

HEALTH INSURANCE AND CATASTROPHIC ILLNESS: A REPORT ON THE NEW COOPERATIVE MEDICAL SYSTEM IN RURAL CHINA

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SUMMARY

The overall goal of the paper is to understand the progress of the design and implementation of China's New Cooperative Medical System (NCMS) program between 2004 (the second year of the program) and 2007. In the paper we seek to assess some of the strengths and weaknesses of the program using a panel of national-representative, household survey data that were collected in 2005 and early 2008. According to our data, we confirm the recent reports by the Ministry of Health that there have been substantial improvements to the NCMS program in terms of coverage and participation. We also show that rural individuals also perceive an improvement in service by 2007. While the progress of the NCMS program is clear, there are still weaknesses. Most importantly, the program clearly does not meet one of its key goals of providing insurance against catastrophic illnesses. On average, individuals that required inpatient treatment in 2007 were reimbursed for 15% of their expenditures. Although this is higher than in 2004, on average, as the severity of the illness (in terms of expenditures on health care) rose, the real reimbursement rate (reimbursement amount/total expenditure on medical care) fell. The real reimbursement rate for illnesses that required expenditures between 4000 and 10 000 yuan (over 10 000 yuan) was only 11% (8%). Our analysis shows that one of the limiting factors is constrained funding. Copyright © 2009 John Wiley & Sons, Ltd.

KEY WORDS: health insurance; catastrophic illness; rural China

1. INTRODUCTION

There are deep concerns about the flagging state of health services in rural China. Consequently, top officials decided to initiate a new effort to improve rural health care (World Bank, 2005). The response was the initiation of the New Cooperative Medical System (NCMS), a co-pay insurance system backed by each county's government with funding from the central government and provincial government. The goal of NCMS is to improve the access of rural residents to health services and – above all – help them reduce the risks that accompany *dabing* (or literally 'severe illnesses,' henceforth *catastrophic illnesses* – WHO, 2004).

According to government statistics, between 2003 and 2008, NCMS expanded dramatically. Officials recently claimed that NCMS has already achieved one of its main milestones; according to the Ministry of Health, by the end of September 2008, more than 95% of counties have been covered by the program

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in China (MOH, 2008). Interviews during the numerous field visits to the sample villages (and to villages in the same towns as the sample villages) by the authors between January 2007 and March 2008 as we were preparing to execute a second round of a panel survey on China's health care (see discussion below), revealed that this assertion could very well be true. After visiting villages in more than five provinces, no villages were found in which a large share of the population was not covered by NCMS.

While few dispute the success in coverage, because of the absence of empirical work based on recent data, there is little understanding of the nature of the medical care that is being provided by NCMS – especially about the effectiveness of the program's ability to provide financial protection for patients when they are struck with catastrophic illnesses. The absence of empirical work has created murky views about the record of NCMS. For example, Chen *et al.* (2005) concluded that NCMS has played an important role in reducing the poverty caused by illnesses. The authors admit, however, that their findings apply only to the individuals who were surveyed in 2005 in their three survey sites in Hubei province. Using survey data from one county in Jiangxi province, Yuan *et al.* (2006) found that NCMS increased the rate of hospitalization of rural residents – although the study did not differentiate patients by the severity of their illnesses. Using a national representative sample, Zhang *et al.* (2006) found that, although the participation rate was high in NCMS-covered villages, the real reimbursement rate was relatively low. Unfortunately, the results were from a survey that was done only 1 year after the launch of the program (2004). Likewise, using a 15 924-household survey from 32 counties, an NCMS assessment group made up of researchers from Peking University, the Chinese Academy of Social Sciences and the Center for Health Statistics and Information concluded that NCMS was effective, citing that hospitalization rates increased by 52.7% (Assessment Group on the Performance of New Cooperative Medical System Pilots, 2006). While based on a large sample, this study also suffered from the fact that it is dated and that it did not differentiate the findings by the severity of the illnesses.

Given the importance of the part of the goal of NCMS that targets providing coverage for catastrophic illnesses, it is somewhat surprising that there are no recent national level, economic studies that empirically assess the effectiveness of the program in this regard. Therefore, the main objective of the paper is to examine whether NCMS has helped rural residents deal with financial risks that accompany catastrophic illness by offering reimbursements to help them cover expenditures for their medical care. To accomplish this goal, among other empirical exercises, the paper will examine whether or not there has been progress in the design and/or implementation of NCMS in terms of the real reimbursement rate (reimbursement amount/total expenditure on medical care).¹ Unfortunately, due to data limitations and space constraints, we are unable to identify the precise sources of program shortcomings (is it due to program design and/or implementation?) – although we do speculate about the possible reasons in the concluding part of the paper.

¹In this paper, we define three types of reimbursement rates: nominal reimbursement rate, promised reimbursement rate and real reimbursement rate. The nominal reimbursement rate is the share of any additional expenditures that are reimbursed to the patient after the deductible is met and before the ceiling payment limit is reached. The following formula illustrates how the promised reimbursement rate is calculated: Promised reimbursement rate = $(Y^*/Y) \times 100\%$, where, $Y^* = \text{Max}[(Y - \text{Deductible}) \times \text{Nominal reimbursement rate}, \text{Ceiling for reimbursement rate}]$, Y is total medical expenditure. The deductible, nominal reimbursement rate and ceiling for reimbursement rate are set by policy makers at each county (province) and in this paper are from data that we collected from each NCMS county office. This is the average rate of reimbursement that patients should expect if all medical expenditures are covered if the program is implemented as promised. The real reimbursement rate is the actual amount received as reimbursement divided by the total medical expenditure. Note: the definitions of nominal reimbursement rates and real reimbursement rates are consistent with those used by the Ministry of Health (MOH, 2007).

2. DATA

Our data are from two separate rounds of household-level surveys led by the Chinese Academy of Sciences' Center for Chinese Agriculture Policy in Beijing in collaboration with Stanford University and MIT in the US. The two surveys were conducted, respectively, in 2005 and 2008 and focused on a time period that spans from the second year after NCMS implementation (through the end of 2004) and the fifth year after implementation (through the end of 2007). Being a true panel (that is we made repeat visits to the same households in the same villages in both time periods), the data provide an opportunity to examine the progress of the NCMS effort and impact over time. Given the timing of our most recent data collection effort, there are no other studies to our knowledge that detail both the current status and the change of status of the NCMS program at the household level.

The first round of the survey was conducted in April 2005 using a randomly selected, nationally representative sample of 100 rural villages in five provinces (Jiangsu, Sichuan, Shaanxi, Jilin and Hebei). The sample provinces were randomly selected from each of China's major agro-ecological zone. Five sample counties were then selected from each province by a two-step procedure. In the first step the enumeration team listed all counties in each province in descending order of per capita gross value of industrial output (GVIO). GVIO was used based on the conclusions of Rozelle (1996) that GVIO is a good predictor of standard of living and development potential and is often more reliable than net rural per capita income statistics. In the second step, the five sample counties were selected randomly from each list. After the county selection was completed, the team then chose the sample townships and villages following the same procedure used in the selection of the counties. Finally, the survey team used village rosters and the survey team's own counts (of households that were living in the village but not on the roster) to randomly choose eight households in each village. In total, 3141 individuals (approximately four members per family) were included in the survey.

The second round survey was conducted in April 2008. The enumeration teams visited the same provinces, counties, townships, villages and households that had been sampled and surveyed in 2005. During the second round, the enumerators re-implemented nearly the same survey instrument (as in 2005). This time, however, the household survey was given to 20 households per village (the original eight survey households plus 12 other households randomly chosen from the 2005 village rosters). Descriptive statistics examining the characteristics of both sets of households (the group of eight households and the group of 12 households) showed that the two groups were statistically identical.

As might be expected, there was attrition from our original sample in the first wave (2005). If a household selected in 2005 had migrated out of the village, the enumeration team selected a replacement household following the same procedure that was used in the selection of the households in 2005. By the end of the survey, nearly 90% of original households surveyed in 2005 were successfully re-surveyed in 2008. In total, we have observations on 681 households for both years. Including replacements, the second round survey included a total of 2000 households and 7939 individuals.

The household survey form was designed to collect information on a wide number of variables during the survey years. Questions were asked about whether or not NCMS was available in the village. The questionnaire included a special block that collected individual health information. Each respondent was asked whether or not he/she got sick during the previous year and, if so, how he/she responded (by seeking out-patient, in-patient or no medical care). The survey also asked the respondent to provide the detailed information about two episodes of illnesses ('the most recent illness' and 'the most serious illness') during the year. In particular, enumerators documented all of the expenses that the household spent on medical care for the two episodes and the share that was covered by insurance. During this part of the survey the respondents were told explicitly that they were to include only medical

expenditures and not expenditures associated with visits to the doctor/hospital (e.g. transportation, meals, etc.).² The survey teams also visited the NCMS offices in each sample county and obtained records about the rules for reimbursement, including information on the level of the deductible, the nominal reimbursement rate and any ceiling on the maximum level of payment.

Finally, in the fall of 2008 and spring of 2009 we conducted a follow-up set of phone/personal interviews with the respondents who reported that they had suffered from some sort of illness, including catastrophic illnesses (henceforth called, the *interview phase of the survey*). The purpose of the interview phase of the survey was to ask the respondents about their level of satisfaction with the program. We also asked them if they would prefer the current coverage or a coverage that was more focused on covering catastrophic illnesses.

3. NCMS COVERAGE

Although there was a great need for rural health insurance during both years of our survey, by 2004 the program still had not spread very far. Only 24 of the 100 sample villages were covered by NCMS in 2004. Of all of the individuals that we surveyed in 2004 only 24% of them were living in villages that were covered by the NCMS program (henceforth, *covered individuals*). The level of coverage of villages among our sample villages, in fact, was higher than the national number at that time. According to the Ministry of Health, by the end of 2004, 14% of individuals were covered by NCMS (MOH, 2005).

Between 2004 and 2007 there was significant progress in coverage. By the end of 2007, 100% of the sample villages were covered. In addition, more than 90% of individuals in the covered villages were participating in the program. If our sample villages were truly representative of China, it would mean that at least 90% of the rural population (more than 700 million individuals) is now participating in NCMS. Hence, the data from our survey support the government reports of nearly universal coverage.

The rise in direct program payments – especially relative to the premium that individuals are paying – provides more evidence that the NCMS program is expanding. In 2004 the expected level of reimbursements to individuals was low. After making a premium payout of 10 yuan, the average participant in the sample received 14 yuan in reimbursements. One of the biggest issues during the early life of the program was that actual reimbursement (14 yuan per individual) was far lower than the (combined) investment into the program by individuals, the local government and the central government (in total equal to about 35 yuan per individual).

By 2007 the situation had changed. The combined investment from individuals and local and the central government rose to 50 yuan. The share of the contribution by local and central governments accounted for most of the rise. The expected level of reimbursement also rose. While the premium was still 10 yuan (for most participants), the average participant received 47 yuan back.³ Not only this means that the individual's return on his/her 10 yuan was higher, it also means that the share of the total investment used for reimbursements also was much higher, rising from 40% in 2004 (14/35) to 94% in 2007 (47/50).

²The survey also asked about other sources of medical assistance. In recent years (beginning in 2003) a new program was launched, called the Medical Assistance Program (MAP), which aims to help the individual members of poor families. Since 2007 the program has been targeted at those individuals who are receiving a minimum living standard allowance (or *dibao*). During the enumeration, we tried to get the respondents to separate NCMS reimbursements from MAP and other payments. In fact, our data showed that there were 75 household who received '*dibao*' among our 2000 sampled households. Of these, only three households reported that part of their medical expenditure were due to the fact that they collected *dibao* (no one had heard of the official name of the program). In total, the additional payments for medical care totaled: 180, 1000 and 1000 yuan for each of the three households. Clearly, the amounts paid out under the MAP program to the households in our sample made up only a fraction of the total reimbursement from the NCMS program.

³The number 47 yuan is calculated by (a) summing up the total amount of reimbursements that the patients who participated in NCMS received from the NCMS program in our sample; (b) counting how many people in our sample participated in NCMS (the total number of participants); (c) calculating the average reimbursement over all participants (a/b).

3.1. Reimbursements for catastrophic illnesses

Based on the above discussion, there is reason to believe that the reimbursement performance by the NCMS program is improving. While in no way do we want to minimize the progress, closer scrutiny reveals that there are still serious shortcomings. Specifically, the proportion of participants that received reimbursement for their medical expenditure from the NCMS program did not rise between 2004 and 2007. In 2004, 22% of participants who sought medical attention (for any type of medical care – either an inpatient or an outpatient) were reimbursed for at least some share of their expenditures. In 2007, only 21% of participants were reimbursed (although this fall between 2004 and 2007 is not statistically significant).

The slight fall in the point estimates of the proportion of those participants who were reimbursed (from 22 to 21%) might have occurred if the NCMS program had shifted its emphasis from reimbursing those who incurred relatively small medical expenses to those who incurred larger ones.⁴ The data, however, do not support this explanation. In 2007, of those who received reimbursements, a large share of the patients (36%) incurred expenses less than 200 yuan (Figure 1, Panel A). An even larger share of all of those who received reimbursements (41%) incurred expenses between 200 and 2000 yuan. If we accept the definition of catastrophic illness (or *dabing*) that is within the range of that used in China (illnesses that require expenditures over 4000), this means that more than three quarters of all reimbursements (36+41 = 77%) were given to patients with illnesses requiring expenditures half the level of a catastrophic illness or less. In fact, 88% of the patients who received reimbursements experienced illnesses that required expenditures of less than 4000 yuan.⁵

The tendency to favor reimbursements to those who incurred non-catastrophic illnesses is born out by data that look at real reimbursement rates of the NCMS program to participants (who received treatment). Although the overall real reimbursement rate in 2007 for both inpatients (15%) and outpatients (4%) was higher than the real reimbursement rate in 2004 (for both inpatients, 7% and outpatients, 3%), the current NCMS program does not appear to be achieving its stated objective of helping rural residents deal with catastrophic illnesses.⁶ As seen in Figure 1, Panel B, as an inpatient moves across expenditure categories (for inpatient care) from expenditure categories of 200 yuan to 2000 yuan; 2000 yuan to 4000 yuan; 4000 yuan to 10 000 yuan (catastrophic illnesses) and 10 000 yuan and above (extreme catastrophic illnesses), the real reimbursement rate falls. Notably, for those who suffered from catastrophic illnesses, the real reimbursement rate was 11%; for those who suffered extremely from catastrophic illnesses, the rate was only 8%.⁷

Although we are not able to identify the precise ultimate reason for this low real reimbursement rate (is it a problem in the original design or implementation?), the immediate problem is clear: Rural residents are not being reimbursed at the levels being promised by the NCMS program rules. In each of the sample counties, our enumerators collected information on the levels at which different illnesses are

⁴It is important to note that although the share of recipients that received reimbursements did not rise, and that although the share of total expenses covered by NCMS is still relatively low (see discussion), the average level of expenditure for each of the inpatients in our sample rose sharply. In 2004 the average inpatient expenditure was 3541 yuan per visit; by 2007, the average expenditure for an inpatient had risen to 5439 yuan.

⁵Our definition of catastrophic illness is in the middle of the range of others – from 1600 yuan (O'Donnel *et al.*, 2007) to 5000 yuan or 6000 yuan or more (e.g. Gao *et al.*, 2006; Xu *et al.*, 2003).

⁶Importantly, the real reimbursement rate for inpatients is statistically higher in 2007 than in 2004 (p -value = 0.005). Although the point estimate of the real reimbursement rate for outpatients is higher in 2007 when compared with 2004, it is not statistically significant.

⁷In fact, from our data we know that the problem is that by far most of the individuals (81.3% of individuals who received reimbursements) experienced real reimbursements that were below 30%. Of the 449 participants from our sample who received inpatient services during 2007, only 84 of them were reimbursed for more than 30% of their expenditures. In a follow-up survey of randomly selected individuals (which we did by phone in late 2008) we found out that there is no seasonal difference in the reimbursement rate. The real rate of reimbursement was the same for patients treated in the spring of 2007 as it was for patients treated in the fall of 2007.

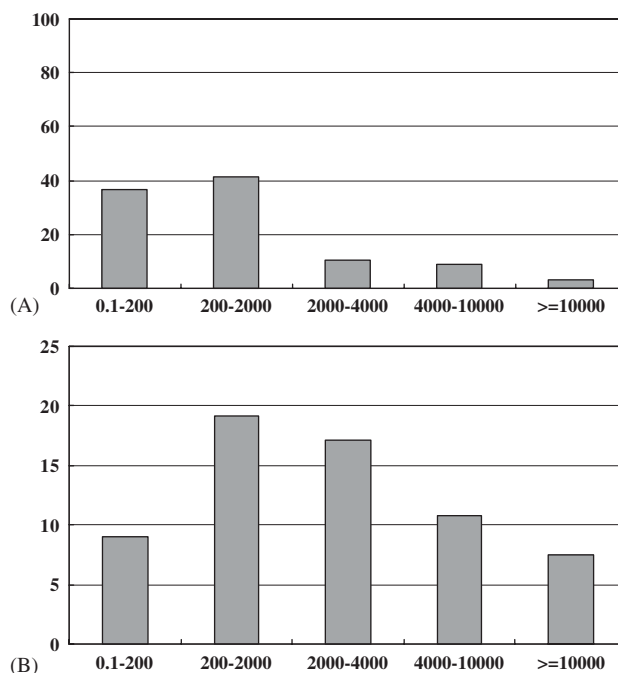


Figure 1. Distribution of participants who received reimbursements and real reimbursement rates in sample households in rural China, 2007

Table I. Deductible and nominal reimbursement rates for inpatient care in 25 sampled counties, 2007

Medical expenditure	Township health center			County hospital			Provincial hospital		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Deductible (Yuan)	53	0	200	166	0	500	746	0	2000
0.1–200	48%	0%	70%	17%	0%	60%	7%	0%	35%
200–2000	54%	30%	70%	44%	26%	60%	29%	0%	42%
2000–4000	56%	35%	70%	46%	30%	60%	34%	20%	50%
4000–10 000	59%	35%	75%	48%	30%	60%	36%	20%	50%
≥ 10 000	60%	45%	75%	49%	40%	60%	38%	30%	55%
Ceiling (Yuan/participant)	24 500	10 000	80 000	Same as in township health center			Same as in township health center		

Data source: Authors' data are collected from the records of county NCMS offices.

supposed to be reimbursed. Based on records (and official documents in each county NCMS office), the enumeration teams collected information on the level of the deductible, the nominal reimbursement rate and any ceiling on payments (henceforth called the *reimbursement package*). Using this information, it can be shown that the reimbursement package varies among regions (Table I). However, when looking at the mean of the sample (columns 1, 4 and 7), one regularity stands out: The nominal reimbursement rate is supposed to rise as the level of the medical expenditure rises.⁸

In Figure 2 we plot the promised reimbursement rate (right hand bar for each category – averaging 42% of expenditures – which is a weighted average of the nominal reimbursement rates from Table I,

⁸Another regularity in the data is that the reimbursement rates are higher and levels of deductible are lower when the level of the hospital is lower (from town, the lowest, to province, the highest).

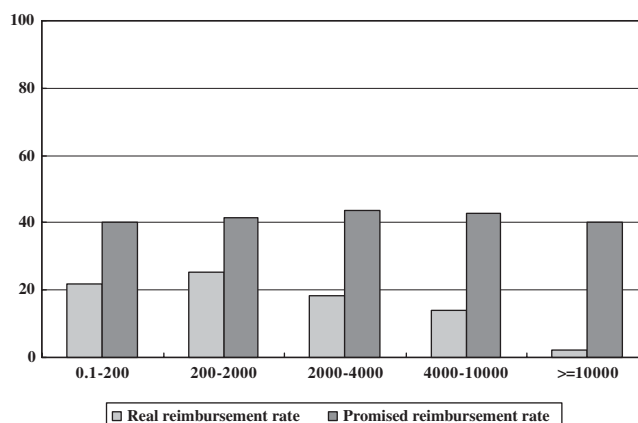


Figure 2. Real reimbursement rates from NCMS and promised reimbursement rates for inpatients, 2007

with weights equal to the propensity of rural residents to visit town, county and provincial hospitals) against the real reimbursement rate – averaging 19% of expenditures (left hand bar). What is clear is that patients are not receiving what the program is promising and the gap widens as the severity of the illnesses rises.⁹

3.2. Implications and reasons for NCMS shortcomings

Are rural residents unhappy with the low rates of real reimbursement? In fact, it appears that rural residents are relatively happy to be receiving the levels of reimbursement that are being offered. During the interview phase of the survey, we talked with rural residents in our sample villages in late 2008 and early 2009 and most rural residents express their appreciation for NCMS. It is also clear from the 2008 survey that when we asked respondents (who were participants who suffered from catastrophic illnesses) about where the funds came from which were used to cover the catastrophic illnesses, the NCMS program only played a minor role. To finance the rest of their medical expenses, rural households draw on their own savings for 62%. They borrow from friends and relatives for 15%. They even sell off assets to cover catastrophic inpatient expenditures. Although any little bit helps, the reimbursements from the NCMS program fall short of achieving a level that can be believed as providing true insurance against the risks of catastrophic illnesses.

So why is it that the real reimbursement rates are so low? Further analysis illustrates that one of the immediate causes of reimbursing individuals at a rate lower than the promised one is that the program does not have sufficient funding. When summing the contributions from the: (a) 7175 individuals (the number of individuals from our sample who participated in NCMS); (b) 25 local governments (which were required by policy to contribute fiscally to the NCMS program in their county for each individual who participated) and (c) central government (which contributed 20 yuan per individual who participated in NCMS in counties of the central and western regions of China), in total the pool of funds available for the 7175 individuals would be 358 750 yuan. In other words, NCMS official would have had this amount of funds at its disposal for use in insuring all illnesses of the participants during 2007. With only this amount at its disposal, the program falls far short of being able to cover its

⁹Although part of the problem may be that there are illnesses that are not being covered by NCMS that are contributing to the denominator of the real reimbursement rate and not (rightly so) included in the numerator. When we look at a single-covered illness (e.g. appendicitis) and examine what each of the six individuals in our sample who were treated for appendicitis were supposed to receive (the promised rate of reimbursement), in five out of the six cases, the individual's real rate of reimbursement fell far below the promised rate of reimbursement.

obligations. For example, if the program promised to reimburse only inpatients with catastrophic illnesses for 20% of their expenditures (a level that is still only half of what the program currently promises), 100% of the funds would have been used up. In fact, if the NCMS program was funded well enough to meet all of the realized expenses at the promised levels of reimbursement, the program would require between two and three times more funds (calculations available from authors on request). Moreover, this estimate does not take into consideration the well-known fact that individuals – on realizing that they would have more of their treatment covered – would demand more care. This behavioral response would increase the demand for funding even more. Clearly, from these simple illustrations, the program is severely underfunded.

4. CONCLUSIONS

In this study we use a nationally representative panel survey of 2000 households in 2004 and 2007 to investigate the newly launched NCMS. Although we find that the coverage of villages has reached 100% and nearly 90% of rural individuals are participating (which confirms the claims of increased coverage in recent reports of the government), China's NCMS program still has a long way to go if it is to meet its own goal of helping rural residents bear a greater share of the burden for the expenditures associated with catastrophic illnesses. Real reimbursement rates are so low that they only help rural-covered individuals who meet less than 15% of the total medical expenditures when they have catastrophic illnesses. There is also evidence that real reimbursement rates are below promised reimbursement rates.

So what is the source of the problem? There are at least three possible explanations. First, policy makers do not know how to design the benefit package. Second, policy makers did not earmark enough funding to cover the specified benefit package. Costs have risen so much that although originally funding was sufficient, by the time reimbursement was being made, there were not enough funds. And, finally, the promised funds actually did not get down to NCMS operation level for reimbursement.

While our data cannot identify the precise source(s) of the problem, we can provide some information to help begin to understand this problem. First, according to our survey, it is not really a problem of funds diversion. By 2007 we see that more than 90% of the allocated funds (47/50) are being used for reimbursement. In addition, while the cost of medical treatment is rising, in recent years the rate of increase has not been any greater than in previous years; a well-designed program should have been able to anticipate the cost increases. Clearly, then, as illustrated in the simulation analysis, the problem mostly is one of either promising too much or not having enough funding under the promises.

So, does the government understand the underfunding is contributing to the low real reimbursement rates? In fact, apparently policy makers do recognize this problem. In the past several months, there has been an announcement that the contributions from both the local and the central governments (up to 80 yuan per participant) and participants (up to 20 yuan per participant) will rise. This will mean that the pool of funds available for covering costs will double. This will obviously help in increasing the real reimbursement rate as long as the additional funds continue to be used for reimbursement. However, even at the current rate of expenditure, this new funding level, as we have seen, will still fall short. In addition, if the real reimbursement rate rises, since participants will be experiencing a *de facto* fall in the price of treatment, we should expect to see demand rise (from its current level), which will lower the real reimbursement rate (as the denominator increases). Therefore, we believe that China's Ministry of Health is going to continue to face a challenge of trying to be able to deliver on its own NCMS promises even under the new funding levels.

While we have only provided empirical information on one aspect of the program, there are a number of other questions that also arise. First, what do rural individuals really want? Would they rather have a program that reimbursed them for expenditures almost every time they paid for medical care or would they rather have true catastrophic illness coverage? During the interview phase of our

survey, we discovered that respondents held the opinion that, although rural individuals like the current NCMS program, most would prefer better coverage for catastrophic illnesses. If this is the case, the next question that arises is how much would a rural household be willing to pay for catastrophic coverage. In fact, because the program has been implemented from top-down with little true experimentation, no one knows. From experiences in other countries, different types of households almost certainly – given a choice – will choose different types of coverage. The current program, however, is one-size-fits-all.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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