

# Willingness to Pay in China's New Cooperative Medical System

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## Abstract

The New Cooperative Medical System (NCMS) was launched in 2002 to address poor health care coverage in rural China. Financing for the program is the joint responsibility of the central government, provincial and sub-provincial local governments, and individual participants. However, the NCMS program is underfunded in many counties. In this paper, we use household survey data from 20 counties in Anhui province to analyze the determinants of households' willingness to pay to participate in the NCMS program. We find that wealthier households, households with at least one member who has been treated as an inpatient in the previous 12 months, and households in counties where NCMS is already established are willing to pay more for the program. Households that carry other forms of insurance, however, have a lower willingness to pay for the NCMS. We also find that the participation fee could be increased substantially to increase the size of the risk pool while scarcely affecting participation rates.

Keywords: willingness to pay; contingent valuation; health insurance; China

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## **1. Introduction**

Poor households in developing countries are less likely than non-poor households to seek medical treatment because they often lack the means to pay for this care and because the quality of the care to which they have access is often substandard (Makinen et al. 2000). At the same time, illness and injury can cause households to fall into poverty as illness spurs lower productivity and as treatment strains household budgets (e.g. Smith 1999; Dercon and Hoddinott 2004; Wagstaff 2005).

China is no exception to these trends. After the collapse of China's highly successful Rural Cooperative Medical System (RCMS) in the early 1980s, most farmers were left without health insurance of any sort (Akin, Dow, and Lance 2004). As a result, health care expenses were responsible for increasing the poverty rate by 2.5 percentage points in the mid-1990s (Gustafsson and Li 2003). Similarly, Ministry of Health (1999) reports that nearly a quarter of poor households attribute their low economic status to illness. Moreover, increases in the price of health care far outstripped increases in personal incomes, such that 38% of rural residents who became sick in the early part of this decade chose to postpone or altogether forego medical treatment (Hsiao 2005).

Recognizing that such outcomes are incompatible with the new leadership's vision for building "harmonious society," the central government unveiled the New Cooperative Medical System (NCMS) in October 2002. The NCMS is a voluntary insurance program that targets people who may otherwise fall into poverty due to catastrophic illnesses. The program is administered at the county level, and as such, local administrators have tremendous flexibility in its design and management. Consequently, there is considerable heterogeneity in program implementation.

For example, financing for the NCMS program is the joint responsibility of the central government, provincial and sub-provincial governments, and individual participants. Each county sets its own participation fee, and some offer assistance or waive the required contribution for poor households (Wang and Rosenman 2007). Although the central government has stipulated a minimum participation fee of 10 RMB per person, some counties have set participation fees as high as 40 RMB. These individual participation fees are matched by at least 20 RMB from local governments in poor counties. In addition, fees from participants in poorer western and central provinces are subject to an additional 20 RMB match from the central government. The total funding available for each participant thus averages 52 RMB (Nie 2007). By the end of 2006, the budget for NCMS programs reached nearly 32 billion RMB (Nie 2007), with participation fees accounting for about one-third of this total.

However, the pooled fund in each county is small relative to total medical costs, sufficient to cover only 20-30% of realized medical expenditures in most counties (World Health Organization 2004). Thus, county administrators are tasked with providing catastrophic health care coverage to rural residents without exhausting the funding available to them. In practice, each county sets reimbursement rates, decides whether to restrict the types of covered ailments, and chooses whether to limit eligibility for reimbursement to certain clinics and hospitals. Various attempts to limit payouts appear to have been successful; for example, just 6% of hospital expenses were reimbursed in surveyed counties in 2004 (Yan et al. 2006). In the end, these considerations to limit payouts may undermine the long-term sustainability of the program as some members who fall ill remain unable to afford medical care.

The goal of this paper is thus to analyze the factors that influence a household's willingness to pay for insurance through the NCMS program in order to allow each county to set

participation fees so as to maximize the total funds available for risk pooling. Using household survey data from 20 counties in Anhui province, we find that households who have had a family member visit a doctor on an inpatient basis as well as households in counties that have already established NCMS at the time of the survey are willing to pay more for health care. Households that have insurance additional to NCMS are willing to pay less for the program than those households that do not. More generally, households are willing to pay 23 RMB for a prototypical NCMS program, suggesting that program fees could rise considerably before significant attrition will set in.

The rest of the paper is organized as follows: Section 2 outlines the objectives and structure of the NCMS program; Section 3 describes the survey data and provides summary statistics; Section 4 discusses the model used in our analysis; Section 5 provides the results; and Section 6 discusses the policy implications of the results.

## **2. The NCMS Program and Health care in China**

Rural health insurance was an integral part of China's collective farming system, which lasted from 1959 through 1978. Under the RCMS, farmers contributed to a commune-based medical fund that entitled them to free visits and discounted medicines at village health clinics. Members also benefited from co-payments for referred hospitalization. After the dissolution of communal farming, however, budget constraints forced most communities to abandon these costly programs (Hsiao 1984; Liu 2004).

Nevertheless, viable RCMS programs persisted in at least ten counties in eastern China (Liu and Cao 1992). Encouraged by their success, the State Council initiated a project to reestablish the RCMS on a pilot basis in 14 counties in 1994 (Carrin et al. 1999), stipulating that

responsibility for financing would be shared between local governments and participants, that local governments would have significant say in designing the programs, and that individuals would be allowed to decide whether or not to participate (State Council 1994). Inspired by the programs operating in the 14 pilot counties, other counties began experimenting with new RCMS-type programs on their own (Chen, Hu, and Lin 1993). However, Hsiao (2005) reports that 96% of rural households lacked health insurance by 2002 despite these efforts. Combined with escalating medical costs, the widespread lack of insurance led 38% of rural residents to forego medical treatment in 2002 (Hsiao 2005).

To address poor access to medical care and poor utilization in rural areas, China's State Council introduced the NCMS in October 2002.<sup>1</sup> The NCMS has several important features that are derived from the programs developed in the 14 pilot counties. First, the NCMS operates on a voluntary basis. To address the adverse selection that generally stems from voluntary programs, the central government has conditioned its participation in financing on local governments achieving enrollment rates of 80% among the eligible population. Local governments have responded by encouraging enrollment by requiring all members of a household to enroll together, and/or by requiring that individuals who have migrated away to enroll with other household members even though they may not be able to benefit from the NCMS at their current location of residence.<sup>2</sup> In some communities, participation has been encouraged through tactics that include door-to-door visits by local leaders and prominently displayed listings of all community members who have signed up for the program.

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<sup>1</sup> The NCMS was designed to support the goals established by *The Decision on Further Promoting the Countryside Health Work*. This document stipulated that a cooperative health care system be implemented to cover all rural residents by 2010.

<sup>2</sup> Hesketh et al. (2008) demonstrate that migrants have better self-reported health status and lower incidence of acute illness, chronic disease, and disability, even controlling for age and education, suggesting that such individuals may be less likely to use the program as well.

Second, individuals are only eligible to participate in the program after they have paid a fee. Each county sets its own participation fee, typically ranging from 10 RMB in poorer provinces to 40 RMB in rich coastal areas. Individual participation fees are nominally matched by a sum that ranges from 20 RMB to 40 RMB from regional and/or sub-regional governments. The size and composition of this subsidy depends on location, the relative income of the province, the relative income of the county, and other fiscal characteristics of the community (Brown, de Bruaw, and Du 2008). In Anhui Province, the central government is responsible for at least 24% of the budget in each of the counties with NCMS programs included in this study. This level of support has prompted many local governments to reduce their contributions accordingly. Indeed, the median level of funding available for each participant in the 16 participating counties was 27.3 RMB, indicating that contributions from the central government had crowded out local contributions below the target level. Individual fees comprise between 19% and 37% of the total budget in our sample of NCMS counties, with a median of 36%.

Third, these budgets influence decisions that each county makes regarding minimum spending levels eligible for reimbursement, maximum reimbursements, whether to allow emigrants to participate, and other important aspects of program design. For example, just over half of the sampled counties allow emigrants to participate in the program because health care costs are higher in urban communities that attract migrant labor (Eggleston and Yip 2004). Reimbursement regimes for health expenditures also vary considerably, even across neighboring counties: the minimum level of spending eligible for reimbursement ranges from 200 RMB to 400 RMB while the maximum benefit ranges from 3,000 to 40,000 RMB. Reimbursement rates also vary according to the administrative level of the hospital that provides treatment in some counties (Brown and Theoharides 2009).

Next, while all programs offer partial reimbursement for inpatient medical care for the treatment of catastrophic illnesses, many programs do not cover outpatient care, even for follow-up treatments for the same catastrophic illnesses (Wang, Gu, and Dupre 2008). Last, accidents and inpatient child delivery are eligible for partial reimbursement in some counties, but not in others.

Since early 2003, the NCMS has been unveiled on a county-by-county basis. The number of counties with NCMS programs has increased rapidly, and the program is slated to operate nationwide by 2010. Early assessments undertaken by China's Ministry of Health suggest that the program has been very well received: the number of counties offering the program has increased over time, as have the participation rates within those counties (Nie 2007). Moreover, hospitalization rates are 52.7% higher in NCMS counties while the average out-of-pocket expenditure for program participants is lower (Nie 2007). Finally, according to a Ministry of Health survey, 90% of NCMS participants were willing to participate in the following year (Nie 2007). On the other hand, Wagstaff et al. (2007) find that out-of-pocket expenditures for NCMS participants has not fallen for poor participants; given that the NCMS has resulted in increased health care utilization, one possible explanation is that doctors prescribe more expensive medical procedures to NCMS participants. Moreover, Brown, de Bruaw, and Du (2008) show that the reimbursement rates offered in many counties are insufficient to induce the poor to seek health care, even for eligible conditions. They argue that such outcomes may jeopardize the long-run viability of the program.

### **3. Data**

The data for this study are derived from a joint household and county-level survey undertaken by one of the authors in October 2006.<sup>3</sup> The household sample consists of 50 households in each of 20 counties in Anhui province. The household survey included modules on demographics, health, health insurance, income sources, assets, and expenditures; among the 1000 sampled households, 983 had complete data. The county-level survey was directed at departments overseeing the NCMS in each county, asking detailed questions about the quality and quantity of health facilities in the county as well as about the NCMS program.

Of Anhui's 105 county-level divisions, sixteen had operated NCMS programs for at least one year prior to the date of our survey; all of these counties are included in our sample, so the county-level data reflect a census of NCMS programs in Anhui. Four counties that had not yet implemented NCMS programs were also included in the sample. The surveyed households within each county were drawn from the National Bureau of Statistics (NBS) sampling frame, chosen to be broadly representative of both the county and the province as a whole; as such, it is very common for scholars to use the NBS sampling frame in their research. Most of these households had been surveyed previously by the same enumerator, allowing for trust building. Nevertheless, while we have a representative sample of households in the 20 surveyed counties, we do not have a random sample of households across China. Therefore, our results are only statistically representative of counties with programs in Anhui.

Table 1 describes the basic characteristics of NCMS programs in the 16 counties that had already established programs at the time of the survey. All but one of the participating counties in Anhui has set the participation fee at 10 RMB, the lowest level allowed by the central

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<sup>3</sup> The household level data collection was undertaken by provincial offices of the National Bureau of Statistics in close collaboration with the Institute for Population and Labor Economics (IPLE) at the Chinese Academy of Social Science and Nanjing Agricultural University. The county-level survey was completed directly by researchers at IPLE.

government. The participation rate averages 83%, perhaps not surprising given some of the strong-arm tactics designed to encourage participation described above. Although just two-thirds of eligible individuals have enrolled in one county (technically making it ineligible for matching funds from the central government), another county had achieved 100% participation. Although the central government's contribution to the pooled fund is similar across all counties in Anhui, some local governments have committed more of their own funding to the program than others; thus, the share of the total budget represented by individual participation fees ranges from 19% to 38%. Finally, the programmatic details vary widely across counties: the minimum outlay before expenditures become eligible for reimbursement ranges from 200 RMB to 500 RMB, and the maximum total reimbursement ranges from 10,000 RMB to 50,000 RMB.

Table 2 presents summary statistics for the 983 sampled households. The mean household income at the time of the survey was 16,827 RMB,<sup>4</sup> although off-farm entrepreneurial opportunities had brought substantial gains to several households and equally substantial losses to a handful of others.<sup>5</sup> Virtually all households are headed by men, and survey questions regarding willingness to pay for insurance were therefore more likely to be answered by men. Inasmuch as women prefer health care consumption relative to men (see Maitra 2004 and Bärnighausen et al. 2007 for evidence from India and China, respectively), this over-representation of men may result in downward-biased estimates of the true willingness to pay for insurance in the population. Some 60% of household heads have completed middle school (or more), similar to the national average. The average dependency ratio (defined as the number of household members under the age of 16 or over the age of 60 divided by the number of household members between the ages of 16 and 60) is 0.5; however, the variance in this figure is

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<sup>4</sup> At official exchange rates, this amount is approximately \$2035, somewhat above the rural average.

<sup>5</sup> Notably, the empirical results described below are robust to truncating income at zero and to substituting wealth for income in the analysis.

extremely high, and households with dependency ratios above 2 are not uncommon in the sample. Moreover, 16 households had no members of working age.<sup>6</sup> Households had 0.6 labor migrants, on average, typically either a child who has not yet married or an adult supporting the education of his or her child. Many households lack migrants altogether while others included as many as four members who migrate for work. Household members sought health care on an outpatient basis in the previous year in 76% of households and on an inpatient basis in 16% of households. Finally, over one-third of the sampled households included at least one member who carried other forms of insurance, often through off-farm jobs.<sup>7</sup>

#### **4. Model Specification**

To assess willingness to pay for insurance through the NCMS program, we use data from a survey that gives respondents a detailed description of a health care program, including the participation fee, insurance coverage, and reimbursement rates for different levels of expenditure. Specifically, we use a bidding game in which the respondent was first asked whether he or she was willing to pay the state-designated minimum of 10 RMB for an insurance plan that is broadly representative of NCMS programs in place in Anhui at the time. Although the actual NCMS program implemented in each county may differ, all survey respondents were asked to evaluate willingness to pay for the same program; Appendix 1 provides the wording of the question, including a full description of this prototypical program.<sup>8</sup> If the survey respondent answered “no,” then the enumerator asked whether he or she would pay 8 RMB, then 6 RMB, and finally 4 RMB. If the respondent initially replied that he or she would pay 10 RMB for the

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<sup>6</sup> These households were re-assigned a dependency ratio of 3, the largest ratio found in the sample otherwise. The results do not appreciably change if these households are instead omitted from the analysis.

<sup>7</sup> Yan (2008) provides a more detailed accounting of the incomes and demography of Anhui Province for interested readers.

<sup>8</sup> Smith (2007) reports that providing detailed “reference goods” (such as that described in the appendix) appears to improve the confidence with which interviewees report their willingness to pay.

program, then the enumerator asked whether he or she would pay 15 RMB, then 20 RMB, then 30 RMB. In addition, the enumerator asked respondents to report the highest per person fee that they would be willing to pay for the program. The mean willingness to pay for the insurance program described in the appendix is 23.2 RMB, more than twice the modal participation fee in the 16 counties in Anhui that had already adopted NCMS programs.

Although stated preference methods for eliciting willingness to pay have been criticized for the inherent “embedding effect” (Diamond and Hausman 1994), discrete choice contingent valuation methods in general and iterative bidding games in particular are commonly used to assess willingness to pay in the economics literature (e.g., Frew, Wolstenholme, and Whyne 2004). However, at least three problems may arise from this approach, including starting point bias (i.e., anchoring), sample selection bias, and response acquiescence (i.e., yea-saying). The extent to which each of these influences our results is described in turn.

In the presence of starting point bias, higher opening offer prices for medical care are correlated with higher willingness to pay among survey respondents. Smith (2006) specifically tests for anchoring bias by comparing the maximum that respondents were willing to pay for health services when the opening bid was high, low, and random; he finds that higher starting bids are associated with higher willingness to pay, presumably because the initial offer has signaling value or because interviewees respond to anticipated cost rather than willingness to pay. In the context of bidding games, O’Brien and Viramontes (1994) and Stålhammar (1996) explicitly test for starting point bias, although they reach conflicting conclusions: the former finds that there is no association between starting bid and willingness to pay after adjusting for income and health status while the latter shows that the opening offer positively influences

willingness to pay.<sup>9</sup> Bhattacharya and Isen (2008) adapt the Bayesian learning model developed by Herriges and Shogren (1996) to correct for starting point bias in willingness to pay for health care; they find that that estimates of willingness to pay among university students are biased by as much as 27%. Although we cannot rule out starting point bias in our estimates of willingness to pay, such biases are likely to be mitigated because the anchor of 10 RMB is a real and widely publicized price for the NCMS program prescribed by the national government.<sup>10</sup> Finally, although Bhattacharya and Isen (2008) advocate random bracket entry to alleviate starting point bias, we follow Klose (1999), who argues that randomization introduces idiosyncratic error in the estimates and that a single starting offer for all survey respondents is therefore preferred.

Sample selection bias may also influence estimates of willingness to pay for insurance if survey respondents differ from the population in salient ways (e.g., Whitehead et al. 1994). However, this particular concern is unlikely to affect our results because the sampled households were drawn from the NBS sampling frame, which is chosen to be representative of the areas in which respondents reside (see Section 3). Moreover, only one household opted out of participating in the survey and complete data are available for over 98% of surveyed households.

Response acquiescence is a systematic form of measurement error arising from social or ethical pressure or to agree to a given question,<sup>11</sup> even when such questions are apolitical in nature (Hurd and van Soest 2003). In the context of medical care, acquiescence has been shown to bias estimates of willingness to pay upward (e.g., Ryan, Scott, and Donaldson 2004). In one

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<sup>9</sup> Philips et al. (1997) also find evidence of starting point bias in the context of health care. Notably, however, evidence of starting point bias in the environmental economics literature is also somewhat mixed (see, for example, Boyle 1985; Cameron and Quiggin 1994; Stålhammar 1996; and Whitehead 2002).

<sup>10</sup> Anderson et al. (1997) follow a similar strategy in using empirical prices to reduce starting point bias. We thank an anonymous referee for bringing this important point to our attention.

<sup>11</sup> Couch and Kenitson (1960) provide an early review of evidence from the perspective of psychology. It has since been adapted to the context of assessing willingness to pay, particularly in the context of environmental economics (e.g., Desvougues et al. 1993; Berrens, Bohara, and Kerkvliet 1997). Hurd and van Soest (2003) demonstrate the presence of yea-saying even when survey questions are apolitical in nature.

of the few studies to quantify this effect, Bhattacharya and Isen (2008) find that yea-saying biases true willingness to pay upward by 29% in their survey. Yeung et al. (2006) show that estimating willingness to pay based on means and medians magnifies the extent of the biases. Given the likelihood of social pressure to affirm the value of the NCMS program in rural China, it is thus important to acknowledge that our estimates of willingness to pay for insurance provided through the NCMS program may be biased upward.

Finally, Ryan and Watson (2009) provide emerging evidence that discrete choice methods of assessing willingness to pay yield higher estimates than those obtained using payment cards. Given that our estimates are based on discrete choice methods, we also acknowledge this potential source of bias.

Responses on willingness to pay for the NCMS program have a natural lower limit of 0, and approximately 3% of the surveyed households value the insurance at 0. Therefore, a tobit model is used to evaluate whether income, education, household demographics, recent hospital utilization, and additional insurance affect a household's willingness to pay for insurance. The tobit model has been used extensively to estimate valuation in the context of both environmental goods (e.g., Whitehead 2006; Whitehead et al. 2008) and health care (e.g., Krupnick et al. 2002).

The model is specified as follows:

$$\begin{aligned}
 (1) \quad WTP &= \beta_0 + \beta_1 \text{totincome} + \beta_2 \text{headmale} + \beta_3 \mathbf{hededu} + \beta_4 \text{dependratio} \\
 &\quad + \beta_5 \text{nmigr} + \beta_6 \text{otherins if } WTP^* > 0 \\
 WTP &= 0 \text{ if } WTP^* \leq 0
 \end{aligned}$$

Here,  $WTP$  is the household's willingness to pay for insurance offered through the NCMS;

$\text{totincome}$  is the total household income;  $\mathbf{hededu}$  is a vector describing the educational

attainment of the household head;  $\text{dependratio}$  is the dependency ratio of each household;  $\text{nmigr}$

is the number of migrants in the household; and *otherins* indicates whether any household member had insurance in addition to NCMS.

Total income, measured in 1,000 RMB, indicates households' ability to pay for insurance. The gender of the household head is included to reflect gender differences in preferences for health care, consistent with Maitra (2004) and Bärnighausen et al. (2007). Education, measured by the level obtained by the head of household, may reflect households' ability to understand the relative costs and benefits of health insurance. Next, because children and the elderly make greater use of medical care and are most likely to be hospitalized (Kruzikas et al. 2004), the dependency ratio is also included in the model. Again, the dependency ratio is defined as the number of household members outside the working ages of 16-59 divided by the number of working-age household members. The number of migrants in the household likely reflects an additional cost of participation as most counties require all household members to enroll despite refusing to reimburse medical care sought outside the prefecture. Finally, whether households carry other insurance program has an ambiguous effect on their willingness to pay for insurance programs through the NCMS: if households participate in an insurance program other than the NCMS, their willingness to pay for coverage through the NCMS may be low if they are satisfied with their current insurance plan. Conversely, households may develop a taste for insurance and may thus choose to augment current insurance by participating in the NCMS.

The health status of households may also influence their willingness to pay for health insurance. In particular, Since the NCMS is designed to insure participants against high treatment costs of catastrophic illness, respondents who have visited medical centers on an inpatient basis may be more likely to value the insurance plan disproportionately. Outpatient medical services may also be indicative of greater need for health care or greater propensity to

seek care conditional on illness. A second specification that includes these considerations may thus be written:

$$(2) \quad \begin{aligned} WTP &= \beta_0 + \beta_1 \text{totincome} + \beta_2 \text{headmale} + \beta_3 \mathbf{headedu} + \beta_4 \text{dependratio} \\ &\quad + \beta_5 \text{nmigr} + \beta_6 \text{otherins} + \beta_7 \mathbf{soughtcare} \text{ if } WTP^* > 0 \\ WTP &= 0 \text{ if } WTP^* \leq 0 \end{aligned}$$

where **soughtcare** is a vector that separately describes the number of times that a household member has sought outpatient medical services and inpatient services.<sup>12</sup>

As a final test for robustness, a dummy variable is included to differentiate counties with NCMS programs from those without, as people who have previous exposure to the program may be more inclined to participate or be willing to pay a higher fee to do so. That is,

$$(3) \quad \begin{aligned} WTP &= \beta_0 + \beta_1 \text{totincome} + \beta_2 \text{headmale} + \beta_3 \mathbf{headedu} + \beta_4 \text{dependratio} \\ &\quad + \beta_5 \text{nmigr} + \beta_6 \text{otherins} + \beta_7 \mathbf{soughtcare} + \beta_8 \text{ncmscounty} \text{ if } WTP^* > 0 \\ WTP &= 0 \text{ if } WTP^* \leq 0 \end{aligned}$$

where *ncmscounty* describes the availability of a local NCMS program. If households in counties that have established NCMS are willing to pay more for the insurance program than those who live in counties without it, we can infer from this differential that the NCMS is successful in providing insurance to rural people.

## 5. Results

Table 3 presents the results from the tobit regressions described in equations (1), (2), and (3).

Overall, we find that household income, the number of household members who have received medical attention on an inpatient basis, and the fact that a county has a NCMS program in place at the time of the survey all account for higher willingness to pay for the NCMS insurance. The

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<sup>12</sup> **Inpatient** and outpatient treatment reflect different aspects of medical history and health status (and hence willingness to pay for insurance provided by the NCMS program). As such, it is important that these measures enter the regression separately.

presence of additional forms of health insurance, however, is negatively related to households' willingness to pay for the insurance. These results are quite consistent across the three specifications; to reduce concern about potential omitted variables, the following discussion focuses on the third specification, which controls for both health care utilization in the previous year and for whether or not the county has an NCMS program in place.

Our results show that for every 1,000 RMB increase in a household's total income, its willingness to pay for the NCMS insurance increased by 0.141 RMB (significant at the 95% confidence level). In addition, households which have had a member receive medical treatment on an inpatient basis are willing to pay more for the NCMS, but households in which members have visited a doctor for outpatient services are not willing to pay more. In fact, households with members who have received inpatient services are willing to pay 5.80 RMB more per person than households that have not (significant at the 95% confidence level). This result reflects the NCMS program's object of insuring participants against high medical costs of treating serious injuries and illnesses through partial reimbursements. A possible explanation is that households with members who have received outpatient services had to make out-of-pocket expenses and thus do not consider the NCMS program beneficial.

Another interesting finding is that the existence of an NCMS program in the county where households reside influences willingness to pay for the program: households located in counties in which NCMS programs are already established are willing to pay 5.53 RMB more than the households who live in counties without an NCMS program (significant at the 99% confidence level). This difference in willingness to pay suggests that participants are generally satisfied with and will continue to support the NCMS program, consistent with the survey evidence collected by the Ministry of Health (Nie 2007).

Households who carry other forms of health insurance, however, do not necessarily consider the NCMS a better alternative or a good supplement to the insurance plans that they have. Our results indicate that such households are willing to pay 4.48 RMB less for NCMS coverage than those who do not have other forms of insurance (significant at the 99% confidence level). One possibility is that other insurance crowds out the ability to pay for NCMS coverage. Another possible explanation is that these households are satisfied with their insurance programs as their coverage is more comprehensive than that of the NCMS program.

Contrary to the findings of Agar et al. (2004), the education level of the head of household has only a weak effect on willingness to pay for health insurance. Compared with household heads who have little or no primary education, those who have finished middle school are willing to pay 3.41 RMB more for health care, an effect that is only statistically significant (at the 90% confidence level) in the third specification. This result provides weak evidence in support of the hypothesis that more educated respondents are able to better understand the benefits of having health insurance and thus be willing to pay more for it.

Although we hypothesize that a household with a higher dependency ratio is willing to pay more for insurance because the young and the old are more likely to become severely ill and therefore incur expensive medical expenses, the evidence to support this hypothesis is not statistically significant at conventional levels.<sup>13</sup> Nevertheless, the consistently negative sign on the coefficient does suggest that households with a large number of dependents have a lower ability to pay. In contrast to the result showing that households with recent medical bills show greater willingness to pay, the evidence for adverse selection is mixed.<sup>14</sup> In addition, labor migrants and the gender of the household head have no effect on a household's willingness to

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<sup>13</sup> Our results are robust to varying definitions of the dependency ratio.

<sup>14</sup> We thank a referee for bringing this point to our attention.

pay for insurance, although the latter result may derive from the fact that less than 4% of the sampled households have female heads.

According to the survey responses, 92% were willing to pay 10 RMB to participate in the NCMS program. In comparison, the tobit results predict that between 98% (model 1) and 99% (models 2 and 3) would be willing to pay 10 RMB to participate. The tobit models thus provide reasonable approximations of the reported willingness to pay using survey data. Both of these figures are well above the empirical participation rate of 83%, which suggests that the program is perceived as being successful and that enrollments will continue to increase, a finding that is consistent with Nie (2007).

Indeed, the overall median predicted willingness to pay is 22.74 RMB, with a standard deviation of 2.79. Our sample of households contribute a total of 31,020 RMB in participation fees, yet raising the price to the median predicted willingness to pay would bring additional revenue to the program, with a total of 33,610 RMB in participation fees. Of course, many households would no longer be willing to participate at the higher fee, underscoring the need to balance revenues with program coverage.

Nevertheless, there is a middle ground: our calculations show that revenues from our sample of households would be maximized at 54,302 RMB with a participation fee of 19 RMB,<sup>15</sup> and that 92.6% of households that participated at the lower fee would continue to participate. However, *t*-tests reveal that households with higher dependency ratios are less likely to be willing to participate in the NCMS when the participation fee rises to this level (statistically significant at the 95% confidence level), suggesting that a vulnerable segment of the population would be at risk of being priced out of insurance coverage. In addition, households that hold other insurance report being less willing to participate in the NCMS program as the participation

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<sup>15</sup> This figure is obtained by multiplying the number of willing participants at each fee by the fee itself.

fee rises to 19 RMB (significant at the 95% confidence level), yet there is no statistical difference in the mean income, migration rates, hospitalization rates, education, or gender of the head between households that report willingness to participate at this price and those that do not.<sup>16</sup>

## 6. Conclusion

Despite its short history, the NCMS has been successful in providing health care to rural residents in China. Funding for the program, however, is far from adequate, covering only 20-30% of the anticipated medical expenditures in most counties (World Health Organization 2004). Since most NCMS programs are underfunded, it is evident that a viable source of extra funds is to increase individual participation fees as our study shows that households are willing to pay more than 10RMB for a program like that described in appendix 1. This is perhaps not surprising given the mean household income of 16,827 RMB: at current rates, a household consisting of four members with mean income would allocate just 0.2% of its income to NCMS participation fees. As most counties in Anhui province currently set the participation fee at exactly 10 RMB, county and local governments in Anhui should carefully consider raising the minimum participation fee, just as many counties in other provinces have done.

Indeed, using a tobit model and conditioning on income, gender and education of the household head, dependency ratios, migration status, and other insurance, we find that the

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<sup>16</sup> An interesting corollary is to describe households that are not willing to pay anything to participate in the NCMS programs. Here, *t*-tests reveal that households with zero willingness to pay are poorer (statistically significant at the 90% confidence level) and less educated (at the 95% confidence level) than households with a positive willingness to pay. However, they are also less likely to have visited a doctor during the previous 12 months, suggesting that they may also be healthier. Interestingly, individuals living in counties that did not have an NCMS program at the time of the survey were more likely to report zero willingness to pay than people residing in counties with a program (significant at the 99% confidence level), suggesting perhaps that familiarity with the program leads to greater willingness to pay. Factors such as the gender of the household head, the dependency ratio, the number of migrants, and other insurance coverage were not statistically different between these two groups.

median predicted willingness to pay is 22.74 RMB. While revenues would increase at this price level, a significant number of households would no longer be willing to participate, reducing the utility of the program. Nevertheless, if the participation fee in Anhui was increased to 19 RMB, over 90% of current participants would continue to enroll in the program and revenues would increase by approximately 75%. While higher fees could potentially pose a burden to some poor households, higher revenues could also be used to offset the program fees for some participants.

Another important finding of this study is that households living in counties in which an NCMS program has already been established are willing to pay more for the insurance than households in counties without NCMS. This shows that participants value the program and understand the benefits of having health insurance.

Finally, it is important to note that estimates of willingness to pay are subject to starting point bias, sample selection bias, and response acquiescence. Although starting point bias and sample selection bias are likely to be minimal given that our bidding game opens with the official price prescribed by the national government (Anderson et al. 1997) and that we use the NBS sampling frame for our survey, yea-saying may influence our results. As such, it is important to acknowledge that are our estimates of willingness to pay for the NCMS program may be biased upward. At the same time, the incentive to preserve surplus from the program suggests a strong incentive to bid below actual willingness to pay. The dual pressures to show support for a program pushed by local authorities and keep it in low price range should be considered together as competing problems, so further analysis might be used to pinpoint the fee which jointly maximizes participation and revenue for risk pooling.

## Appendix 1

Your household has the opportunity to participate in a collective medical insurance scheme next year. You must contribute 10 RMB for each household member to sign up for the insurance scheme, and the Central, Provincial, and County governments will add 20 RMB per household member to the county insurance pool. If you get sick and go to a hospital for treatment, you will receive reimbursement for some of your medical expenses. The program does not cover pregnancies, or accidents, but it covers all other expenses while in the hospital. If one of the members of your household is a migrant, he or she can go to any hospital and be reimbursed for reimbursement as long as the receipts are sent to the county administration.

The reimbursement rates are as follows:

Amount of Expense	Township Hospital	Other Hospital (County, etc.)
500-1000 RMB	30%	25%
1000-3000 RMB	35%	30%
3000-6000 RMB	40%	35%
6000-10,000 RMB	45%	40%
Over 10,000 RMB	50%	40%

The maximum reimbursement possible is 10000 RMB, so any one person can only receive 10000 RMB in a year.

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**Table 1. Characteristics of the 16 NCMS Programs in Anhui Province**

County	Participation rate (%)	Participation fee (RMB)	Participation fees as a share of total budget (%)	Minimum spending eligible for reimbursement, township clinic (RMB)	Maximum allowable reimbursement, prefectural hospital (RMB)
Participation rates below 70%					
1	66%	10	36.10%	200	10,000
2	67%	10	35.40%	300	10,000
3	68%	10	38.20%	200	15,000
Participation rates between 70% and 85%					
4	82%	10	36.10%	500	15,000
5	82%	10	38.20%	200	30,000
6	83%	10	36.10%	301	40,000
7	84%	10	36.10%	301	16,000
8	84%	10	33.30%	200	30,000
9	85%	10	36.10%	400	30,000
10	85%	15	37.40%	200	50,000
11	85%	10	19.00%	200	20,000
Greater than 85% participation					
12	86%	10	38.20%	200	10,000
13	89%	10	35.10%	200	30,000
14	89%	10	26.30%	280	30,000
15	89%	10	36.10%	300	11,170
16	100%	10	36.10%	300	40,000
Averages across counties					
	82.75%	10.31	34.61%	268	24,198

*Source: Authors' survey data*

**Table 2. Summary Statistics of Sampled Households**

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
<i>totincome</i>	Household income	983	16,827	13,155	-12,765	100,044
<i>headmale</i>	Dummy: Head of household is male	983	97%	18%	0%	100%
<i>headedu1</i>	Dummy: Head of household did not finish primary school	983	24%	43%	0%	100%
<i>headedu2</i>	Dummy: Head of household finished primary but not middle school	983	15%	36%	0%	100%
<i>headedu3</i>	Dummy: Head of household finished middle school	983	60%	49%	0%	100%
<i>dependratio</i>	Dependency ratio	983	0.46	0.58	0	3
<i>nmigr</i>	Number of migrants in the household	983	0.63	0.87	0	4
<i>hhmemout</i>	Dummy: Household members visited the doctor on an outpatient basis	983	76%	43%	0%	100%
<i>hhmemin</i>	Dummy: Household members visited the doctor on an inpatient basis	983	13%	33%	0%	100%
<i>otherins</i>	Dummy: Household members carry other insurance	983	35%	48%	0%	100%

*Source: Authors' survey data*

**Table 3. Factors of Willingness to Pay for NCMS - tobit**

Variable	Description	model (1)	model (2)	model (3)
<i>totincome</i>	Household income (1,000 RMB)	0.137** (0.06)	0.143** (0.06)	0.141** (0.06)
<i>headmale</i>	Dummy: Head of household is male	-5.234 (4.18)	-6.011 (4.18)	-5.659 (4.16)
<i>headedu2</i>	Dummy: Head of household finished primary but not middle school	3.124 (2.51)	3.498 (2.50)	3.956 (2.50)
<i>headedu3</i>	Dummy: Head of household finished middle school	2.54 (1.86)	3.012 (1.86)	3.405* (1.86)
<i>dependratio</i>	Dependency ratio	-1.244 (1.35)	-1.457 (1.34)	-1.161 (1.34)
<i>nmigr</i>	Number of migrants in the household	-0.341 (0.92)	-0.423 (0.92)	0.126 (0.94)
<i>hhmemout</i>	Dummy: Household members visited the doctor on an outpatient basis		1.607 (1.79)	1.573 (1.78)
<i>hhmemin</i>	Dummy: Household members visited the doctor on an inpatient basis		5.841** (2.30)	5.799** (2.30)
<i>otherins</i>	Dummy: Household members carry other insurance	-3.620** (1.63)	-3.899** (1.63)	-4.477*** (1.64)
<i>ncmscounty</i>	Dummy: County already has an NCMS program in place			5.525*** (1.94)
Constant		25.50*** (4.52)	24.09*** (4.66)	18.82*** (5.00)
Observations		983	983	983

Notes: Standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: Authors' survey data