

URBANIZATION AND HEALTH CARE IN RURAL CHINA

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ABSTRACT

Since the early 1980s, strong economic growth has led to remarkable urbanization across many urban and rural areas in China. Using longitudinal data from the China Health and Nutrition Survey (CHNS), this study obtained the first empirical estimates of how health insurance and access to care among the rural population were changed in response to the process of urbanization and other factors. The study results revealed strong evidence indicating that urbanization led to a significant and equitable increase in health insurance coverage for the rural population. Individual income also served as a critical determinant of insurance status. Moreover, adverse selection seemed to play an important role in deriving the individual demand for insurance. In analyzing the probability of seeking care when ill, the study found both the severity of illness (the need) and insurance coverage (enabling) to be crucial determinants. However, after controlling for insurance coverage, little variation in seeking care remained attributable to urbanization. Based on the findings, it can be concluded that financial barriers remain a major threat to seeking medical care in rural population. Urbanization may well help develop the local community-based insurance market in rural areas, thereby improving people's insurance status and access to care.

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I. INTRODUCTION

In the last two decades, China has experienced unprecedented economic growth at a rate of 10% annually during the 1980s and 11.2% for the 1990s, whereas the worldwide average rates were 3.2 and 2.5%, respectively (World Bank 2000a). Accompanying this growth has been increasing urbanization resulting from changes in economic policies related to the transition from the Soviet-style industrialization to a market economy. The pace of urbanization has accelerated following the success of rural reforms that increased agricultural productivity and freed labor from a dependence on agriculture. As people continue to move away from traditional farm activities toward non-farm businesses in more urbanized areas, the urban population is expected to nearly double, increasing from the current 455 million to more than 712 million in 2020 (World Bank 2000b).

The spatial dimension of urbanization is also changing. Physical boundaries (such as city walls) used to separate a city from the countryside are disappearing. Today in China, urban activities have far extended the city walls to encompass township and village enterprises that are very much part of an expanded economic market being formed in different regions. As dubbed by the great urban historian Lewis Mumford (1961), beyond the urban fringe are *invisible cities* where the influence of urban consumption and culture is widespread, thanks to dramatic advances in transportation and telecommunication.

China's urbanization has led to a wide range of opportunities and developments in multiple dimensions of the society. There have been enormous changes and improvements in infrastructure, industrialization, migration, labor force participation, education, and social welfare programs in both urban as well as rural areas. While much attention was paid to the development of urban cities, little appears in the literature about the extent of urbanization across rural areas, and how it may have influenced the social welfare of rural populations. In particular, little is known about the impact of urbanization on health care in rural China, where the vast majority of people have to pay for health care out of own pockets. This is an exceedingly important issue in China for several reasons.

First, over 70% of Chinese still live in rural areas. A recent report by the World Bank (1996) indicates that the urban to rural population ratio was about 30/70 in 1993, but the urban to rural health expenditure ratio was reversed at 70/30. On average, urban residents spend over four times as much on health care as do rural residents. Differences in the supply of health care facilities and manpower are also striking across urban and rural areas (China Ministry of Health 1996). While the overall urban-rural gap has been demonstrated, little research has documented how rural health care conditions change in response to various levels of economic development and urbanization.

Second, health care financing in China has long been segmented by urban and rural residence. In urban areas, health care is primarily financed through two major public programs: the Government Insurance Program (GIP) and the Labor Insurance Program (LIP). Although both programs are being merged into an integrated community-based insurance system, the new system continues to cover only urban populations (Liu et al. 1999; Liu et al. 2001). The rural population, in contrast, is ineligible for any publicly financed insurance. Rural patients must either pay out of pocket or through the "cooperative medical plans" (CMP) run by villages and townships, which typically pool the voluntary contributions of local residents and also organize

medical services at the local community level. Nonetheless, the lack of publicly financed health insurance for the rural masses represents a great challenge to China, shedding light on concerns about inequity in health care (WHO 2000).

Given the current socioeconomic condition in China, it is likely that the rural population will continue to use self-financing or CMP schemes. Public financing is unlikely to occur in rural healthcare. Therefore, urbanization may serve as a community-based driving force for the development of healthcare market in rural china. On the demand side, urbanization triggers economic opportunities that can generate a sizable income effect on the demand for health insurance. Moreover, individual preference and knowledge about health risk and choice of health insurance may be influenced as well, which can further contribute to the demand function. On the supply side, urbanization may help mobilize health care resources including infrastructure, investment, and manpower, all contributing to the development of CMP plans.

Another related issue concerns the distribution of urbanization across different population groups within the same area. Often the benefits of development do not trickle down to the poor, raising the question of whether urbanization alleviates or exacerbates inequities in health care between people with different socioeconomic and health conditions (Liu, Hsiao and Eggleston 1999, World Bank 1997b, Knight and Li 1996).

Clearly, health care in rural China remains a major public concern. Given the lack of direct public organization and financing, developing rural health care seems to be viable and operational only at local community level through the cooperative efforts between individuals and business communities. Therefore, from a policy perspective, it is critical to understand how community-based urbanization would help create business opportunities and mobilize both human and capital resources, which in turn may facilitate the development of health insurance and service markets in rural areas. Using the longitudinal data for a sample of eight provinces from the China Health and Nutrition Survey (CHNS), this analysis represents the first empirical research to investigate the extent of urbanization and its impact on health insurance and access to care among different population groups. Three specific questions were pursued in the study:

- Across rural populations experiencing different degrees of urbanization, are there differences in health insurance status or care-seeking behavior?
- Does the impact of urbanization on health insurance and access to care differ by income and social status?
- What other factors contribute to cross-group variations in health insurance and access to care among rural populations?

Section II discusses data sources, model specifications and the measurements of key variables. Section III presents the empirical results of the estimation. Section IV provides a discussion and concluding remarks.

II. DATA AND METHODS

2.1 DATA

This study uses the China Health and Nutrition Survey (CHNS) data series, a large-scale

longitudinal survey conducted in eight provinces in China in 1989, 1991 and 1993.¹ CHNS was conducted using a multistage, random cluster process. Eight provinces were represented in the survey: Liaoning, Shandong, Jiangsu, Henan, Hubei, Hunan, Guangxi, and Guizhou. They vary considerably on a range of key characteristics, including geography and economic development. Counties in each of the eight provinces were stratified by income level and randomly selected based on weighted sampling scheme. In addition, the provincial capital and lower-income cities were selected in sampling. Townships and villages were selected randomly within the counties, and urban and suburb neighborhoods within the cities.

Overall, the total sample consists of 32 urban neighborhoods, 30 suburb neighborhoods, 32 towns and 96 villages. Each of the surveys was performed at the individual and household level in communities. The panel sample includes 16,000 individuals and 3800 households for which detailed information about health, health care, nutrition, family planning, household income, social services and socioeconomic characteristics was collected. The survey was designed to allow for a broad range of health and nutrition related issues to be investigated.

2.2 MODEL SPECIFICATION

Analytically, if we treat urbanization as an “intervention” variable (U) in a health care outcome function (Q), we can specify a generic functional form as follows:

$$Q_{it} = f(U_{it}, X_{it}, U_{it} Z_{it}, \alpha_{it}, \delta_t; \varepsilon_{it}) \quad (1)$$

where f is a functional form of the relationship between Q_{it} and its determinants in the equation; $i=1, 2, \dots, N$ is an index representing the individuals in the sample; and t =years 1989, 1991, and 1993. In this equation, we control for several major sources of variation in health care outcomes. The first is U_{it} , an urbanization index measuring the level of urbanization in a community where individual i resides in year t . We discuss the measurement of U_{it} in detail in the next sub-section.

The second source of variation is from X_{it} , a vector of individual characteristics and socioeconomic conditions for individual i in year t . Following the framework developed by Andersen and Newman (1973), we consider three groups of factors in X_{it} that are likely to determine health care use: 1) predisposing factors, including age, gender, education, marital status, and job status; 2) enabling factors, including income and insurance coverage; and 3) need factors, which mainly refer to one’s health status or disease conditions.

The third source is from a vector of fixed-effects, α_{it} , reflecting an individual’s geographic location. With the CHNS data, this variable is used to capture the province-specific fixed effects associated with eight provinces: Jiangsu, Hunan, Guangxi, Liaoning, Shandong, Hubei, Guizhou, and Henan (reference).

$U_{it}Z_{it}$ is a vector of interaction terms that capture the distributional effects of urbanization across population cohorts with different income and job status Z_{it} . δ_t is a time effect which controls for a time trend from year 1989, 1991 to 1993. ε_{it} captures all unobserved residual effects on Q_{it} .

¹ CHNS was jointly sponsored by the Institute of Nutrition and Food Hygiene in the Chinese Academy of Preventive Medicine, jointly with the Carolina Population Center at the University of North Carolina at Chapel Hill.

URBANIZATION (U)

Unlike other quantitative variables, urbanization is difficult to measure. In an attempt to define a quantifiable index, this study considers several variables that may shed light on the level of urbanization. In simple economic terms, the urbanization process of an area should lead to a dense agglomeration of people and firms. While sociologists may view an urban area as a multiplicity of interacting social processes and political scientists may see that as a subdivision of government jurisdictions, a fundamental economic criterion is the population density. From an economic standpoint, therefore, an urbanized area can be defined as a place with higher population density than elsewhere (Mills 1972). Rising urbanization can then be measured by an increase in the density of population within an area.² This density approach follows the economic reasoning of the forces driving the urbanization process. As theorized by Robert Lucas (1988) and Paul Krugman (1991), the benefits of agglomeration to firms come ultimately from economies of scale, increasing returns, division of labor, and knowledge externalities. That is, agglomeration simply reduces cost for goods, people, and ideas (Glaeser 1998). These economic incentives reinforce the geographic concentration of production activities. Thus, population density can be a good measurement component of urbanization.

Another fundamental feature of the urbanization process is the development of specialized industries and services that generate higher returns than agriculture. This is reflected in the century-long phenomenon that urban workers earn higher wages than farm laborers (Glaeser and Mare 1994). Given standard neoclassical assumptions, firms are willing to pay higher wages only for higher marginal productivity of labor. It follows that urbanization can be measured in part by indicators that reflect rural industrialization and off-farm employment that generate higher incomes than farming.

In addition, an urbanization process is typically accompanied by the development of infrastructure such as transportation and telecommunications. The role of the transportation network in facilitating the growth of an urbanized area is evident in reducing the cost of inputs and final goods for producers, traders and consumers. The convenience of transportation often affects the locations of production and market through agglomeration. Indeed, transport costs explain location choices in many documented urban and regional economic studies (Alonso 1964, von Thünen 1966, Fujita 1989). Similarly, advances in telecommunication technology also accommodate the rising demand for contact and information as urbanization takes place (Imagawa 1996).

Applying these insights to rural China, we find it difficult to capture the overall level of urbanization consistently across the study areas using a single urbanization-related indicator as discussed above. To better account for the level of urbanization, we developed an index that integrates information from three major dimensions: population density, infrastructure and industrialization.

We used three major sets of variables to construct the urbanization index:

- 1) Total population of the village/neighborhood divided by the area of the village or neighborhood;

² This is a relative concept. The threshold population density, for example, varies from country to country. The minimum population density that defines an urban area in China would be much higher than in the United State.

- 2) Infrastructure variables, including whether there was an open trade area; an open city, a special economic zone within two hours by bus, any bus stop; the most common characteristic of its road: mud road, rock road, and good road; and the availability of telex, telephone, and fax services;
- 3) Industrialization variables, including the availability of any locally managed collective enterprises, the number of total and private enterprises; distance to the nearest urban center or the nearest county; the percentage of the work force working in enterprises employing more than 20 people; and the number of household with good water sewers divided by number of households.

We first calculate the distribution of these variables, and then define the uppermost quartile as the “**high level**”, the lowermost quartile as the “**low level**”, and the middle two quartiles as the “**middle level**”. For all dummy variables, the high level takes the

	1989	1991	1993
High urbanization	19	17	16
Middle urbanization	146	147	153
Low urbanization	25	26	21
Total	190	190	190

value of 1, and the low level a value of 0. This allows us to quantify each community’s degree of urbanization by summing up the above dummy variables. According to this new index from summation, we define high-level urbanized communities as those with scores in the top 10%; the low-level urbanized communities as those in the bottom 10%; and the middle-level urbanized communities as all others. Following this approach, we categorize urbanization into three levels: high (U^H), middle (U^M) and low (U^L). The distribution of urbanization for communities contained in CHNS is displayed in Table 1, which ranks the communities by the urbanization index on a relative scale within each year.

Having defined this urbanization index, we then derive two specific probability models from the generic model (1) to measure urbanization and its impact(s) on health care outcomes.

PROBABILITY FUNCTION OF HEALTH INSURANCE COVERAGE

Access, ability to obtain health services when needed, is a vital component of quality of care. That ability is subject to two conditions: financial and non-financial constraints. The former includes variables such as income and insurance coverage, and the latter refers to factors such as physical access to health care personnel and service facilities. On the financial side, it is well known that health insurance plays a key role in the determination of health care utilization from a patient’s perspective. For instance, the Rand Health Insurance Experiment provided a large body of empirical evidence as to the strong effects of co-insurance policies on medical care use (Manning et al. 1987; Newhouse et al. 1993). Researchers have also obtained consistent evidence on the role of insurance in demand for health care in many developing countries (Schwartz, Akin, and Popkin 1988; Akin, Guilkey, and Denton 1995; Akin et al. 1998; Henderson et al. 1995). Given the importance of health insurance, we specified a probability function to examine the impact of urbanization and other factors on individual insurance coverage. The modeled is as follows:

$$I_{it} = G(U_{it}, X_{it}, U_{it}^H Y_{it}^H, U_{it}^H S_{it}^H, \alpha_{it}, \delta_t; \varepsilon_{it}) \quad (2)$$

Where $I_{it} = 1$ indicating an insurance coverage and $I_{it} = 0$ otherwise; $U_{it} = (U_{it}^H, U_{it}^M)$; X_{it} includes age, gender, education, occupation, marital status, income, and self-perceived health status; Y^H is a dummy variable measuring high-income vs. low-income groups; and S^H is a dummy variable to capture the impact of social status at work (1 for village officials and 0 for others). Equation 2 is estimated as a logistic probability function to test the primary hypotheses as follows:

- H1** Urbanization increases the likelihood of individual health insurance coverage. This hypothesis will be tested with the coefficients of urbanization index vector U_{it} .
- H2** The impact of urbanization on health insurance coverage will not differ with individual socioeconomic status. This hypothesis will be tested with the coefficients of the two interaction terms ($U_{it}^H Y_{it}^H$ and $U_{it}^H S_{it}^H$) respectively.
- H3** Adverse selection effect exists underlying the demand for health insurance by individuals. With all other conditions being constant, this hypothesis predicts that people with poor health status are more likely to have health insurance coverage. This hypothesis will be tested out using three self-perceived health status dummy variables included in X_{it} : very good status, good status, and fair status, with poor status serving as the reference.

PROBABILITY FUNCTION OF SEEKING CARE

The second primary model in this study is a probability function of seeking care when one becomes ill. As discussed above, insurance coverage plays an important role in financial access to care. In addition, non-financial factors such as availability of health care facilities can also influence one's ability to obtain care. This function will examine the probability of obtaining health care when needed as a function of urbanization, insurance coverage, and other determinants following the health care utilization model developed by Andersen and Newman (1973).³ This model is specified as follows:

$$H_{it} = G(U_{it}, X_{it}, U_{it}^H Y_{it}^H, U_{it}^H S_{it}^H, I_{it}, \alpha_{it}, \delta_t; \omega_{it}) \quad (3)$$

Where G is a logistic function, and $H_{it} = 1$ if a sick person obtained care, and 0 if failed to get care due to any barriers. This model contains the same subset of variables as described in equation (2). In this model, several new hypothesis tests are to be carried out.

- H4** Health insurance coverage (I) reduces financial barriers and thus increases access to

³ There is a notable difference between our model specification and that of many other international studies on health care utilization. The latter often look at the probability of seeking care annually among the general population (Duan et al. 1983; Newbold, Eyles, and Birch 1995), whereas our model specifies health care utilization as conditional on patients with sickness. For a developing country, such as China, access to medical care is a major issue among sick people, especially in the poor rural areas. We feel that when data permits, it is more appropriate to control for the condition of being ill while examining the likelihood of seeking care. This approach, in fact, was adopted in some previous studies for developing nations, such as studies of Thailand (Pannarunothal and Mills 1997) and China using CHNS data by Henderson et al. (1994; and 1998).

care, all other factors constant.

Henderson and her colleagues (1998) tested this hypothesis using the total population sample combining both urban and rural people together. But their study uncovered an unexpected pattern suggesting that insurance deterred health care utilization, which upsets the assertions of a wide body of literature. Our study takes a different approach by limiting our sample to all rural population who are not eligible for GIP and LIP. The rationale for our approach is that rural people are more homogeneous in terms of many health related factors, including the nature of their insurance program CMP (vs. GIP and LIP), health behavior, health care infrastructures and manpower, health policies and socioeconomic conditions. Therefore, the statistical distributions are unlikely to be the same for both the urban and rural populations.

H5 Severity of an illness, rather than self-perceived health status, is a key determinant of one's decision to seek care. CHNS data contain a variable indicating the severity of illnesses or injuries occurring within the past four weeks. The severity variable is defined at three levels: quite severe, somewhat severe and not severe.

III. EMPIRICAL ANALYSIS AND RESULTS

3.1 DESCRIPTIVE STATISTICS

Table II gives the definitions of all variables used in the analysis. Table III reports the mean values of these variables. After data cleaning and grouping, the sample includes a total of 33,404 individuals. These individuals are distributed in eight provinces: Guizhou (15%), Guangxi (15%), Henan (15%), Hubei (13%), Hunan (12%), Shandong (11%), Liaoning (10%) and Jiangsu (10%).

Based on the total sample, the mean age was 28.9 years; 41% had elementary schooling. in terms of occupation, over 72% were farm laborers, 2% were officials, 11% worked for private or collective enterprises, and 14% had other jobs. The mean annual income was about 1,000 RMB (Chinese Yuan) (\$1 USD≈8.4 RMB).⁴ In order to capture the non-linear income effect, this analysis categorizes individual annual income into three levels: high- (1st quartile, average annual income > 1,266 RMB); middle (2nd and 3rd quartiles, average annual income between 1,266 and 390 RMB); and low- (4th quartile, average annual income < 390 RMB).

In terms of insurance coverage, the data show that over 90% of the individuals did not have any insurance, 3.3% had access to CMPs, and 6% had work unit insurance, maternal and child insurance, or planned immunization insurance for children. There are two sets of variables measuring health conditions. One is a survey item asking respondents to rate their health relative to their peers on a four-point scale from very good to poor. Responses were as follows: very good (13%), good (66%), fair(20%), and poor (3%) For anyone who was ill in the four weeks before the survey, the second variable reflects the severity of illness. Among those who reported having had an illness (1,974), 12% reported it as having been quite severe, 43% as

⁴ This income figure might be under-estimated for several reasons. First, subsistence farming is common in China. Therefore, farm production cannot be observed through market exchange and measured. Secondly, many Chinese barter or receive favors of reduced rent. These exchanges also cannot be observed and were unlikely to be included in responses to the survey. Third, the reference period for the survey was the previous twelve months. The length of the reference period may have limited the accuracy of respondent recall, especially for small and irregular exchanges of goods and services that are common in China. Fortunately, these limitations will not affect our analyses because individual income is not included in deriving the urbanization index.

somewhat severe and 45% not severe. Seventy-nine percent of sick individuals sought care from professional clinics (excluding self care services).

3.2 EXPLANATORY ANALYSES

Models I and II were estimated as logistic probability functions. The results are reported in Tables IV and V.

HEALTH INSURANCE COVERAGE

This model was estimated using 1991 and 1993 CHNS data.⁵ As predicted by hypothesis 1, there is a significant urbanization effect on one's likelihood to have health insurance. The probability of having health insurance is significantly higher for those residing in highly urbanized areas ($p < 0.001$) and moderately urbanized areas ($p < 0.002$), as compared to those with limited urbanization (the reference group). This effect is especially robust for individuals in the low-income group. For the high-income group, as indicated by the interaction term, the urbanization-driven difference in insurance coverage is somewhat reduced, but the reduction is significant only at the $p < 0.10$ significance level.

Health insurance status also differs greatly with individual income level and occupation, holding the level of urbanization and other factors constant. Both high-income and middle-income groups are much more likely than low-income groups to have insurance coverage ($p < 0.001$). In addition, farmers are less likely to be insured than people in any other occupation, including village officials, non-farm workers, and those in non-farm businesses ($p < 0.001$). These findings persist regardless of the level of urbanization, as indicated by the insignificance of the interactions.

As expected by hypothesis 3, individual health status is highly predictive of insurance coverage. This model includes three dummy variables indicating self-perceived health status at very good, good, and fair levels, respectively, with poor health status serving as the reference. The likelihood of having insurance is lowest for those indicating very good status ($p < 0.001$), followed by those in good status ($p < 0.006$), relative to the group reporting poor health. Insurance status is similar among people reporting poor or fair health. These results demonstrate an important observation that adverse selection seems to play a role in driving the demand for health insurance by rural population. While adverse selection is a common phenomenon identified in well-developed health insurance market, it is worth noting in the case of rural China where the choices for insurance supply are quite limited.

Health insurance status is also associated with educational level and gender. Five educational levels are specified in the model: no education (reference), elementary school, middle school, high school, and college. The estimates show that better educated individuals are more likely to have health insurance, with the exception of those with college education. One plausible explanation for this is that as only few individuals were in the college-level education category, so that the estimates could have been severely biased due to the effects of some outliers. Finally, males appear to be less likely than females to have insurance, but the difference is barely significant ($p = 0.07$).

⁵ This model was limited to 1991 and 1993 because it includes self-perceived health status variables that were available only in the 1991 and 1993 CHNS data.

Lastly, the study finds strong province-specific fixed effects, suggesting that the insurance status vary widely by province, even after controlling for urbanization and other factors. People are far more likely to have insurance if they live in one of four provinces: Jiangsu, Guangxi, Shandong, or Hubei ($p < 0.01$) relative to the poorest province, Henan. Other three provinces showed no difference in insurance coverage with Henan. In the model we also controlled for a time effect from 1991 to 1993, which captures a decreasing time trend in the likelihood of insurance coverage ($p < 0.001$).

ACCESS TO CARE

This model allows us to test a number of hypotheses concerning how urbanization, insurance, and other factors in rural areas affect an individual's likelihood of obtaining care when ill. As expected, the single strongest predictor of health care use is the severity of the illness. The estimates show an odds ratio of 3.72 for those reporting a "quite severe" illness in the previous four weeks ($p < 0.001$), and 1.6 for the "severe" group ($p < 0.006$), compared to the "not – severe" group. Furthermore, the study finds a strong and significant insurance effect suggesting individuals with insurance coverage are far more likely to obtain care than those without insurance coverage ($p < 0.01$), even after controlling for the severity of illness and other factors.

After controlling for health insurance and severity of illness, the model shows no association between the level of urbanization and the likelihood that an individual seeks medical care. Neither of the urbanization variables in the model is statistically significant. Similarly, other enabling and predisposing variables such as income and education do not play a significant role in the model. However, there is a significant gender effect suggesting that women are more likely than men to use care ($p < 0.002$), all else constant.

This model also controls for time trend and fixed effects. The time trend variable indicates that people were actually less likely to seek care in 1993 than in 1989 ($p < 0.005$). Following the fixed effect at provincial level, the results suggest that people in Henan were less likely to obtain health care when ill than those in Jiangsu ($p < 0.01$), Liaoning ($p < 0.001$), and Guizhou ($p < 0.01$).

V. DISCUSSION AND CONCLUSIONS

Urbanization has been taking place rapidly in China, resulting in a wide range of improvements in both urban and rural areas. However, empirical data are lacking as to whether or not urbanization has improved social welfare in general, and health care in particular for people residing in rural areas. Even less is known about the distribution of any effects of urbanization effects within subgroups of the rural population as defined by socioeconomic status and health conditions. This study adds to the literature by addressing both of these two major issues in an empirical analysis of the CHNS data in 1989 and 1993. Health care financing and delivery systems in rural China have remained largely unchanged since that time. Therefore, the findings and policy implications derived from this research are important today.

Our primary finding is that urbanization is strongly associated with higher rates of insurance coverage in rural populations, and this finding was robust. Urbanization may mobilize health care resources so as to increase the supply of health insurance. On the other hand, urbanization may also increase demand for health insurance through better education,

communication, and improved economic opportunities (and therefore higher individual incomes). Given the overall beneficial impact of urbanization on the prevalence of health insurance, our next question was whether or not such an effect was equitable (hypothesis 2). Our model specifically tested for differences in the effects of urbanization across high- and low-income groups, and between officials and other occupational groups. This study finds no significant evidence to reject the null hypothesis that urbanization benefits all income groups and occupations equally in terms of health insurance status.

In addition, the study examined whether urbanization would influence the probability of obtaining health care when people became ill. The study finds no association between the level of urbanization and the probability of using care, after controlling for health insurance and the severity of illness in the access model. Since access to care can be constrained by both financial (insurance) and physical barriers (supply of medical care), this finding implies that while urbanization has a strong positive impact on individual insurance status, it may have little impact on the supply of medical care. It is possible that after controlling for insurance status, the access model would capture no additional effect from urbanization.

This study also revealed a significant adverse selection effect on the individual demand for health insurance as predicted by hypothesis 3. While adverse selection has been a well-known phenomenon in the West, our study is the first to identify strong evidence of this effect in rural China. The health insurance model not only indicates a significant inverse relationship between insurance coverage and patient self-perceived health status, but also finds this relationship to attenuate consistently with the level of patient health status. Considering the great potential of the Chinese rural insurance market, this finding may provide valuable insights to both the public and private sectors that intend to develop business operations in this market.

One other important finding is that insurance status plays a key role in the utilization of health care in rural China (hypothesis 4). Some previous studies indicated that the insurance effect would disappear after controlling for the severity of reported illness or injury using the total CHNS sample combining both rural and urban population together (Hendersen et al. 1998). Our finding adds an insightful addition to the previous literature, suggesting that as urban and rural health care systems are segmented in China, it would be more appropriate to treat urban and rural population groups as two differently distributed samples when conducting empirical studies. This approach, as explored in our current study, leads to more consistent results. In addition to insurance status, severity of illness was suggested in hypothesis 5 as a key force behind an individual's decision to seek care, given all other factors constant. Our study indeed finds severity of illness to be the single most important predictor of seeking care, in both the significance level and coefficient magnitude.

We also investigated several predisposing and enabling variables for their roles in the determination of health care insurance coverage and health care access, in the context of the Andersen model (1973). Some of which do not support the model predictions. For example, we found a strong and significant income effect in the health insurance model, but not in the probability model of obtaining care. One implication is that people could be statistically indifferent in terms of access to care once all have health insurance coverage. Yet, a further question still remains as to whether the quantity and quality of care would vary with their income level. In fact, many previous studies showed that income effect might affect access to care differently than the quantity and quality of care once accessed (Newbold et al. 1995; Alberts et al. 1997; Diehr et al. 1999; Liu et al. 1999).

One last point is that both of our models indicated a decreasing trend in health care insurance and access. It is possible that this trend is an artifact of some variation in sampling over the years. However, given its quite consistent pattern in both models, one should not rule out the possibility that this trend may reflect an actual decrease in the prevalence of insurance and in access to care. Another possibility is that preferences for having health insurance and seeking care when ill may have actually changed over time. This argument can well apply to the probability function of seeking care because it was measured conditional on illness, which could involve some measurement errors as well. For the insurance model, however, data on the dependent variable was simply based on "yes" or "no" questions and we would expect people to know with near certainty whether or not they have health insurance. Alternatively, it may be that the time trend illustrates institutional changes in the rural health care system following the collapse of most CMPs.

This study is limited on several counts. First, the 1989 data were gathered using the first versions of the survey instruments, and the 1993 versions contained additional variables and some modifications. This limitation prevented us from developing a dynamic model to take full advantage of the longitudinal dataset. In fact, this limitation constrained our estimation of the insurance model to a comparison of insurance in 1991 and 1993, but not in 1989.

Data limitations also prevented us from addressing a few econometric issues in our models including the possibly endogeneity of insurance selection, and heterogeneity of individual health endowment. All of these issues could have been addressed if better data were available. As a result, one should read some of our results with caution. Hypothetically, for example, the insurance variable could well be an endogenous variable in determining the probability of seeking care. If so, the estimated insurance effect can be potentially inconsistent.

Third, urbanization is difficult to measure. We constructed an urbanization index variable to quantify the degree of urbanization, but it maybe subject to measurement or even conceptual errors. The selection of the variables in our index was indeed a challenge. Nevertheless, it was determined based on the literature, expert opinion and our own assessment and understanding of urbanization. Yet, the urbanization index has not been formally validated. Data limitations also prevented us from including in the urbanization index a measure of variation in the availability of health care facilities across the study areas.

Lastly, the generalizability of the study findings is limited. This limitation was attributable in part to the survey design. While the study sample was randomized and stratified across a number of provinces, cities, local communities and households, the sample is not representative of the Chinese rural population as a whole, nor does it contain any weighting index variables for individual observations.

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TABLE II. Variable Definitions

Variables	Definitions
Age	Age at survey in years, original variable
Teenage	DV = 1 if age is from 0 to 17; 0 otherwise (DV=dummy variable. Thereafter)
Young	DV = 1 if age is from 18 to 34; 0 otherwise
Adult	DV = 1 if age is from 35 to 49; 0 otherwise
Elderly	DV = 1 if age is 50 and above; 0 otherwise
Male	DV = 1 for male; 0 for female
Education	
Noedu	DV = 1 if without any education; 0 otherwise
Elementary	DV = 1 if with some elementary school education; 0 otherwise
Middleschl	DV = 1 if with some middle school education; 0 otherwise
Highschl	DV = 1 if with some high school or professional education; 0 otherwise
Highedu	DV = 1 if with some college or higher education; 0 otherwise
Primary occupation	
Tech	DV = 1 for professional or technical personnel; 0 otherwise
Officer	DV = 1 for manager, director or officer; 0 otherwise
Farmer	DV = 1 for farmer, fisher, hunter; 0 otherwise
Worker	DV = 1 for worker; 0 otherwise
Otherjob	DV = 1 for other jobs do not mentioned above; 0 otherwise
Province-wide income	Per capital annul income, original variable
Highincome	DV = 1 for income in the uppermost quartile (higher than or equal to 1,266RMB / yr); 0 otherwise
Midincome	DV = 1 for income in the middle two quartiles; 0 otherwise
Lowincome	DV = 1 for income in the lowermost quartile (lower than or equal to 390RMB / yr); 0 otherwise
Marital status	
Marry	DV = 1 for married people; 0 otherwise
Unmarry	DV = 1 for non-married people; 0 otherwise
Widow	DV = 1 for widowed people; 0 otherwise
Healthinsu	DV = 1 for insured; 0 for non-insured
Governinsur	DV = 1 for government insurance policy; 0 otherwise
Laborinsur	DV = 1 for labor insurance policy; 0 otherwise
Cooprinsur	DV = 1 for cooperative medical insurance; 0 otherwise
Otherinsur	DV = 1 for insurance other than mentioned above; 0 otherwise
Noinsur	DV = 1 for no insurance; 0 otherwise
Self-perceived health status	
Verygood	DV = 1 for very good; 0 otherwise
Good	DV = 1 for good; 0 otherwise
Fair	DV = 1 for fair; 0 otherwise
Poor	DV = 1 for poor; 0 otherwise
Illness	DV = 1 for having been sick or injured within the last 4 weeks; 0 otherwise
Care sought	DV = 1 for person who go to the hospital to see a doctor, based on the illness or injury; 0 otherwise
How severe was the illness or injury	
Litsevere	DV = 1 for not severe, based on the illness or injury; 0 otherwise
Midsevere	DV = 1 for somewhat severe, based on the illness or injury; 0 otherwise
Hvypsevere	DV = 1 for quite severe, based on the illness or injury; 0 otherwise
Urban	DV = 1 for people in urban area; 0 for rural; original variable
Province	
Jiangsu	DV = 1 for people in Jiang Su province; 0 otherwise
Hunan	DV = 1 for people in Hu Nan province; 0 otherwise
Guangxi	DV = 1 for people in Guang Xi province; 0 otherwise
Liaoning	DV = 1 for people in Liao Ning province; 0 otherwise
Shandong	DV = 1 for people in Shan Dong province; 0 otherwise
Hubei	DV = 1 for people in Hu Bei province; 0 otherwise
Guizhou	DV = 1 for people in Gui Zhou province; 0 otherwise
Henan	DV = 1 for people in He Nan province; 0 otherwise
Urbanization index	
Highurban	DV = 1 for high urbanization; 0 otherwise
Midurban	DV = 1 for middle urbanization; 0 otherwise
Lowurban	DV = 1 for low urbanization; 0 otherwise
t91	DV = 1 for 1991 people; 0 otherwise
t93	DV = 1 for 1993 people; 0 otherwise

TABLE III. Distribution of Key Variables

Variable	N	Mean	Std Dev
Age	30,308	28.9	19
Teenage	9,880	32.6%	0.469
Young	9,850	32.5%	0.468
Adult	5,940	19.6%	0.397
Elderly	4,667	15.4%	0.361
Gender	33,399		
Male	16,366	49.0%	0.500
Education	27,061		
Noedu	6,386	23.6%	0.424
Elementary	11,122	41.1%	0.492
Middleschl	7,631	28.2%	0.450
Highschl	1,894	7.0%	0.254
highedu	54	0.2%	0.043
Primary occupation	19,996		
Tech	220	1.1%	0.104
Officer	340	1.7%	0.129
Farmer	14,417	72.1%	0.448
Worker	2,200	11.0%	0.313
Otherjob	2,819	14.1%	0.348
Income	32,380	1,002	1,044
Highincome	8,095	25.0%	0.433
Midincome	16,158	49.9%	0.500
Lowincome	8,127	25.1%	0.434
Marital status	28,763		
Marry	13,806	48.0%	0.500
Unmarry	13,921	48.4%	0.500
Widow	1,035	3.6%	0.186
Healthinsu	24,238		
Cooperative insurance	800	3.3%	0.178
Other insurance	1,479	6.1%	0.239
No insurance	21,960	90.6%	0.291
Self-perceived health status	18,807		
Very good	2,351	12.5%	0.331
Good	12,375	65.8%	0.474
Fair	3,573	19.0%	0.392
Poor	508	2.7%	0.162
Illness	23,512		
Yes	1,999	8.5%	0.279
Care sought	1,971		
Yes	1,561	79.2%	0.406
Severity	1,974		
Not severe	880	44.6%	0.497
Somewhat severe	851	43.1%	0.495
Quiet severe	243	12.3%	0.328
Province	33,404		
Jiangsu	3,274	9.8%	0.297
Hunan	3,942	11.8%	0.323
Guangxi	4,944	14.8%	0.356
Liaoning	3,240	9.7%	0.296
Shandong	3,608	10.8%	0.311
Hubei	4,376	13.1%	0.338
Guizhou	5,011	15.0%	0.357
Henan	4,944	14.8%	0.355
Urbanization index	32,667		
Highurban	1,437	4.4%	0.205
Midurban	24,827	76.0%	0.427
Lowurban	6,403	19.6%	0.397
t91	11,157	33.4%	0.472
t93	11,190	33.5%	0.472

**TABEL IV. Logistic Model of Having Health Insurance
(N = 11,544; 2 yrs)**

	Estimate	S.E.	p-value	Odds ratio
Intercept	-7.693	0.779	<.0001	
Predisposing factors				
Age category				
Teenage (reference)				
Young	-0.430	0.310	0.165	0.651
Adult	-0.220	0.337	0.514	0.803
Elder	0.121	0.359	0.736	1.129
Gender				
Male	-0.203	0.112	0.070	0.817
Education				
Noedu (reference)				
Elementary	0.326	0.161	0.043	1.385
Middleschl	0.346	0.192	0.071	1.414
Highschl	0.895	0.240	0.000	2.447
Highedu	0.306	1.238	0.805	1.358
Primary occupation				
Tech	0.560	0.399	0.160	1.751
Officer	1.231	0.246	<.0001	3.426
Worker	0.882	0.137	<.0001	2.416
Otherjob	0.815	0.226	0.0003	2.260
Farmer (reference)				
Marital status				
Marry (reference)				
Unmarry	-0.217	0.174	0.213	0.805
Widow	-0.107	0.243	0.660	0.898
Enabling factors				
Annul income				
Highincome	2.678	0.289	<.0001	14.560
Midincome	1.127	0.293	0.0001	3.086
Lowincome (reference)				
Need factors				
Self-perceived health status				
Verygood	-1.175	0.306	0.0001	0.309
Good	-0.750	0.271	0.006	0.472
Fair	-0.228	0.281	0.416	0.796
Poor (reference)				
Fixed effect				
Jiangsu	5.166	0.586	<.0001	175.186
Hunan	-0.889	0.917	0.332	0.411
Guangxi	1.536	0.614	0.012	4.647
Liaoning	0.273	0.737	0.711	1.314
Shandong	2.829	0.596	<.0001	16.931
Hubei	3.000	0.594	<.0001	20.080
Guizhou	0.726	0.694	0.295	2.068
Henan (reference)				
Time effect				
T91 (reference)				
T93	-0.490	0.105	<.0001	0.613
Urbanization effect				
Highurban	1.965	0.495	<.0001	7.137
Midurban	0.726	0.235	0.002	2.066
Lowurban (reference)				
Highurban * officer	-1.874	1.117	0.093	0.154
Highurban * highincome	-0.924	0.516	0.073	0.397
-2 log likelihood ratio	4,991.45		<.0001	

**TABLE V. Logistic Model of Obtaining Care Conditional on Sickness
(N = 1,008; 3 yrs)**

	Estimate	S.E.	p-value	Odds ratio
Intercept	0.678	0.865	0.433	
Predisposing factors				
Age category				
Teenage (reference)				
Young	1.091	0.792	0.169	2.978
Adult	1.100	0.815	0.177	3.004
Elder	0.672	0.824	0.415	1.958
Gender				
Male	-0.564	0.179	0.002	0.569
Education				
Noedu (reference)				
Elementary	0.255	0.215	0.234	1.291
Middleschl	0.483	0.278	0.082	1.621
Highschl	0.576	0.406	0.156	1.778
Primary occupation				
Tech	-1.100	0.801	0.170	0.333
Officer	0.107	0.655	0.870	1.113
Worker	0.711	0.373	0.057	2.037
Otherjob	-0.187	0.414	0.652	0.830
Farmer (reference)				
Marital status				
Marry (reference)				
Unmarry	0.346	0.399	0.387	1.413
Widow	-0.021	0.339	0.952	0.980
Enabling factors				
Health insurance				
Insured	0.966	0.392	0.014	2.627
Annul income				
Highincome	-0.054	0.256	0.834	0.948
Midincome	-0.007	0.200	0.970	0.993
Lowincome (reference)				
Need factors				
Severity of the illness or injury				
Hvsevere	1.315	0.283	<.0001	3.723
Midsevere	0.462	0.168	0.006	1.587
Lowsevere (reference)				
Fixed effect				
Jiangsu	-0.723	0.288	0.012	0.485
Hunan	0.031	0.366	0.933	1.031
Guangxi	-0.299	0.265	0.260	0.742
Liaoning	-1.189	0.351	0.001	0.305
Shandong	-0.265	0.421	0.529	0.767
Hubei	-0.426	0.292	0.145	0.653
Guizhou	-0.674	0.275	0.014	0.510
Henan (reference)				
Time effect				
T89 (reference)				
T91	-0.150	0.223	0.501	0.860
T93	-0.675	0.241	0.005	0.509
Urbanization effect				
Highurban	-0.340	0.912	0.710	0.712
Midurban	-0.237	0.212	0.263	0.789
Lowurban (reference)				
Highurban * officer	-0.194	1.693	0.909	0.824
Highurban * highincome	-0.264	1.153	0.819	0.768
-2 log likelihood ratio	1,101.86		<.0001	