).

Large medical expenses that can occur in the absence of financial risk protection have impoverished many rural families. Several studies have shown that 15–22% of poverty-stricken Chinese families became poor due to family members' health problems (Health Care Financing and Organization in Poor Rural Areas of China Project Group 1998; Ministry of Health PRC 1999). Families often have to borrow money or sell their productive goods, such as seeds for the next season, in order to pay for medical expenses. Poverty due to illness has thus become a significant social problem in rural China.

Following policy announcements made in 1994 and 1997 (State Council 1994), there have been a number of local

efforts to re-establish some forms of CBI. Most of these newly established CBIs share certain common features: they offer one single benefit package covering both basic and catastrophic expenses, they require a low premium, and enrolment is voluntary (Health Care Financing and Organization in Poor Rural Areas of China Project Group 1998; Carrin et al. 1999). One reason that this design is popular is that it matches beneficiaries' preference for services with capacity to pay: farmers demand that the scheme cover both basic and catastrophic health services (Wang et al. 2003), yet their ability to pay the premium is limited (Carrin et al. 1999). In addition, a low annual premium can be expected to reduce financial barriers to CBI enrolment and therefore encourage farmers, especially poor farmers, to join the scheme. Both of these factors are seen as favourable to increasing enrolment and therefore satisfy the government's policy goal of increasing CBI coverage. However, for CBIs to be financially sustainable, a low premium with broad coverage has necessitated high co-payment rates for services. With a typical co-payment rate of 80%, reduced financial barriers to CBI enrolment may be offset by high financial hurdles for service utilization, especially for the poor farmers.

The CBI's low premium/high co-payment benefit design could have important equity implications in a number of dimensions. For instance, a low premium may increase equity in enrolment among the rich and poor by making health insurance affordable to those with low incomes. In this case, the equity of CBI enrolment could be improved by adopting the low premium strategy. A high co-payment for services, however, may deter actual service utilization among poor CBI enrollees through its effects on high out-of-pocket expenditure. In this case the equity of health service utilization might be reduced due to high co-payment rates. Despite the widespread recognition of equity being an important objective in health policy (Qiu 1989; Aaron 1992; Wagstaff et al. 1992; Culyer and Wagstaff 1993; Smith 1993; Henderson et al. 1994; Liu et al. 1999; Liu et al. 2002; Roberts et al. 2004), there has been no empirical evaluation of the equity impact of a system of low premiums and high co-payments. The goal of this study is to empirically assess the impact of China's newly established CBI on the equity of CBI enrolment, health service utilization and the net benefit (NB) distribution among enrollees and the overall population in the community that established CBI.

The rest of the paper is organized as follows. We first present a conceptual framework which guides our empirical assessment of equity in CBIs. This framework is followed by a description of the methods used to estimate our models and of the data collected. We then present the results of our findings and, finally, discuss policy implications of equity in CBI enrolment, service utilization and the NB distribution among enrollees and the overall population in the community.

Methods

Conceptual framework

In this study, we define 'net benefits' (NB) as the difference between the value of services that an individual receives and the sum of premium and co-payment that the individual pays out-of-pocket, which is different from the 'net benefit' used in cost-benefit analysis and cost-effectiveness analysis. To examine the equity implications of a low premium and high co-payment benefits package, we decompose the NB that an individual receives into two components, and examine how income and health affect each of them. These two components include the decision to enrol in CBI and the decision to use services, which could be described as the following:

$$E(\text{NB}) = \text{Pr}(\text{Enrolment}) \times E(\text{NB}|\text{Enrolment}), \text{ where}$$

$$E(\text{NB}|\text{enrolment}) = [\text{Pr}(\text{Use}|\text{Enrolment})$$

$$\times E(\text{Quantity}|\text{Use}) (1 - \text{co-payment rate})] - \text{Premium}$$

If a farmer does not join the CBI, his/her premium is zero, his/her co-payment is effectively 100%, and therefore the NB to him/her is zero. If a farmer joins the CBI, he/she has to pay a premium, but will pay for only a fraction of the charge for services when he/she utilizes health services.

How does income affect a farmer's decision to enrol and to use services given he/she is enrolled in the CBI? In deciding whether to enrol or not, a farmer compares the expected NB he/she will enjoy under the two scenarios. A lower premium increases the expected NB of enrolment and therefore a farmer's probability of enrolling (Feldstein 1993). The effect is stronger for those with lower income as the same amount of premium represents a greater share of income of the lower income farmers. Further, whether a farmer will use services and the amount of services he/she will consume is dependent on the price of the service. The higher the co-payment, the higher the prices and the less likely the farmer will use services. As shown in the literature, the poor have a more negative price elasticity than those with high incomes. This implies that a high co-payment will have a greater negative impact on the utilization of services for the poor.

In addition to income, health status plays an important role in people's decisions to enrol in health insurance: the less healthy have a greater potential to utilize medical services, and are therefore more willing to join health insurance schemes, which is termed adverse selection (Rothschild and Stiglitz 1976; Feldstein 1993; Cutler and Zeckhauser 2000). Because poverty and poor health status in China are closely related (Liu et al. 2001), the equity effects of the CBIs' low premium/high co-payment system are theoretically uncertain. Wealthier enrollees can afford to pay high co-payments, for instance, leading them to demand more services and therefore derive a greater benefit from the scheme than poorer enrollees; in that case, the poor would subsidize the rich. On the other hand,

because poorer enrollees usually have worse health status, they may use more services than wealthier enrollees and therefore obtain greater benefits from the scheme than the rich; the rich could thus subsidize the poor. The evidence base in support of either scenario is limited.

Empirical models

Based on the conceptual framework, we estimated two empirical models. The first models the probability of joining the CBI. A logistic regression is used to establish the predicted probability of participation and to explore how related factors, especially income level and health status, influence people's decisions about participating in the re-established CBI. Secondly, CBI participants' health service utilization (as measured by utilization rates and medical expenditures per utilization) is predicted using the two-part model (Duan et al. 1983; Cretin et al. 1990; Jones 2000). The use of outpatient services and inpatient services are modelled using separate two-part models. In each, the probabilities of outpatient and inpatient service utilizations are estimated using logistic regression. The outpatient and inpatient health service expenditures, conditional on positive outpatient/inpatient service utilization, are then estimated using ordinary least squares (OLS) linear regression. Since medical expenditure usually has a skewed distribution, the natural logarithms of medical expenditures of total outpatient services and total inpatient services are used in the models. Predicted log medical expenditures are re-transformed to a raw scale in order to calculate the predicted total medical expenditure using the smearing technique (Duan 1983).

After construction of the CBI participation model and health service utilization model described above, the 'recycling' prediction method is used to predict the distribution of participation rate, utilization rates and expenditures based on income and health status with the assumption of all other variables being fixed (Yip et al. 1998; Stata Corporation 2003).

Source of data

The study uses data collected from a household survey conducted in the Fengshan Township, located in China's Guizhou Province, at the end of 2002. Based on government statistics, the annual per capita income in Fengshan was about 2000 Chinese yuan (US\$275) in 2001. This township has one township hospital and 56 village doctors who serve in village health posts across the whole township. In 2001, this township re-established a CBI with a 10 yuan (US\$1.2) premium from each participant, 3 yuan subsidy for each participant from township government and 20% reimbursement rate (80% co-payment rate) for prescription drugs. The premium is usually collected during October and November each year, since these are the months when farmers sell their farm products and have cash to pay the premium. Only drugs are reimbursed: the scheme does not cover medical examinations and other service fees. The actual reimbursement is only about 10% of total expenditure (based on

the estimation using survey data). Therefore, we used 10% as the reimbursement rate (90% co-payment rate) in our actual estimation of the NB.

The study population was chosen through multistage sampling. In the first stage, random sampling was used to select six villages. In a second stage, all households with family members in the 'high-risk' population, as well as about one in three other households chosen at random, were selected ('high-risk' was defined as: single elderly; the disabled; those with dementia; women who were pregnant in the previous year or at the time of interview; those admitted to the hospital in the previous year; those with a severe health condition as diagnosed by the village doctor). The entire sample includes 1173 households with 4160 residents from the six sampled villages. A sample weight variable was created based on different sampling probabilities for households with a family member in the 'high-risk' population and other households for weighted analysis (Palta 2003), and robust estimation was used in the regression analyses to control for potential cluster effects within households.

Variables

Variables considered for analysis included: CBI participation, health care utilization, income, health status, and socio-demographic characteristics. We expected that both the income and health effects described earlier would influence people's willingness to participate in the CBI, where the probability of CBI participation by farmers with higher incomes and/or worse health would be greater than the probability of participation by those with lower incomes and/or better health. In terms of health care utilization, information was collected on the use and cost of both outpatient services during the preceding month of the survey and inpatient services during the preceding year. In extrapolating the estimates of monthly outpatient expenditure to an annual figure, we applied a seasonal adjustment. Due to the lack of information on seasonal adjustment from the local area, we used the seasonal adjustment data from a Rand Rural Health Insurance Study in rural China (Chinese Rural Health Insurance Study Group 1990). This data showed that the December total outpatient expenditure is 9.08% of annual outpatient expenditure. Since the survey was conducted at the end of December, we multiplied the monthly expenditure obtained from our survey by the inverse of 9.08% to obtain the annual outpatient cost.

We expected that both income and health effects would influence the utilization rate and expenditures per utilization, with those who were wealthier and/or in worse health exhibiting higher rates/expenditures than those who were poorer and/or in better health. The amount of non-medical consumption was used as a proxy for farmers' incomes because of the sensitivity and difficulty of obtaining income levels with the interview approach. By assuming that people who consume more non-medical goods also have the capacity to pay for more medical care, we believe that non-medical consumption reflects people's

Table 1. Description of variables

Characteristics	Description	%/mean (n = 4048)
Low income*	Total expenditure (net of medical expenditure) is in the 0–25% percentile. Omitted group	25.0
Medium income	1 if total expenditure (net of medical expenditure) is in the 26–75% percentile, 0 if otherwise	50.0
High income	1 if total expenditure (net of medical expenditure) is in the 76–100% percentile, 0 if otherwise	25.0
Poor health*	Self-perceived health is 'poor' or 'fair'. Omitted group	21.4
Medium health	1 if self-perceived health is 'good', 0 if otherwise	35.0
Good health	1 if self-perceived health is 'very good' or 'excellent', 0 if otherwise	43.6
Age 1–14*	Age ≤14 years. Omitted group	26.3
Age 15–60	1 if age >14 and ≤60 years, 0 if otherwise	62.0
Age >60	1 if age >60 years, 0 if otherwise	11.8
Male	1 if male, 0 if otherwise	52.5
Unmarried*	Unmarried. Omitted group	39.3
Married	1 if married, 0 if otherwise	54.6
Divorced	1 if divorced or separated, 0 if otherwise	6.1
Illiterate*	Illiterate and age ≥6 years. Omitted group	20.6
Elementary	1 if elementary school, 1–6 years, 0 if otherwise	46.8
Junior high	1 if primary school, 7–9 years and above, 0 if otherwise	26.1
Children	1 if children <6 years, 0 if otherwise	6.6
CBI	1 if covered by CBI, 0 if otherwise	66.4
D-village	Mean distance (km) from home to village health post	1.3
D-township	Mean distance (km) from home to township hospital/health centre	8.0
D-county	Mean distance (km) from home to county hospital	22.0
Weight	High risk households (weight = 1 if high risk, 2.335 otherwise)	36.9

*These variables are reference groups in regression analyses.

ability to pay for health services. Income levels were grouped into high-income, medium-income and low-income brackets. A self-assessed measure of health was used to measure health status, with 'excellent' and 'very good' health representing good health status, 'good' representing medium health status, and 'fair' and 'poor' representing poor health status. Possible interaction effects between income and health status on the probability of CBI participation and/or health service utilization were captured through a set of dummy variable interaction terms. Finally, socio-demographic characteristics felt to influence health service utilization were included in analyses as control variables. These included: age, gender, marital status, level of education and the distance from respondent's home to the village health post, township hospital and county hospital, respectively. Table 1 describes these variables and provides summary statistics for each.

Results

CBI enrolment

Farmers with low incomes and/or in good health are less likely to enrol in a CBI than farmers with medium and high incomes and/or in poor health. As indicated in Table 2, the odds ratio for CBI enrolment is 1.39 for farmers in the high/medium-income bracket compared

Table 2. Logit model on the probability of joining the CBI

Variables	Odds ratio	Standard errors
Medium income	1.3814	(0.2481)*
High income	1.3851	(0.2873)
Medium health	0.8418	(0.1048)
Good health	0.6215	(0.0938)***
Age 15–60	0.5634	(0.0992)***
Age >60	0.7470	(0.1805)
Male	0.9612	(0.0545)
Married	1.5079	(0.2009)***
Divorced	1.1364	(0.2408)
Elementary	1.2322	(0.1480)*
Junior high	1.4951	(0.2254)***
Children	2.0907	(0.4760)***
D-village	0.8264	(0.0349)***
D-township	0.9898	(0.0155)
D-county	0.9772	(0.0087)***
Observations	4046	

Robust standard errors in parentheses.

*significant at 10%; **significant at 5%; ***significant at 1%.

with low-income farmers (controlling for all other variables). In terms of health status, farmers in self-perceived good health are less likely to participate in the CBI than farmers with medium or poor health status, a result statistically significant comparing good with poor health status (OR = 0.62).

Table 3. Probability of joining the CBI by income and health status

Health status	Low income	Medium income	High income	Difference between high and low income
Poor health	0.69	0.72	0.69	0.00
Medium health	0.65	0.67	0.71	0.06
Good health	0.52	0.64	0.62	0.10
Difference between poor and good health	0.17	0.08	0.07	

Table 4. Health care utilization among CBI enrollees

Variables	Outpatient visit (OR)	Inpatient admission (OR)	Outpatient expenditure (coefficient)	Inpatient expenditure (coefficient)
Medium income		0.6862 (0.2033)	0.4352 (0.2159)**	-0.2640 (0.2770)
High income		1.2891 (0.4000)	0.5596 (0.2597)**	-0.1681 (0.2834)
Medium health		0.3182 (0.0811)***	-0.6048 (0.1435)***	-0.1763 (0.2845)
Good health		0.1788 (0.1050)***	-0.4065 (0.1848)**	-0.7251 (0.3054)**
Poor health × medium income	0.7980 (0.2165)			
Poor health × high income	0.7097 (0.2099)			
Medium health × low income	0.2682 (0.0829)***			
Medium health × medium income	0.2763 (0.0747)***			
Medium health × high income	0.3331 (0.0999)***			
Good health × low income	0.1749 (0.0553)***			
Good health × medium income	0.1588 (0.0489)***			
Good health × high income	0.2215 (0.0697)***			
Observations	2704	2704	734	103
R-squared			0.07	0.28

Robust standard errors in parentheses.

*significant at 10%; **significant at 5%; ***significant at 1%.

The results are controlled for age, gender, marital status, education and distance to the health facilities.

Income appears to be a more influential determinant of CBI enrolment among healthy farmers than among those in poorer health. Table 3 lists the predicted probabilities of farmers' participation in the CBI stratified by income and health status. In the poor-health group, the probability of enrolment by both the low-income and high-income groups is 0.69. Among those with a good health status, however, the probability of participation by the low-income group is 10% less than the probability of participation by the high-income group. This finding suggests income plays a greater role in CBI enrolment decisions among the good-health group than among the poor-health group.

Table 3 also indicates that health status among low-income farmers is a more influential determinant of CBI enrolment than health status among high-income farmers.

In the low-income group, the probability of participation for those in the good-health group is 17% less than the probability of participation for those in the poor-health group; while in the high-income group, the probability of participation for those in the good-health group is only 7% less than the probability of participation for those in the poor-health group. This finding suggests that health plays a greater role in CBI enrolment decisions in the low-income group than in the high-income group.

CBI service utilization

The results of the two-part health service utilization models are presented in Table 4. Since the interaction variables of income and health status were only statistically significant in the outpatient visit model, we excluded these

Table 5. The distribution of the net benefits among CBI enrollees by income and health status

Utilization	Low income	Medium income	High income	Difference between high and low income
Total health expenditure				
Poor health	48.51	46.12	63.92	15.41
Medium health	6.18	6.48	14.35	8.17
Good health	-0.24	1.27	7.01	7.26
Difference between poor and good health	48.75	44.85	56.91	
Outpatient expenditure				
Poor health	23.55	32.56	36.41	12.86
Medium health	2.79	4.60	8.74	5.95
Good health	-0.17	1.09	5.68	5.85
Difference between poor and good health	23.72	31.47	30.73	
Inpatient expenditure				
Poor health	24.96	13.56	27.51	2.55
Medium health	3.39	1.89	5.61	2.22
Good health	-0.08	0.18	1.33	1.41
Difference between poor and good health	25.04	13.37	26.18	

interaction variables in the other three models and used individual income and health status variables instead.

For outpatient services, high-income farmers are more likely to utilize services than low-income farmers among those with medium and good health. However, among farmers with poor health, income does not exhibit any statistical significance in affecting the probability of use. For inpatient services, health is a strong predictor for admission, while income does not show any statistically significant effect. Farmers with poor health are more likely to have a hospital admission than those in good health.

Expenditure models

Level of income appears to be positively associated with outpatient expenditures, but there is no evidence that income level affects inpatient expenditures. Enrollees with a good health status have significantly lower expenditures than enrollees of poor health, for both outpatient and inpatient services.

Net benefits among CBI enrollees

Table 5 shows predicted NB among those who enrol in the CBI, stratified by income and health status. Although those in poor health have the greatest NB at any income level, there is a greater disparity of NB by income level among farmers in good health compared with those in poor health. Those in poor health accrue the greatest NB from the CBI, ranging from 46.12–63.92 yuan. Holding health status constant, the difference in NB between high-income and low-income farmers is greater among those in poorer health. For farmers in poor health, for example, average total NB are 48.51 yuan, 46.12 yuan and 63.92 yuan in the low-, medium- and high-income groups, respectively; the NB of the high-income group for those in poor health is 15.41 yuan greater than for the low-income group. For farmers in good health, average total NB are -0.24 yuan, 1.27 yuan and 7.01 yuan in the low-, medium- and high-income groups, respectively; the NB

of the high-income group at this health level is 7.26 yuan greater than for the low-income group.

Further, these disparities in NB by income level arise mainly from outpatient services. As indicated in Table 5, high-income enrollees at all health levels obtained greater NB for outpatient services than low-income enrollees (i.e. 5.85, 5.95 and 12.86 yuan greater according to good, medium and poor health status, respectively). The corresponding figures for inpatient services exhibit a much smaller range of NB disparities (1.41, 2.22, 2.55 yuan).

Unlike outpatient services, the NB of inpatient services among the medium-income group is lowest at poor-health and medium-health levels. A possible explanation might be that although we controlled for health status (at poor-health and medium-health levels), health status at poor-health and medium-health levels in the low-income group might be still worse than in the medium-income group at these levels. Therefore, the demand for health service utilization in low-income groups might be higher than the demand in medium-income groups.

Net benefits among the entire study population

For the study population as a whole, wealthier farmers gain more NB than poorer ones. Combining the results on the distribution of CBI participation and of NB for CBI participants, we estimated the aggregate distribution of the NB among the overall population in the community which had established the CBI. As indicated in Table 6, high-income farmers gained greater NB at all levels of health: 4.48, 6.17 and 10.63 yuan more NB than low-income farmers at good, medium and poor levels of health, respectively.

Discussion

The findings point to several implications regarding equity in the NB of CBI with low premium/high co-payment benefit packages. First, even a small premium

Table 6. The distribution of the net benefits among the entire community population by income and health status

Health status	Low income	Medium income	High income	Difference between high and low income
Poor health	33.47	33.21	44.10	10.63
Medium health	4.01	4.34	10.19	6.17
Good health	-0.13	0.81	4.35	4.48
Difference between poor and good health	33.60	32.39	39.76	

may discourage the enrolment of low-income farmers into the CBI. Because of the low premium set in Fengshan, it was expected that income would no longer play a significant role in people's decisions to participate in the CBI. Fengshan's CBI premium of 10 yuan is 0.5% of the average annual income for the overall population, and 1.7% of the average annual income for the poorer population (the average annual income for the poor was 575 yuan in this study). Contrary to expectations, however, it was found that low-income farmers are less likely to participate in the CBI than higher-income farmers, despite the low premium. The CBI premium may therefore still be a barrier to CBI enrolment among the poorest farmers, one which reduces their benefits from this form of health insurance.

Secondly, the distribution of NB among CBI enrolees favours wealthier farmers, especially those in good health. The income effect on NB (i.e. the difference in NB comparing high- and low-income farmers) is greater for those in poor health than those in good health; this finding holds for both outpatient and inpatient services. These findings suggest that richer farmers benefit disproportionately from the CBI's low premium/high co-payment system compared with poorer ones. Indeed, even though all CBI participants pay the same premium, the NB obtained by the high-income participants across health strata are 7.26–15.41 yuan greater than the NB obtained by low-income participants. Low-income participants, therefore, are subsidizing high-income participants at every level of health status.

Thirdly, while the CBI may offer a relatively uniform degree of risk protection for more expensive services, there may be greater inequity in NB distribution for outpatient services. There is a relatively small difference in inpatient service NB between high- and low-income groups; this finding suggests that the CBI does offer a similar degree of risk protection against catastrophic and/or expensive services for enrolees at all income levels. The same does not appear to be true for outpatient services, however, where wealthy farmers benefit substantially more than low-income farmers (especially for those in poor health). Given that outpatient services tend to be prevention-oriented and/or relate to less severe health problems, inequities in NB according to income level may be greatest for the most frequently experienced health conditions.

Conclusions and policy implications

In October 2002, China embarked on a new path to develop community-based health insurance, a new CBI scheme. For the first time in China's history, governments at various levels will entice farmers in poor, rural areas to contribute and enrol in CBIs by providing them with a small annual subsidy of 20 yuan (US\$2.50) (Liu 2004). However, the benefit package design is left to be decided locally. The results of this study have shown that CBIs with low premiums and high co-payments (the prevailing form of newly established CBIs) favour the rich. In order to reduce the inequity of the NB distribution across a population of different incomes, the following policy options need to be considered in new CBI development.

- (1) *Target the government premium subsidy to the poor.* This study found that the poor still do not participate in the CBI, despite very low premiums. Not only does this mean that poor farmers do not enjoy any benefits of the CBI, but they are also subject to major financial risk when they fall ill. To protect the poor and to improve equity in the distribution of CBI net benefits, the government should shift its subsidy to poor rural areas, especially to the poor in those areas, and subsidize those who cannot afford the premium to join the CBI.
- (2) *Reduce co-payment rates to the poor.* Our study further found that conditioning on health status, lower income farmers use health care services less than higher income farmers, suggesting that a high co-payment rate imposes a deterrent on health care utilization among the poor, even after they have enrolled in the programme. A lower co-payment rate would reduce the financial burden from out-of-pocket expenditure, especially for the poor. This would improve the equitable distribution of the NB of CBI and improve financial risk protection among the poor in particular. There are three possible options to consider as companion policies for reducing the co-payment rate. First, the range of health care services covered by CBI could be reduced by such means as limiting some expensive examinations and treatments. Therefore, the total expenditure covered by CBI is reduced and the co-payment rate can be decreased. Secondly, the maximum reimbursement from CBI could be capped, which will also reduce the total expenditure covered by CBI. However, both reducing the range of health care services and putting a cap on the maximum reimbursement might reduce the CBI's capacity for providing risk protection from catastrophic health problems, and might impact on the quality of services. Thirdly, a government subsidy could be used to increase the premium, especially for the poor rural areas and targeted to the poorest. As described previously, the Chinese Government has already committed to contribute a small amount of annual subsidy to each CBI participant. With the government subsidy, the overall CBI fund will increase and therefore the co-payment rate can be reduced.

- (3) *Decrease the co-payment rate for outpatient services.* The study results indicate that the inequity in the distribution of health services utilization stems mainly from outpatient, rather than inpatient, service utilization. This finding suggests that patients are more price-sensitive for less severe health conditions, which are generally less expensive. A CBI with relatively low co-payment rates for outpatient services using government subsidy, conditional on the reduction of the co-payment rate for both outpatient and inpatient services, could therefore have a larger effect on reducing the inequity in the distribution of NB obtained from CBI than changes to co-payment rates for inpatient services.

References

- Aaron H. 1992. Equity in the finance and delivery of health care. *Journal of Health Economics* **11**: 467–71.
- Carrin G, Ron A, Hui Y et al. 1999. The reform of the rural cooperative medical system in the People's Republic of China: interim experience in 14 pilot counties. *Social Science and Medicine* **48**: 961–72.
- Chinese Rural Health Insurance Study Group. 1990. *Handbook of Chinese Rural Health Insurance*. Chengdu, China: Sichuan Science and Technology Press.
- Cretin S, Duan NH, Williams AP Jr, Gu XY, Shi YQ. 1990. Modeling the effect of insurance on health expenditures in the People's Republic of China. *Health Services Research* **25**: 667–89.
- Culyer A, Wagstaff A. 1993. Equity and equality in health and health care. *Journal of Health Economics* **12**: 431–57.
- Cutler DM, Zeckhauser RJ. 2000. *The anatomy of health insurance*. Amsterdam: Elsevier BV.
- Duan NH. 1983. Smearing estimate: a nonparametric retransformation method. *Journal of the American Statistical Association* **78**: 605–10.
- Duan N, Manning WG, Morris CN, Newhouse JP. 1983. A comparison of alternative models for the demand for medical care. *Journal of Business and Economic Statistics* **1**: 115–26.
- Feldstein PJ. 1993. The demand for health insurance. In: Feldstein PJ. *Health care economics*. Albany, NY: Delmar Publishers Inc., pp. 106–40.
- Feng X, Tang S, Bloom G, Segall M, Gu Y. 1995. Cooperative medical schemes in contemporary rural China. *Social Science and Medicine* **41**: 1111–8.
- Gu X, Bloom G, Tang S et al. 1993. Financing health care in rural China: preliminary report of a nationwide study. *Social Science and Medicine* **36**: 385–91.
- Health Care Financing and Organization in Poor Rural Areas of China Project Group. 1998. *Health care financing and organization in poor rural areas of China*. Beijing: People's Health Press.
- Henderson G, Akin JS, Hutchinson PM et al. 1994. Equity and the utilization of health services: report of an eight-province survey in China. *Social Science and Medicine* **39**: 687–99.
- Hsiao WC. 1984. Transformation of health care in China. *New England Journal of Medicine* **310**: 932–6.
- Jones AM. 2000. Health econometrics. In: Culyer AJ, Newhouse JP (eds). *Handbook of Health Economics*. Amsterdam: Elsevier BV, volume 1A, pp. 285–9.
- Liu Y. 2004. Development of the rural health insurance system in China. *Health Policy and Planning* **19**: 159–65.
- Liu YL, Hsiao WC, Eggleston K. 1999. Equity in health and health care: the Chinese experience. *Social Science and Medicine* **49**: 1349–56.
- Liu YL, Rao K, Evans T, Chen Y, Hsiao WC. 2001. China: Increasing health gaps in a transitional economy. In: Evans T, Whitehead M, Diderichsen F, Bhuiya A, Wirth M (eds). *Challenging inequalities in health: from ethics to action*. Oxford: Oxford University Press, pp. 77–89.
- Liu GG, Zhao Z, Cai R, Yamada T, Yamada T. 2002. Equity in health care access to: assessing the urban health insurance reform in China. *Social Science and Medicine* **55**: 1779–94.
- Ministry of Health PRC. 1999. *Research on National Health Services: an analysis report of the Second National Health Services Survey in 1998(II)*. Beijing: National Center for Health Information and Statistics.
- Palta M. 2003. *Quantitative methods in population health: extensions of ordinary regression*. Hoboken, NJ: John Wiley & Sons Inc.
- Qiu RZ. 1989. Equity and public health care in China. *Journal of Medicine and Philosophy* **14**: 283–7.
- Roberts M, Hsiao WC, Berman P, Reich MR. 2004. *Getting health reform right: a guide to improving performance and equity*. New York: Oxford University Press.
- Rothschild M, Stiglitz J. 1976. Equilibrium in competitive insurance markets: an essay on the economics of imperfect information. *Quarterly Journal of Economics* **90**: 630–49.
- Smith KA. 1993. Accessibility, ethics and equity in health care (Editorial). *Social Science and Medicine* **36**: iii–vii.
- Stata Corporation. 2003. *Stata Statistical Software Release 8.0*. College Station, TX: Stata Corporation.
- State Council. 1994. *To speed up the reform and development of rural cooperative medical system*. Beijing: The State Council.
- Wagstaff A, van Doorslaer E, Calonge S et al. 1992. Equity in the finance of health care: some international comparisons. *Journal of Health Economics* **11**: 361–87.
- Wang H, Ye Y, Wang S. 2003. The willingness to pay for farmers to participate in the new rural cooperative medical system. *Chinese Health Economics* **22**: 17–18.
- Yip WC, Wang H, Liu Y. 1998. Determinants of patient choice of medical provider: a case study in rural China. *Health Policy and Planning* **13**: 311–22.

Acknowledgements

The data used in this study are from a Rural Mutual Health Care (RMHC) social experimental study carried out by a Harvard research team. This study is funded by the Guanghua Foundation.

Biographies

Hong Wang, MD, Ph.D., is an assistant professor at the Division of Global Health, Yale University School of Public Health, USA. Before this, he served as an associate professor of health economics at Beijing Medical University. He was also Deputy Director of the National Health Economic Institute in the Chinese Ministry of Health, and was a member of Chinese Ministry of Health Advisory Committee of Health Policy and Administration during 1995 and 1998. Professor Wang's majors are Health Economics and Health Policy. His primary research interests are in health care financing, health system reform and the determinants of population health in developing countries.

Winnie Yip, Ph.D., is an Associate Professor of International Health Policy and Economics at the Harvard School of Public Health. She holds a Ph.D. in Economics from the Massachusetts Institute of Technology. Dr Yip has over 10 years' research experience in

China's health care system. She leads an inter-disciplinary team of international experts in economics, anthropology, psychology, sociology and public health to study the effect of rapid economic growth on people's health and subjective well-being in rural China, through changes in cultural value, social capital, social relationships, social standing and individual preferences. She also leads a team of researchers at Taiwan's National Health Research Institute to evaluate the impact of Taiwan's National Health Insurance on access to health care, health outcomes and public satisfaction and their implications on equity.

Licheng Zhang, MD, MPH, is a senior lecturer at the Department of Health Policy and Management, Beijing University School of Public Health. Her major is Health Economics. Her main research fields are health care financing and health economic evaluation. She has worked on studies of health financing systems in rural and urban China. She is currently working on the experimental study on rural mutual health care in poor areas of China, the evaluation of the health impact of air pollution in Beijing, and the economic relations between drugs and medical services.

Lusheng Wang, BA, is the Deputy Director of the National Health Economic Institute, Ministry of Health, China. He was previously a Government official in the Health Bureau in Ningxia Province. His research interests are mainly in operational research issues such as health institute financial management. He has worked in rural health care financing for the past 20 years.

Willam Hsiao, Ph.D., is a K.T. Li Professor of Economics in the Department of Health Policy and Management, Harvard School of Public Health, USA. Dr Hsiao's health policy research programme spans across developed and less developed nations. He and his research team focus their economic studies on five topics: (a) a simulation model of the US health sector; (b) payment systems for physicians and hospitals; (c) comparative health care systems; (d) financing health care in developing nations; and (e) interaction between economic development and health care.

Correspondence: Hong Wang, Assistant Professor, Global Health Division, Yale University School of Public Health, 60 College Street, Suite 315, New Haven, CT 06520-8034, USA. Tel: +1 203-785-6230; Fax: +1 203-785-6193; E-mail: hong.wang@yale.edu