A comparison of rural and urban healthcare consumption and health insurance

H. Holly Wang
Department of Agricultural Economics, Purdue University, West Lafayette, Indiana, USA

Shaomin Huang
Business Division, Lewis-Clark State College, Lewiston, Idaho, USA

Linxiu Zhang
Center for Chinese Agricultural Policy, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China

Scott Rozelle
Freeman Spogli Institute of International Studies, Stanford University, Stanford, California, USA, and

Yuanyuan Yan
Department of Public Administration, China Youth University for Political Sciences, Beijing, China

Abstract

Purpose – Since 1999, China has undergone reform of its healthcare system. City-based social health insurance (SHI) is the primary form of current health insurance, supplemented by various commercial health insurance programs. The rural new cooperative medical system (NCMS) was introduced in 1993 and extended to cover the whole of rural China in 2003.

Design/methodology/approach – The paper developed a theoretical model for consumer demand of medical services and health insurance based on an expected utility framework with a two-stage decision under uncertainty. The model is then applied to current health insurance systems in China for urban citizens and rural residents separately. Least square and logistic regressions are employed.

Findings – The major results are that although the factors driving the decisions on health insurance participation are basically the same for rural and urban citizens, the participation levels are quite different. The major difference is that urban SHI has higher coverage and urban citizens have higher income, resulting in a much larger urban medical expenditure.

Practical implications – The empirical analysis reveals that health insurance programs have played an important role in the healthcare expenditure for urban residents, while the NCMS has not made a significant impact towards increasing the ability of rural residents to seek more medical services, based on data at 2004.

Originality/value – This is the first paper employing a health production theory on China’s new urban and rural healthcare programs.

Keywords Health insurance, Health services, Consumption, Rural areas, Urban areas, China

Paper type Research paper

JEL classification – I38, E22, G22
China has experienced a three-decade-long fast economic development with an average annual gross domestic product (GDP) growth of about 9.5 percent and a significant reduction in poverty. However, population life expectancy and health status, two important measures in evaluating the welfare of any economy, have not improved at a comparable pace. During this period, drastic changes occurred in the Chinese health system. The rapid replacement of state-owned enterprises by private business (including international firms and all other forms of non-government business) has left urban residents with less health insurance coverage. On the other hand, the collapse of the rural collective production system which was the base of the old rural cooperative medical system left rural residents with no risk pooling mechanism in healthcare (Hu et al., 1999). The government total expenditure on health as a share of its GDP has decreased in the last decade and is lower than most developing countries (Liu et al., 2003). Complaints about unaffordable medical costs can be heard constantly.

In urban areas, the health care system has been undergoing reform since 1999. City-based social health insurance (SHI) is the primary form of current health insurance covering the majority of the urban population (Eggleson and Yip, 2004), supplemented by various commercial health insurance programs. In July 2003, the rural new cooperative medical system (NCMS) was introduced and piloted in many rural areas in China. Up to the end of 2004, almost 100 million rural residents had access to the program and about 75 percent of them actually participated in more than 300 counties in 30 provinces, municipalities, and autonomous regions. By 2006, 40 percent of all counties were covered. NCMS completed its piloting stage in 2007, and was rolled out across the whole of rural China (MOH, 2006, 2007, 2008).

In this paper, we will theoretically model the demand for health care services and demand for health insurance programs including the NCMS, SHI, and commercial health insurance. Empirical analysis will also be conducted based on a 2004 survey of rural households’ health expenditure and 2003 urban hospital records in China. The goal of this paper is to investigate the impact of the current two health policies on the medical services demand behavior of both urban and rural Chinese and their welfare. A comparison will also be made between rural and urban impacts. The feasibility of commercial health insurance in the light of the government policies will also be explored.

We will introduce SHI, the NCMS, and the relevant literature pertaining to risks and insurance in the following paper. The models will be developed in Section 2, together with theoretical results and discussions. Data and empirical models will be introduced in Section 3. Section 4 will present the empirical results and followed by the conclusion.

1. SHI, the NCMS, and relevant studies

SHI is operated by the government and is available for government employees and employees of state and private enterprises. Participation is usually mandated by the government for employers to contribute an amount equivalent to 6 percent of employee wages and for employees to contribute another 2 percent of their wages. All of the employees’ contributions and about 30 percent of the employers’ contributions are kept on individual Medical Savings Accounts and will be used to cover outpatient services. The rest of the employers’ contributions are pooled into the Social Risk Pooling Fund to cover inpatient services after deductibles and copays. The deductible is set at 10 percent of the area average annual salary for everyone in the area, and the maximum payment is set at four times the area average annual salary. The copay can be anywhere from zero to
over 20 percent depending on the total expenses, the type of services, and other factors. Usually, the pool is based at prefecture level (State Council, 1998). Urban residents not covered by SHI are usually dependents, self-employed people, rural migrants, and other employees in the casual labor sector.

The NCMS is organized and supported by central and local governments to partially cover the cost of major illness for rural residents. Rural residents participating voluntarily contribute 10 yuan per person per year to the fund, and the governments match this with another 20 yuan in the early years later increasing to 80 yuan each[1]. The participants will be partially reimbursed for their medical costs from designated healthcare services, after a particular deductible is met. Similar to SHI, the self-contributed 20 yuan is saved in a family-based personal account, and the government contribution goes to the common pool. However, the deductible is quite high for the insurance payment drawing from the pool, because the NCMS is aimed at catastrophic medical cost coverage and low premium cost to participants. The coverage ratio can also be low, leaving a high copay burden on the participants themselves. Although the specific policies from each county are different, the coverage is usually lower than 40 percent of all medical costs.

Commercial insurance is at a developing stage in China. Although automobile insurance, property insurance, and life insurance are increasingly available, health insurance is way behind. Many “health insurance” products available have more of saving and investing features than risk pooling features. Only a small portion of insurance products such as accidental insurance and student health insurance for major illness are true risk pooling products.

Although health economics is a relatively young field, a vast amount of literature has been contributed to the study of health and demand for medical care. Folland et al. (2004) summarize these studies. Health as a consumption good in a consumer utility function is not purchased from the market, but rather produced in a health production function, and the medical care is a factor input purchased from the market. Moreover, the decisions on medical care and health production are made after the health status is revealed, so there is perfect information under certainty. Only when health insurance is brought into the decision set does the model start to involve risk because the health status is uncertain by the time the insurance decision is made. Expected utility maximization, the typical model for decision under risk, is then used. Such studies include Koc (2004a, b), Cameron et al. (1988), Nyman (2002), etc.

Traditional insurance literature based on expected utility models tends to assume that the insurance is the only decision to be made a priori when facing an uncertain future and neglect the reality that some decisions can be made after the uncertainty is revealed. Most insurance studies on property (fire and automobile) and agricultural production insurance are of this nature. Some health insurance studies also assume the medical care decisions after the uncertain health status is revealed are pre-made, such as Liu et al. (2003) and Wang and Rosenman (2007). Besides, the property and production insurance studies focus on the wealth risk only and neglect the ultimate utility of a consumer is based on consumption decisions that may be interrelated to wealth risk management decisions. Recent studies such as Koc (2004a), Cutler and Zeckhauser (2000) and Cameron et al. (1988) have introduced the two-stage expected utility model that has the capacity to incorporate the consumption decisions and to describe the medical care decision under certainty properly.
Studies on insurance demand for both government programs and commercial programs also exist. Costa and Garcia (2003) investigated Spanish health insurance demand with a primarily empirical approach. Studies on Chinese urban and rural medical care systems are also available. Such studies include Hu et al. (1999), Liu (2004), Gu (2001), Yip and Eggleston (2001), Liu et al. (2003), Zhang et al. (2006), Wang and Rosenman (2007) and Yan et al. (2006). There is still a lack of rigorous empirical study on Chinese health care and health insurance demand that are based on sound economic theoretical models.

2. Theoretical analysis

Following Koc's (2004a) one-period two-stage model, the consumer makes the decision on insurance at the first stage when his health status is uncertain, and he makes decisions on consumption and medical care at the second stage when his health status is revealed and the insurance decision has been made[2].

At stage two, the model is:

\[
\begin{align*}
\max_{c, m} U(c, H(m, s); r) &= \max_{c, m} W(c, m; s, r) \\
\text{st. } y' &= c + \min(b (pm - d) + d, pm), \quad c \geq 0, \quad m \geq 0,
\end{align*}
\]

where \(U(\cdot)\) is the utility which represents the consumer's preference on health \(H\) and other regular consumption goods \(c\), as well as the risk attitude \(r\). The \(H(\cdot)\) is the health production function depending on the consumer's health status \(s\) and medical care service received, \(m\). \(W(\cdot)\) is the utility explicitly expressed as a function of the two choice variables \(c\) and \(m\). \(y'\) is the income available at the second stage. The price of the consumption good is normalized to 1, \(p\) is the price for medical services, \(d\) is the deductible requirement of the insurance policy, and \(b\) is the copay rate determined by the insurance policy.

We assume \(W\) is quasiconcave in \(c\) and \(m\) to satisfy the conditions for an interior solution, and denote the optimal choice of the consumption good and medical care by \(c^*(y', p, b, d, s, r)\) and \(m^*(y', p, b, d, s, r)\), respectively. Depending on \(s\), the optimal choice of medical care may end up at a low level, where the deductible is not reached so that the total medical care cost lies on the consumer himself, or at such a high level that the consumer will receive payment from the insurance[3]. There is a discontinuity of the chosen medical care level as \(y', p, d, r, s\) or \(b\) changes because of the dichotomized budget constraint, as graphically shown in Figure 1.
At stage one, the consumer is supposed to be able to choose his/her optimal level of insurance under the unconstrained model:

\[
\max_b EU(c^*, H(m^*, s); r) = \max_b EW(c^*, m^*, s; r) = \max_b EV(b, p, d, s, y'; r)
\]

subject to

\[
y = y' + a(b), \quad 0 \leq b \leq 1,
\]

where \(y\) is income, \(V(\cdot)\) is the indirect utility, and \(a(\cdot)\) is the premium function of the insurance policy which should be non-increasing with respect to the chosen copay rate, \(a'(b) \leq 0\). The case of no insurance is depicted by \(b = 1\), and the case of full insurance with zero copay means \(b = 0\). If we assume the utility function is quasiconcave and the marginal utility on health is strictly decreasing for the risk averse, the indirect utility must also be quasiconcave. Therefore, an interior solution for \(b\) should exist. Equation (2) can be equivalently expressed as:

\[
\max_b EV(b, p, d, s, y - a(b); r).
\]

Suggested by Koc (2004b) and Cameron et al. (1988), we now assume a Cobb-Douglas type of utility and household production functions,

\[
U(c, H; r) = c^\alpha H^{1-r}, \quad H(m, s) = m^\beta s^{1-\beta}.
\]

The coefficient \(a(\alpha > 0)\) measures the relative importance of consumption goods of the person to his health level, \(\beta(0 < \beta < 1)\) measures the effectiveness of the medical care service relative to his health status, and \(r\) \((r > 0)\) is the constant Arrow-Pratt relative risk aversion coefficient. This health production function implies that there is no perfect health status. Medical care can always be sought to improve health.

The preference is then:

\[
W(c, m; s, r) = c^\alpha m^{\beta(1-r)} s^{(1-\beta)(1-r)}.
\]

Given equation (3), no matter what health status \(s\) occurs, the shape of the \(W\) indifference curves stays the same just with different label values. An interesting result is that consumers will always choose the same medical care and consumption levels for a given income and insurance policy, no matter how sick they are. The optimal choice of consumption good and medical care is dependent on the income but independent of the health status and equal to:

\[
c^* = \begin{cases} \frac{\alpha y'}{a + \beta(1-r)} & \text{under specific conditions} \\ a[y' - d(1-b)] & \text{otherwise} \end{cases}
\]

and

\[
m^* = \begin{cases} \frac{\beta(1-r)}{p} & \text{for the same condition,} \\ \frac{y' - d(1-b)}{bp} & \end{cases}
\]

\[
d < \frac{y(1 - \beta(1-r))/(\alpha + \beta(1-r)) - a(b)}{1 - b}.
\]

This situation can be reasonable when the medical service includes preventive procedures, optional treatment, alternative medicine such as nutritional supplements, and/or fitness and exercise services. For example, a poorer consumer may choose a conservative treatment for the same sickness when a richer consumer chooses a more expensive but aggressive treatment. On the other hand, a richer consumer can choose
preventive medical services even when s/he is quite healthy. It is also assumed that there is no moral hazard problem associated with these consumers.

We see immediately from equation (4) that people tend to seek more medical care if:

- their income \( y' \) is higher;
- medical care cost \( p \) is lower;
- medical care is more efficient with a larger \( \beta \);
- the other consumption is less preferred relative to health with a smaller \( \alpha \); and
- deductible \( d \) is lower, and/or copay \( b \) is lower.

We can categorize consumers into two types: low- and high-medical care. The decisions on medical care services do not depend on health status, an unusual case caused by the Cobb-Douglas utility assumption with a smooth substitution between health and other consumptions. This implies there is no moral hazard behavior. Relaxing the specific utility assumption, the medical expense will depend on health status.

Low-medical care consumers never spend more than the deductible and are never eligible to any insurance payment. Insurance provides no benefit to them. So, to return to the first stage, they will never participate in any insurance programs even if eligible.

In the case of China, the rural residents can choose to participate in the NCMS or not to, while most urban employees have no choice but to be either enrolled in SHI through their employer or not qualify. Furthermore, the insurance premium for NCMS is a constant amount \( a_R \), while it is proportional to income for SHI participants, \( a_Uy \). For the given NCMS with fixed \( b_R \) and \( d_R \), those rural residents whose income and preference parameters satisfy this condition:

\[
d_R > \frac{y - a_R - yb_R(\beta(1-r))/(\alpha+\beta(1-r))}{1 - b_R},
\]

are not interested in the NCMS. Although urban employees are mandated to enroll in SHI, for the given SHI with fixed \( b_U \) and \( d_U \), those rural residents whose income and preference parameters satisfy this condition:

\[
d_U > \frac{y(1 - a_U - b_U(\beta(1-r))/(\alpha+\beta(1-r))}{1 - b_U},
\]

are worse off by participating. Because the deductible and premium levels of NCMS are universal to all participants, people with extremely low income may opt not to participate. Similarly in urban areas, some low-income people may actually be worse off by participating.

If we also include commercial insurance in the person’s decision set, the flatter budget line in Figure 1 can rotate around the crossover point of the two budget lines in the range from the steeper budget line to the horizontal position, when the choice of \( b \) changes from 1 to 0. Also, because commercial insurance premiums are higher with little government subsidy compared with NCMS or the employers’ contribution in SHI, the new flatter budget lines are shifted downwards. The new budget constraint has now three line segments, the no insurance line, the NCMS (or SHI) line, and the commercial insurance line (Figure 2).

Recently, some people still choose to have no insurance because the non-subsidized commercial insurance is too expensive. However, some previous non-participants may...
now prefer the higher coverage of commercial insurance over SHI and NCMS. In addition, some who previously preferred NCMS may switch to commercial health insurance with higher coverage[4]. These two cases are shown in Figure 2. People participating in commercial insurance tend to use a higher level of medical care. The analytical solution for $b$ and the conditions for choosing between commercial insurance and NCMS can be derived in the same way if the premium structure is assumed. However, the algebra is very tedious and not presented here.

The stage one problem for the rural resident who chooses commercial health insurance is:

$$\text{Max } EU^M = \frac{\alpha^\alpha (\beta(1-r))^{\beta(1-r)} E_s (1-\beta(1-r))}{(bp)^{\beta(1-r)}} \times \left( \frac{y - a(b) - d(1-b)}{\alpha + \beta(1-r)} \right)^{\alpha + \beta(1-r)}.$$  \hspace{1cm} (5)

The first order condition can be written as:

$$K = abd - (\alpha + \beta(1-r))ba'(b) - \beta(1-r) \times (y - a(b) - d) = 0.$$  \hspace{1cm} (6)

An immediate result is that the optimal selection of insurance coverage $b$ is independent of health risk. Again, this is determined by the perfect substitution feature of the preference and the health production function. This implies that there is no adverse selection problem due to asymmetric information on risk. We can furthermore prove that people with higher income, of relatively lower weight in the preference of regular consumption, with belief in more efficient medical care, and higher risk aversion level, will select higher coverage:

$$\frac{\partial b}{\partial y} = - \frac{\partial K/\partial y}{\partial K/\partial b} = - \frac{-\beta(1-r)}{\partial K/\partial b} < 0, \hspace{1cm} (7)$$

$$\frac{\partial b}{\partial \alpha} = - \frac{\partial K/\partial \alpha}{\partial K/\partial b} = - \frac{b(\beta - d'(b))}{\partial K/\partial b} > 0 \text{ for } d'(b) < 0 \hspace{1cm} (8)$$

$$\frac{\partial b}{\partial \beta} = - \frac{\partial K/\partial \beta}{\partial K/\partial b} = - \frac{(1-r)[ba'(b) + y - d - a(b)]}{\partial K/\partial b} = - \frac{-\alpha b(d - d'(b))/\beta}{\partial K/\partial b} < 0 \hspace{1cm} (9)$$

$$\frac{\partial b}{\partial r} = - \frac{\partial K/\partial r}{\partial K/\partial b} = - \frac{\beta[ba'(b) + y - d - a(b)]}{\partial K/\partial b} = - \frac{\beta}{1-r} \frac{\partial b}{\partial \beta} > 0 \hspace{1cm} (10)$$

Figure 2. The effect of commercial health insurance on utility

\hspace{1cm}

\hspace{1cm}
3. Data and empirical model

The urban data set is an actual hospital record from a clinical hospital affiliated to Peking University. Besides, the large proportion of patients from Beijing, they also have patients from all over China because they are among the top quality hospitals and can handle the most sophisticated cases. This dataset from 2003 is records of 14,095 patients with multiple hospital stays (from the same patients aggregated). It records the expenditure, age, gender, ethnic group, residence area, the seriousness of the medical situation, and the type of sickness. It also records the type of insurance the patient holds, if any.

In this urban hospital, there are different health insurance coverage groups. The first group, regular insurance, has almost 100 percent insurance coverage on medical expenses with restrictions on medicines and treatment procedures. People in this group are regular employees in the system. The second group, commercial insurance, has 100 percent insurance coverage on medical expenses with far fewer restrictions (on using newly developed and imported drugs, having a private hospital room, and having special diagnostic and treatment methods). The small number of individuals in this group tend to be high rank private business executives with higher incomes. The third group, uninsured, includes primarily the self-employed or employees in small private business with low incomes. The fourth group, special insurance, is similar to the first group except having zero deductibles and copays, and also fewer restrictions on drugs and treatment. People in this group are current and retired high-ranking government officials and veterans. The last group, others, includes (primarily) dependents of the first group with partial insurance coverage, and other types of medical benefits. The five groups also represent the income distributions of patients with the commercial insurance group who have the highest income, followed by special insurance group, regular insurance group, others, and uninsured. The descriptive statistics of expenditures are shown in Figure 3.
The rural data is from the survey led by the Center for Chinese Agriculture Policy in collaboration with the University of California, Davis and University of Toronto. The survey was conducted in early 2005 from a randomly selected sample of 101 rural villages in 5 provinces of China (Jiangsu, Hebei, Jilin, Sichuan, and Shaanxi). A detailed description of the survey method can be found in Zhang et al. (2006). The survey included a total of 808 households. In this analysis, we use a sub-sample for villages that have NCMS, which included 24 villages with 777 individuals. Furthermore, to make it comparable to the urban data, we picked the sub-sample for those who were sick in the year before the survey and had actually realized healthcare costs to estimate the healthcare demand equation.

The survey form was designed to collect information on each individual’s participation in the NCMS, health status, type of sickness if sick, and medical care expenses during 2004. Detailed information on other characteristics of individuals and their families are also collected including age, education, and wealth of each household member approximated by the house value of the individual (Table I)[5].

The two datasets are collected from separate sources with some different measurements. They are also for two different years although very close to each other, hence we estimate in separate empirical models. Because basically no commercial insurance was revealed by the rural dataset and only a small number of observations from the urban dataset, and both of the two public insurance programs have fixed premium schemes, fixed deductible and copay levels, these three variables are subsumed by the intercept of the models. Also, the medical prices are hard to quantify and the health care efficiency is not measured, hence they are omitted from the empirical model as well. An individual’s preference on health and other consumption goods are approximately evaluated by a set of demographic variables, assuming these characteristics dictate people’s preferences.

Based on equation (4), we estimate an empirical equation for healthcare service:

\[ m = f(y, s, x, b; \beta) + \varepsilon \]  

(11)

where \( m \) is the medical expenditure, and \( y \) is the income level approximated by the per capita housing asset value in the rural model. We do not have an income or wealth level

<table>
<thead>
<tr>
<th>Variables in the rural survey 2004</th>
<th>Total sample</th>
<th>Sub-sample of those seeking medical services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals living in villages covered by NCMS (covered individuals)</td>
<td>783</td>
<td>486</td>
</tr>
<tr>
<td>Covered individuals that participate in NCMS (participating individuals)</td>
<td>617</td>
<td>397</td>
</tr>
<tr>
<td>Self-reported illness</td>
<td>569</td>
<td>486</td>
</tr>
<tr>
<td>Self-reported chronic illness</td>
<td>166</td>
<td>150</td>
</tr>
<tr>
<td>Illness reported to be serious</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Seeking healthcare service (both in and outpatients)</td>
<td>486</td>
<td>486</td>
</tr>
<tr>
<td>Being admitted to hospital (inpatient)</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Male</td>
<td>408</td>
<td>238</td>
</tr>
<tr>
<td>Average healthcare expenditure (yuan)</td>
<td>372.15</td>
<td>599.58</td>
</tr>
<tr>
<td>Average age (years)</td>
<td>34.65</td>
<td>36.27</td>
</tr>
<tr>
<td>Average education (years)</td>
<td>5.48</td>
<td>4.98</td>
</tr>
</tbody>
</table>

Table I.
for the urban dataset. However, it seems to be highly correlated with the insurance
category variables, i.e. the high income people are highly likely to be found in the special
self paying group and special coverage group, while the low-income people are in the
uninsured group. $s$, the health status variable, is represented by a set of dummy
variables indicating the type of sickness and the serious level of the sickness for the
healthcare demand equation. In both datasets, we have tumor, cardiac sickness, acute
problems, and general sickness categories, of which general is the default in the urban
model and acute is the default in the rural model. In addition, the urban hospital records
also have kidney sickness, multiple sickness (complications), life-threatening situations,
and urgent situation categories[6]. $x$ is a set of demographic variables including age,
gender, and educational level (for the rural model only).

Based on equation (6), we will estimate a Logit model for insurance participation for
the rural model only, because urban citizens have no choice about whether they
participate in the insurance scheme or not:

$$Pr(b = 1) = g(y, s, x; \beta)$$

(12)

where $b$ is the binary participating variable; $s$ is now a set of variables for the distribution
parameters of the random health status. We use self-assessed health status based on
past experience to approximate it. There are dummy variables representing health is
excellent, above average, average, below average, and poor with average as the default.

4. Empirical results

The urban model has been estimated using an ordinary least square technique. The
results (Table II) show that medical services demand by urban residents is strongly
influenced by the sickness itself and type of insurance coverage. Most of the variables
we include in the model are statistically significant. Patients in urgent situations spend
2,702 yuan more on healthcare care than non-urgent sickness, while the life-threatening
situations cost patients 9,476 yuan more. Among the six categories of sickness, patients

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<table>
<thead>
<tr>
<th>Coefficients</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>15,492.16*</td>
</tr>
<tr>
<td>Urgent situations</td>
<td>2,702.03**</td>
</tr>
<tr>
<td>Life-threatening situations</td>
<td>9,476.29**</td>
</tr>
<tr>
<td>Tumor</td>
<td>28,140.09**</td>
</tr>
<tr>
<td>Acute problems</td>
<td>-617.37</td>
</tr>
<tr>
<td>Kidney problems and diabetics</td>
<td>-1,799.44</td>
</tr>
<tr>
<td>Cardiac sickness</td>
<td>9,312.09**</td>
</tr>
<tr>
<td>Multiple sickness</td>
<td>21,741.97**</td>
</tr>
<tr>
<td>Commercial insurance group</td>
<td>49,846.61**</td>
</tr>
<tr>
<td>Special insurance group</td>
<td>6,097.21**</td>
</tr>
<tr>
<td>Uninsured group</td>
<td>-6,022.28**</td>
</tr>
<tr>
<td>Other paying groups</td>
<td>-3,021.75</td>
</tr>
<tr>
<td>Age</td>
<td>51.24*</td>
</tr>
<tr>
<td>Female</td>
<td>-7,428.53**</td>
</tr>
<tr>
<td>Multiple $R$</td>
<td>0.279</td>
</tr>
<tr>
<td>Observations</td>
<td>14,095</td>
</tr>
</tbody>
</table>

Table II. Regression results of urban healthcare expenditure model

Note: Significant at *5 and **1 percent levels, respectively
spend far more to treat tumors, 28,140 yuan more than the default general category. The next category is multiple sickness, costing 21,742 yuan more than the default category. This is because patients in this category tend to be aged people with multiple problems and complications that may cross several categories. Cardiologic problems and strokes also cost 9,312 yuan more than the default category. The acute category is not much different than the default category because the problems tend to be accidental injuries, not necessarily expensive to treat, and the kidney and diabetic problems tend to be treated with medication instead of costly surgical operations. Neither of the last two category coefficients is significant.

Although the medical expenditure difference caused by sickness is itself determined by the nature of medical techniques and the lumpiness of the treatment, the expenditure difference caused by insurance status can be explained more with economic rationale. People in the commercial insurance group spend 49,846 yuan more than the default group, regular coverage group, because the insurance has far better coverage and because patients in this group are likely to come from a really high income elite group. They are willing to pay anything for state of the art healthcare to get their health problems fixed and to ensure their hospital stay is as comfort as possible (such as having private rooms). special insurance group patients also spend 6,097 yuan per patient more than the default group for they have better insurance coverage. However, their income is not as high as the commercial insurance group, and they may not seek luxury services using money out of their own pockets. The uninsured group spends 6,022 yuan less per person than the default group, the lowest expenditure among all the groups. This is clearly because patients’ health care behavior is significantly conservative without the help of health insurance within the constraints of low incomes. The dependents of regular employees in the others group can have partial coverage and their healthcare behavior is similar to the default group, with an insignificant negative coefficient.

Age is also a significant variable because older people tend to have more and more severe health problems. Even when sickness and insurance variables are controlled, age still contributes to higher care expenses because of the severity of the sickness. On average, the cost is 51 yuan higher for every year of increase in age. Female patients tend to spend less than male patients. We believe this is caused by a gender difference in the nature of the sickness, that women tend to have less severe health problems than men within each category of sickness, rather than a gender difference within the family.

The estimation for the rural healthcare expenditure shows some similarities as well as differences with its urban counterpart (Table III). First of all, the healthcare expenditure levels are much lower. The rural average is in the hundreds as opposed to tens of thousands for the urban average. Notice, our rural dataset includes mostly outpatients and those who only bought medicine from a drugstore without even visiting a doctor, while the urban dataset includes inpatients only. Therefore, the expenditure difference is not contributed by income only.

Similar to urban case, the Tumor category is also the most costly one with 2,095 yuan higher per patient than the default group, the acute category this time. Cardiac (including stroke) sickness also costs $782 yuan more than the default. The general sickness category is not statistically different from the default group with a positive coefficient, which is the same as in the urban case. Kidney problems and multiple diseases are not recorded separately in the rural data. Although the relative size of expenditure across different sicknesses shows similarities between the rural and
urban dataset, we realize the magnitude of the expenditure difference is ten times bigger for urban patients. For tumor and cardiac patients, inpatient care is needed, in general. Comparing urban patients with these diseases who spend ten or twenty thousand yuan more than other patients, the rural patients with the same diseases only spend one or two thousand yuan more than the average of other rural in- and out-patients. This indicates they either opt not to stay in hospital, stay in hospital for shorter period, and/or take cheap treatments even as an inpatient.

Surprisingly, health insurance participation does not play a significant role in the healthcare behavior of rural residents, which is very different to the urban case and to conventional wisdom. Two reasons may explain this. First, the current NCMS has a high copay rate so it does not affect participants’ decision on medical treatment very much. Second, people’s decisions on whether to seek medical treatment when sick is primarily determined by the nature of the sickness, and the financial factors (whether to have insurance coverage or income levels) will play a small role in the extent of the treatment. For rural residents under NCMS, the coverage is specified at the very basic level of treatment. Patients have no freedom to upgrade their treatment even when they have NCMS to defray some of the cost. This implies that the potential for NCMS to help improve rural people’s ability to seek medical care services is not realized yet. The second reason can also be used to explain the insignificant wealth level.

Similar to the urban case, age contributes to the healthcare expenditure significantly, but the per-year contribution is only 8 yuan, much lower than the 51 yuan for urban patients. The relative magnitudes reflect the relative expenditure levels of rural and urban patients. Again, men tend to spend more on healthcare than women, but it is insignificant in the rural case.

The NCMS participating model was estimated for both the whole sample and the sub-sample of only those who got sick in the past year to keep it consistent with the healthcare expenditure model estimation (Table IV). For the sub-sample, age, wealth and the excellent health status are statistically significant. Older people have a higher probability in NCMS participation than their younger counterparts. People with excellent health in the past tend not to participate in NCMS. Both of these effects are a sign of adverse selection. Because NCMS does not discriminate people in terms of premium rates and coverage benefit based on age or health history, those who believe they will receive more benefit from NCMS will be more interested in participating. The current goal of the

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<table>
<thead>
<tr>
<th></th>
<th>Coefficients</th>
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<tbody>
<tr>
<td>Intercept</td>
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<tr>
<td>Tumor</td>
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<tr>
<td>Cardiac sickness</td>
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<tr>
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<tr>
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<tr>
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<tr>
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</tr>
<tr>
<td>Observations</td>
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<td></td>
</tr>
</tbody>
</table>

**Note:** Significant at *5 and **1 percent levels, respectively
government-sponsored NCMS is focused on providing a wide coverage as opposed to financial competitiveness. Given the insignificance of all other health status categories, the slight sign of adverse selection is not necessarily a bad sign for the program. Wealth is a positive contribution to participation. Although the 10 yuan per person is very minimal, it is still an extra expense to the really poor families in rural areas with many family members. The results conform with our stage one model in that income, health status, and other preference variables contribute to the health insurance decision.

Based on the full sample, the estimation results are slightly different. Nowadays, wealth is no longer significant but has a similar magnitude with the sub-sample. Excellent health status becomes significantly negative now. The more educated people tend not to participate in NCMS. Literature has suggested that more educated people tend to be less risk averse so they are less interested in insurance. This is reasonable especially when the wealth level is controlled in the estimation. Age contributes in the same way as we see from the sub-sample. Gender is not significant for either sample, although we see the healthcare expenditure is different for males and females.

Based on the survey, reasons other than wealth and personal health status that prevent 20 percent of rural residents from participating in the NCMS when it is available include living out of town (not being able to visit the network healthcare services), having other insurance, low coverage (higher copay), complicated reimbursement procedures, lack of trust in the fund management, and the high cost of the network health care services. A few survey respondents claimed that they could not even afford the 10 yuan per person in 2004.

5. Summary and concluding remarks
In this paper, we have modified a theoretical model to investigate the effects of NCMS in rural China and SHI in urban China on medical services demand. We found that people with higher income, with a relatively higher preference of health over regular consumption, with a belief in more efficient medical care, and a higher risk aversion level, will select a higher level of health insurance. We also conducted empirical analysis based on data from a 2004 rural health survey and 2003 actual urban hospital records.

<table>
<thead>
<tr>
<th></th>
<th>Sub-sample with non-zero healthcare expenditure</th>
<th>Whole sample</th>
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<tr>
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<tr>
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Note: Significant at *10, **5 and ***1 percent levels, respectively

Table IV. Logit estimation of the NCMS participation model
The empirical results support the theoretical results on health insurance demand, although the latter is derived at very restricted assumptions to be kept tractable.

Although the two datasets for SHI and NCMS are not identical in terms of variables and sampling scope, similar variables and economic relationships can be revealed and compared. The major difference is that urban SHI has higher coverage and urban citizens have higher incomes, resulting in a much larger urban medical expenditure. The healthcare service demand is determined primarily by the nature of the revealed health status (type and degree of sickness) for both urban and rural people. Although the health insurance programs play an important role in the healthcare service expenditure for urban residents, the NCMS seems not to be so effective in increasing the ability of rural residents to seek more medical services. However, this does not mean the NCMS has no impact on rural residents’ welfare, although we did not investigate NCMS’ welfare effect in this paper.

The newly launched NCMS in rural areas has about 80 percents of eligible people enrolled, achieving its major goal of covering a large portion of the population where the program is piloted. There is a slight effect of adverse selection that older people tend to participate and very healthy people tend not to participate. Although income effect is marginal given that NCMS is heavily subsidized and the expected payoff is higher than premium contribution, we still have a few survey respondents that claim they cannot afford the premium.

Because the urban health insurance program SHI is primarily a mandated group health plan for employees at large and midsize businesses, there is a need to increase the participation of small businesses and self-employed urban citizens as well as all their dependents. There is also an efficiency concern indicated by the huge difference in healthcare expenses between special coverage and regular coverage insurance groups. Should the program impose some limitations (or copay rates) on the coverage of advanced and costly procedures and medicine, the overall cost could be reduced. Higher level of healthcare subsidies could also be considered by the government for urban low-income citizens, e.g. the unemployed.

As for the NCMS, “buy-up” options may be considered at lower subsidy levels so that those rural citizens with higher incomes may consider taking the options. Furthermore, the option of allowing healthcare from out of network services should also be considered even with an additional out-of-pocket premium for those millions of migrant laborers working in cities today.

Notes
1. The amount of government contribution can be higher than this bottom line in some counties, especially in wealthier regions.
2. The model is general and applicable to commercial insurance programs and the pooled funds in both SHI and NCMS. The difference lies in the subsidy of the insurance premium.
3. It may yield two indifferent optima. We will ignore this case in the later discussion.
4. Urban employees may choose commercial insurance in addition, and urban residents not covered by SHI can theoretically participate in commercial insurance.
5. Because of small farm sizes and diversified income sources, it is impossible to get accurate information on rural residents’ income. Furthermore, land is not owned by farmers in China, and the best measure for wealth and income is the house value.
6. Acute problems include accidental injuries, appendix infection, and other problems that need immediate handling, but not necessarily life-threatening as in an emergency. Kidney problems include both kidney problems and diabetics. General is a broad category that includes all sickness that does not fit into any other specific groups. It tends to be dominated by minor problems such as gynecologic problems, obstetric problems, and optical problems.

References


**Further reading**


**About the authors**

H. Holly Wang is an Associate Professor in the Department of Agricultural Economics, Purdue University. She received her PhD from the Michigan State University, and served as an Assistant and Associate Professor at the Washington State University from 1997 to 2007. Her research has focused on risk and insurance for both US and Chinese issues. H. Holly Wang is the corresponding author and can be contacted at: wanghong@purdue.edu

Shaomin Huang is a Professor in the Business Division, Lewis-Clark State College. He received his PhD from the Washington State University. His research and teaching interests include econometrics and Chinese health care system.

Linxiu Zhang is a Professor and a Deputy Director at the Center for Chinese Agricultural Policy, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences. She obtained her PhD from the Reading University. Her research focus is on rural poverty, rural labor market development, community governance, public investments, and the economics of rural education and health care.

Scott Rozelle is the Helen Farnsworth Senior Fellow in the Food Security and the Environment Program of the Stanford University’s Freeman Spogli Institute for International Studies. Rozelle’s research focuses almost exclusively on China and is concerned with three general themes: agricultural policy, including the supply, demand, and trade in agricultural commodities; the rural environment; and issues of poverty alleviation with a focus on rural education. He is the Chair of the Board of Academic Advisors of the Center for Chinese Agricultural Policy.

Yuanyuan Yan is an Assistant Professor in the Department of Public Administration, China Youth University for Political Sciences. She received her PhD from the China Agricultural University. Her research and teaching interests are in management and agricultural policy.

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