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ABSTRACT

Health Demand and Health Determinants in China*

This paper identifies health determinants in rural and urban China. Using the 2000 wave of the China Health and Nutrition Survey, we find that education has an important positive effect on health. We also find that region is an important determinant of health. Our results indicate that the self-reported health status is not significantly different between the urban and the rural population. Our study suggests that Chinese males have better health than females, and married persons have better health than single persons. We also find that the rural residents who live in suburbs have worse health than those who live in remote villages.

JEL Classification: I12, J24, D12

Keywords: self-reported health status, health determinants, ordered probit, China

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1. Introduction

Health is widely considered as an important component of human capital. Since the seminal work of Grossman (1972), the Grossman model has become the standard model to study health demand and health determinants. Applying the Grossman model, economists have carried out numerous empirical studies, for example, Wagstaff (1986, 1993), Erbsland et al. (1995), Sickles and Yazbeck (1998), and Dustmann and Windmeiher (2000). However, few studies of health issues in China are based on human-capital theory.[1]

In this paper, we use the China Health and Nutrition Survey (CHNS) data set to identify the main determinants of health in rural and urban China.

We find that education has an important positive effect on health, but the effects of wage rate and household income are insignificant. The relationship between age and health is nonlinear. At young age, health increases with age, but it peaks around age 40. This implies that people should pay more attention to their health starting from a relatively young age.

Region, gender, marriage status, and body weight are also important factors. Region is an import determinant of health. People in western provinces have the worst health; people in coastal and northeastern provinces have the best health. Gender and marital status are also important. Males and married persons have better health. In contrast with the situation in developed countries (e.g., Gerdtham and Johannesson, 1999), being underweight is a better predictor for poor health than being overweight.

We also find that the rural residents who live in a suburb have worse health than those who live in a village.

[1] Liu et al. (2004) is one of the few exceptions. They study the relationship between economic growth and health capital.

The rest of the paper is organized as follows: Section 2 outlines the analytical framework and specifies the econometric models. Section 3 describes the data set, the health status variable, and the descriptive statistics. Section 4 presents empirical results, and Section 5 concludes the paper with discussions on the policy implications of its findings.

2. Conceptual Framework

Economists have considered health as human capital for a long time, beginning, e.g., with Mushkin (1962), Becker (1964), and Fuchs (1966). Building on the human-capital theory, Grossman (1972) provides a formal model to analyze health capital. According to his approach, the main difference between health and education is that health increases income through adding healthy working days, while education does so through improving productivity.

Following the standard model of Grossman (1972, 2000), we assume that the utility function of a representative consumer is as follows:

$$U = U(\phi_t H_t, Z_t),\ t = 0,1,...,n \qquad (1)$$

where H_t is the stock of health capital at time *t*, ϕ_t is the benefit produced by one unit of health capital, $h_t = \phi_t H_t$ is the health consumed at time *t*, and Z_t is consumption of other goods at time *t*.

The initial stock of health capital H_0 is exogenous. H_t at other times and the length of life *n* are endogenous. The following equation describes the change of health capital:

$$H_{t+1} - H_t = I_t - \delta_t H_t \qquad (2)$$

where I_t is the investment in health and δ_t is the rate of depreciation of health capital at time *t*. The value of δ_t changes with age.

I_t and Z_t are produced by the production functions

$$I_t = I_t(M_t, TH_t; E) \tag{3}$$

$$Z_t = Z_t(X_t, T_t; E) \tag{4}$$

where M_t are market goods, such as health care services, which are used to produce I_t. TH_t is the time allocated to improve health. E comprises the other exogenous components of human capital besides health, such as education. Equation (4) is the home-production function for other consumption items Z_t. These items are produced with the use of market goods X_t, time T_t, and other human capital E.

Furthermore, the consumer faces the following budget constraint:

$$\sum_{t=0}^{n} \frac{P_t M_t + Q_t X_t}{(1+r)^t} = \sum_{t=0}^{n} \frac{W_t TW_t}{(1+r)^t} + A_0 \tag{5}$$

where P_t and Q_t are prices, W_t is the wage rate, TW_t is hours of work, and A_0 is initial wealth.

Beside the budget constraint, the consumer also needs to meet the time constraint Ω. The total Ω must be used up at each period as follows:

$$TW_t + TH_t + T_t + TL_t = \Omega \tag{6}$$

where TW_t is the time for working, and TL_t is the time loss due to illness.

Equations (1) to (6) constitute the Grossman model, and they jointly determine the demand for health.

Based on the above model, we can study the demand for health through two approaches: the *pure investment model* and the *pure consumption model*. Grossman (2000) has stressed "the estimation of the investment model rather than the consumption model because the former model generates powerful predictions from simple analysis and less innocuous assumptions." This paper is based on the pure investment model. The optimal condition of this model is

$$\frac{G_t W_t}{\pi_{t-1}} + \frac{G_t[\left(\frac{U_{ht}}{m}\right)(1+r)^t]}{\pi_{t-1}} = r + \delta_t \qquad (7)$$

where $G_t = \partial TL_t / \partial H_t$ is the marginal product of health capital, $U_{ht} = \partial U / \partial H_t$ is the marginal utility directly produced by health, m is the marginal utility produced by monetary income, and π_{t-1} is the shadow price of health, which is determined by the cost of health care services, the wage rate, etc.

The condition (7) is similar to other optimal conditions in economics. Namely, it means that marginal benefit equals marginal cost. The benefit of health includes two aspects: one is the monetary benefit, i.e., $G_t W_t / \pi_{t-1}$, and the other is the utility gain directly from health, i.e., $G_t[(U_{ht} / m)(1+r)^t] / \pi_{t-1}$. The cost of health is the same as the cost incurred in other standard investments, including interest and depreciation.

Equation (7) provides a series of testable hypotheses. As in Figure 1, the crossing point of the health benefit curve ($G_t W_t / \pi_{t-1} + G_t[(U_{ht} / m)(1+r)^j] / \pi_{t-1}$) and the cost curve ($r + \delta_t$) determines the optimal demand for health, H_t^*. If the cost increases, the demand for health will decrease.

------Figure 1 about here---

In the literature, the change of the rate of depreciation δ_t is one focal point. It is usually assumed that δ_t is increasing in age. If δ_t increases to δ^*_t, the demand for health will reduce from H_t^* to H_t^{*a}.

Education is another key variable. Health and education are two types of complementary human capital. Increase of education will improve health, since a more educated consumer will produce health at lower cost, and hence will lower the shadow price of health, which in turn will increase the health demand from H_t^* to H_t^{*b}.

Health care service is one of the main inputs of health. If its price increases, the cost of health will inevitably increase, and that will decrease the demand for health.

The wage rate reflects the value of time. On the one hand, if the wage rate increases, the earnings from healthy working days will also increase. On the other hand, production of health takes time, so an increase of the wage rate makes the production of health more costly. Therefore, the effect of the wage rate on the health demand is ambiguous. However, people generally believe that the former effect dominates the latter one, and that wage rate should have a positive effect.

The time constraint also has testable implications. If the consumer works more, he will end up with less time to improve his health, so his health will decline.

Our empirical study will test the above theoretical implications. The basic specification is as follows:[2]

[2] There are two reasons for adopting a linear model instead of a double-logarithm model derived from the Grossman model. One is that the study of Wagstaff (1993) finds that the assumption $\widetilde{H}_t / \delta_{t-1} = 0$ is

$$health = \beta_0 + \beta_1 age + \beta_2 wage\ rate + \beta_3 worktime + \beta_4 health\ price + \beta_5 education + \varepsilon \tag{8}$$

Age is used as a proxy for rate of depreciation. The wage rate and the price of health care services reflect the shadow price of health. We estimate different variations of equation (8) in our study. In Section 4 we also control for other factors such as gender, marital status, and region.

3. Data Set, Measurement of Health, and Descriptive Statistics

3.1 China Health and Nutrition Survey Data Set

The data set is the China Health and Nutrition Survey (CHNS). The CHNS is a longitudinal survey, which includes five waves, in 1989, 1991, 1993, 1997, and 2000. The survey covers coastal, middle, northeastern, and western provinces in China.[3]

The CHNS utilizes a multistage, random cluster-sampling scheme. In each province, both big cities and small cities are sampled. The CHNS also includes cities on different income levels, and surveys both rural and urban residents. The CHNS has very rich information on health and nutrition. It provides a valuable national sample for researchers in the health and nutrition fields.

Our econometric approach in this paper is reduced-form cross-sectional analysis. We focus our study on the latest wave of the data, the 2000 survey, which includes 15,648 observations.

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unconvincing and that the linear model is more consistent with the data. The other is that we use an ordered probit model to analyze the ordered categorical health status variable instead of continuous variables.

Since the Grossman model is based on working adults, our final sample only includes observations with ages from 18 to 55. The final urban sample used in this paper has 2,037 observations. Among them 1,077 are female, and 1,356 are working adults. The rural sample has 5,158 observations with 2,671 female observations.

3.2 Self-Reported Health Status

One of the major difficulties in studying health determinants is how to measure health. In the literature, there are many methods, including *quality-adjusted life years* (see Cutler and Richardson, 1997), *disability-adjusted life years* (see World Bank, 1993), and the *quality of well-being scale* (see Kaplan and Anderson, 1988). Field and Gold (1998) provide an excellent survey.

In the CHNS data set, the people are asked to self-report their health status in four categories: poor, fair, good, and excellent. The survey use {1, 2, 3, 4} to represent {poor, fair, good, excellent}. In this paper, instead of using a continuous measure, we therefore use a discrete measure, self-reported health status (SHS), as our health measure, as in Gerdtham and Johannesson (1999). Of course, this measure is not perfect, but compared with continuous measures, one advantage of categorical measures is that in some degree they can mitigate the measurement error problem in that only order matters.[4] Recent studies using this variable include Case, Lubotsky, and Paxson (2000) and Currie and Stabile (2001).

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[3] The surveys of 1989, 1991, and 1993 include eight provinces: Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangshu, Liaoning, and Shangdong. In 1997, Heilongjiang replaces Liaoning. In 2000, both Liaoning and Heilongjiang are included in the survey along with the other provinces.

3.3 Descriptive Statistics

Figure 2 compares the SHS between rural and urban population in 2000. The bars indicate percentage differences between rural and urban population in each health category. For the whole sample, rural people report higher percentages of excellent, good, and fair health status than urban people do. Except for Hunan province, urban people in the nine provinces studied here report a higher percentage of poor health than rural people do. Overall, there is no significant difference between rural and urban populations on the SHS, a result that is in sharp contrast to the huge income differential between rural and urban China. In 2000, the average income of the rural population in these nine province is only 40% of that of the urban population; the lowest, in Guizhou, is less than 30% (Table 1).

------Figure 2 about here------

------Table 1 about here------

Figure 3 shows the distribution of SHS categories. The percentage of population in the "excellent" category is the lowest, less than 5% for most provinces, and no province is above 10%. The "fair" category has the largest share, ranging from 50% to 60%. A sizable fraction of the population falls into the "poor" category. It is interesting to note while 20% to 30% of population in Jiangsu province and Shandong province, both of which are coastal and developed provinces, are in poor health, the fraction in Guizhou and Guangxi, both of which are western and poor provinces, is only around 5%.

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[4] Studies such as Kaplan and Camacho (1983) find that this categorical health variable contains important information on an individual's health.

------Figure 3 about here------

Figure 4 and Figure 5 give distributions of SHS categories by gender. The distributions are similar to those in Figure 3.

------Figure 4 and Figure 5 about here------

Table 2 shows that among 5,158 rural residents, 51.8% are female, and 30% live close to a city. Nearly half of the rural population only have an elementary education, and only 2% have college education or higher. Overall, males have higher education level than females. Of the whole sample, 15% are married, and the average family size is 4.2. The labor participation rate is 85%. The health insurance coverage rate is low in rural areas, about 14%. The average cost for a flu treatment is 27 RMB yuan, which is equivalent to one day's earnings.[5]

------Table 2 about here------

Table 3 gives descriptive statistics for urban observations. 52.9% are female in the urban sample. 46% of them live in a big city. 15.7% are married, which is comparable to the proportion of the rural population. The average family size is 3.7. Of the urban population, 73% are working, and among them 47% are employed in the formal sector. The weekly wage rate is 357 RMB yuan. The urban population has a higher education level than the rural population. 15% have college education or higher, but still a sizable fraction

(15%) of them only received elementary schooling. 38% of the urban population is covered by health insurance. The cost for a flu treatment is 43 RMB yuan, which is higher than in rural areas, but is only equal to 60% of daily earnings.

------Table 3 about here------

4. Empirical Results

We use the ordered category variable SHS as the measure of health, so a natural choice for the estimation strategy is the ordered probit model. There is a significant difference between urban areas and rural areas in China; hence, we analyze the urban sample and rural sample separately.

4.1 Econometric Results for Rural Sample

Tables 4 and 5 report estimation results for the rural population. Table 4 reports results from basic models. The basic models include key variables in the Grossman model, such as age (proxy for rate of depreciation), education, marriage status, a health insurance dummy, and the cost of a flu treatment (proxy for the cost of health care services).[6] The last two variables reflect the shadow price of health.

------Table 4 about here------

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[5] The sample average earnings per week are 131 RMB yuan.

[6] We use the community cost instead of the individual cost to avoid the problem that individual cost is only observed for the people who have the flu.

The effect of age on health comes from two sources: increase of the depreciation rate of health capital and decrease of the benefit period from investment in health. Both sources negatively affect the demand for health.

In order to accommodate nonlinearity in age, we adopt two approaches. One is using age, age squared, and age cubed, and the other is using age group dummies. From Table 4, it is clear that the effect of age is highly nonlinear. The negative coefficient of age and positive coefficient of age squared indicate an inverted U relationship between age and health. We experimented using age group dummies to capture the nonlinear relationship between age and health; it appears that the dummy approach performs better, and we will use this approach in the later modeling.

Table 4 shows there is a positive relationship between education and health, though not all coefficients of education dummies are significant. This is consistent with the prediction of the Grossman model. The more educated people are more efficient in health production. We also find that females' health is significantly worse than males'. Married couples have better health than singles.

The coefficient of health care services cost (using cost of a flu treatment as proxy) is positive and statistically but not economically significant. The small coefficient (0.003) indicates that the cost of health services has little influence on health status. This is inconsistent with the theoretical implication of the Grossman model. One reason may be that this variable also captures the development level of the community. The cost of health services is usually higher in the developed regions, and the people in the developed regions often have better health than the ones in the less developed regions. Another reason maybe this variable does not capture all information on the cost of the health care services.

In Table 5, we control for additional variables, such as provincial dummies and a dummy for living near a city or not. The relationship between age and health is similar to the one found in the basic model.

------Table 5 about here------

After controlling for additional information, the effect of education on health remains positive, and both magnitudes and significance levels are increased. The coefficients of female dummy, health insurance dummy, marital status, and cost of health services are roughly in line with the ones in the basic model. The coefficient of family size becomes positive and significant, which reflects the fact that large families can share risk better than small ones (given that there is no well-functioning health insurance system in rural China) and thus are less vulnerable to health shock.

Table 5 shows living close to a city has a negative effect on health. There are two possible explanations. One is that urbanization increases the rate of depreciation of health capital (e.g., Gerdtham and Johannesson, 1999). On the one hand, these people suffer from negative consequences of urbanization, such as environmental deterioration. On the other hand, due to the *Hukou* system, the rural residents are excluded from the coverage of the government welfare system, and are not entitled to many social benefits.

The other explanation is that the income inequality and relative level of income have a negative effect on the health of low-income people; see Macinko et al. (2003) for a survey. Compared with the people living in a remote village, rural people living in a suburb are more likely to perceive their income inequality. Furthermore, they need to pay higher prices for goods and services.

4.2 Econometric Results for Urban Sample

Table 6 and Table 7 are estimates from ordered probit models for the urban sample. Table 6 reports results from basic models. The variables in the model are the same as in Table 4. As shown in Table 6, compared to the age group from 18 to 22, the age groups from 23 to 30, 31 to 35, and 36 to 40 have better health. After 40, health deteriorates with age.

------Table 6 about here------

In the basic model, the effect of education is significantly positive for the whole population, as well as for males and for females. The cost of health care services has negative but insignificant effect on health for the whole population, as well as for males and for females separately. We also find that females' health is significantly worse than males'. Both married males and married females have better health than their single counterparts do. The effect of household size is also positive, but only significant for males.

In Table 7, we control for additional factors, such as region, city size, income level of the cities, and province dummies. The findings on age and education from the basic models remain unchanged. However, the effect of household size becomes significantly positive. The effect of cost of a flu treatment becomes significantly negative for the whole population as well as for males. This is consistent with the prediction of the Grossman model.

------Table 7 about here------

Region is an important determinant of health. Compared to Henan province (located in the middle of China), western provinces (Guangxi and Guizhou) have worse health, but coastal provinces (Shangdong and Jiangsu) and northeastern provinces (Liaoning and Heilongjiang) have better health. Provinces (Hubei and Hunan) in the same region as Henan have similar health status to Henan.

We also consider city characteristics. Being in a big city is not an important factor in determining the health of males. We divide the cities into three groups according to income level—high-income, middle-income, and low-income cities—and include a high-income city dummy and a middle-income city dummy in our estimation. For the whole population as well as for males and for females separately, the coefficients of the middle-income city dummy are significantly positive. Nonetheless, the coefficients of the high-income city dummy are all insignificant. One interpretation is that the health care services are inadequate in low-income cities, so compared to residents in low-income cities, residents in middle-income cities have better health. Furthermore, the pressure to work is very high in high-income cities, and the residents in high-income cities focus more on working, and less on health and leisure.

In Table 8, we restrict our analysis to the working sample. For the working sample, we also control for wage rate, hours of work, and type of work. We find that wage rate, hours of work, and working in the formal sector are all insignificant, albeit all of them are positive. The inconsistency of our findings on the wage rate with common wisdom is not surprising, given that primary health care in urban China is part of the government welfare program. Nonmarket forces mainly drive the health investment decisions of urban residents. Furthermore, the effect of the wage rate goes in both directions, so that in theory it is ambiguous.

------Table 8 about here------

We also run separate regressions for people in the formal sector and in the informal sector. Results for these two groups are similar (see Table 9).

------Table 9 about here------

5. Concluding Remarks

Applying the Grossman model, we have studied the health demand and health determinants in China based on self-reported categorical health status.

We find the effect of education on health is significantly positive. The positive relationship between health and education is robust. This relationship means that it is possible to use education as a practical tool to improve the health of the population. Investing in education not only increases productivity and income, but also improves health; and health is found to be positively correlated with income (Liu et al., 2004). When formulating human capital policy, it will be fruitful to consider health and education simultaneously.[7]

Our study shows that health deteriorates with age starting from around age 40. This finding is striking in that even while we are still young; our health is starting to deteriorate. An important policy implication is that after a certain age, we should have regular physical examinations. On the one hand, an examination can find illness at an earlier stage, so it helps to slow down the rate of health deterioration; on the other hand, it can save the money that would have been spent on future treatment.

Our empirical findings on education, age, and cost of health services are consistent with the predictions from the Grossman model.

The effect of wage rate or income on health is also positive, but insignificant. That finding is not surprising, given that primary health care in urban China is part of the government welfare program and given the success of the rural health care system before 1990s. Non-market forces mainly determinate the health of rural and urban residents. Furthermore, the effects of the wage rate go in both directions, so in theory the net effect is ambiguous.

Members of bigger families tend to have better health. Given that there is no well-functioning health insurance system in rural areas and less than 40% of the population are insured in urban areas, this dependence reflects the fact that large families can share risk better and so are less vulnerable to health shock. Nonetheless, it is inefficient to pool

[7] To interpret the result on education, it is necessary to point out that in our analysis we cannot model unobservable factors such as ability. If the correlations between ability and education and between ability and health are both positive, our result on education will be biased upward due to omitted-variable bias (see Grossman, 2000).

risk at the household level. Establishing a rural health insurance system and expanding the coverage of health insurance in urban areas are urgent tasks.

We find that living close to a city has a negative effect on health of rural population. There are two possible explanations. One is that urbanization increases the rate of depreciation of health capital, and the other is that income inequality and relative level of income have a negative effect on the health of poor people.

Contrary to findings in developed countries, underweight instead of overweight is a better predictor of poor health. We also find that region is an important determinant of health. Western provinces have the worst health; coastal and northeastern provinces have the best health. Males have better health than females have, and married persons have better health than single ones.

The econometric approach adopted here is reduced-form cross-sectional analysis. This is our first attempt to estimate and to test the Grossman model using Chinese data. In future studies, we will explore the structural model approach and consider the role of life-cycle behavior.

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Figure 1 Static Analysis of Health Demand

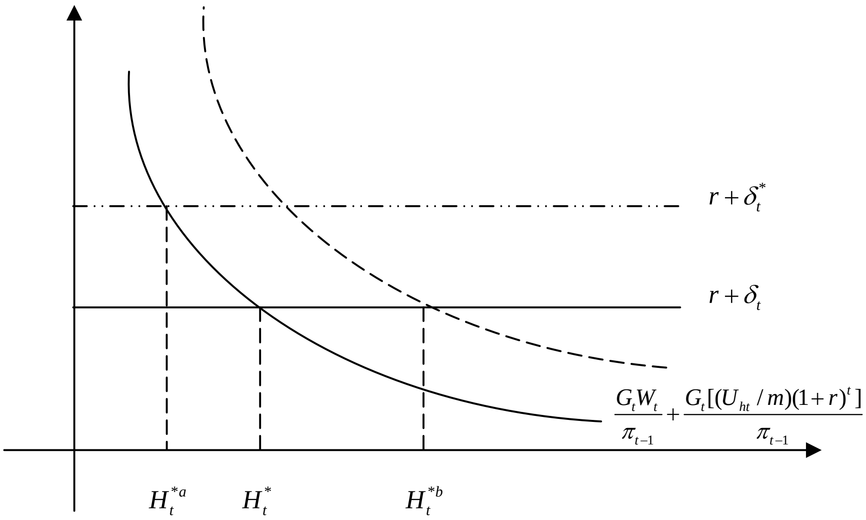

Figure 2 Comparison of Self-Reported Health Status between Rural and Urban Population in 2000

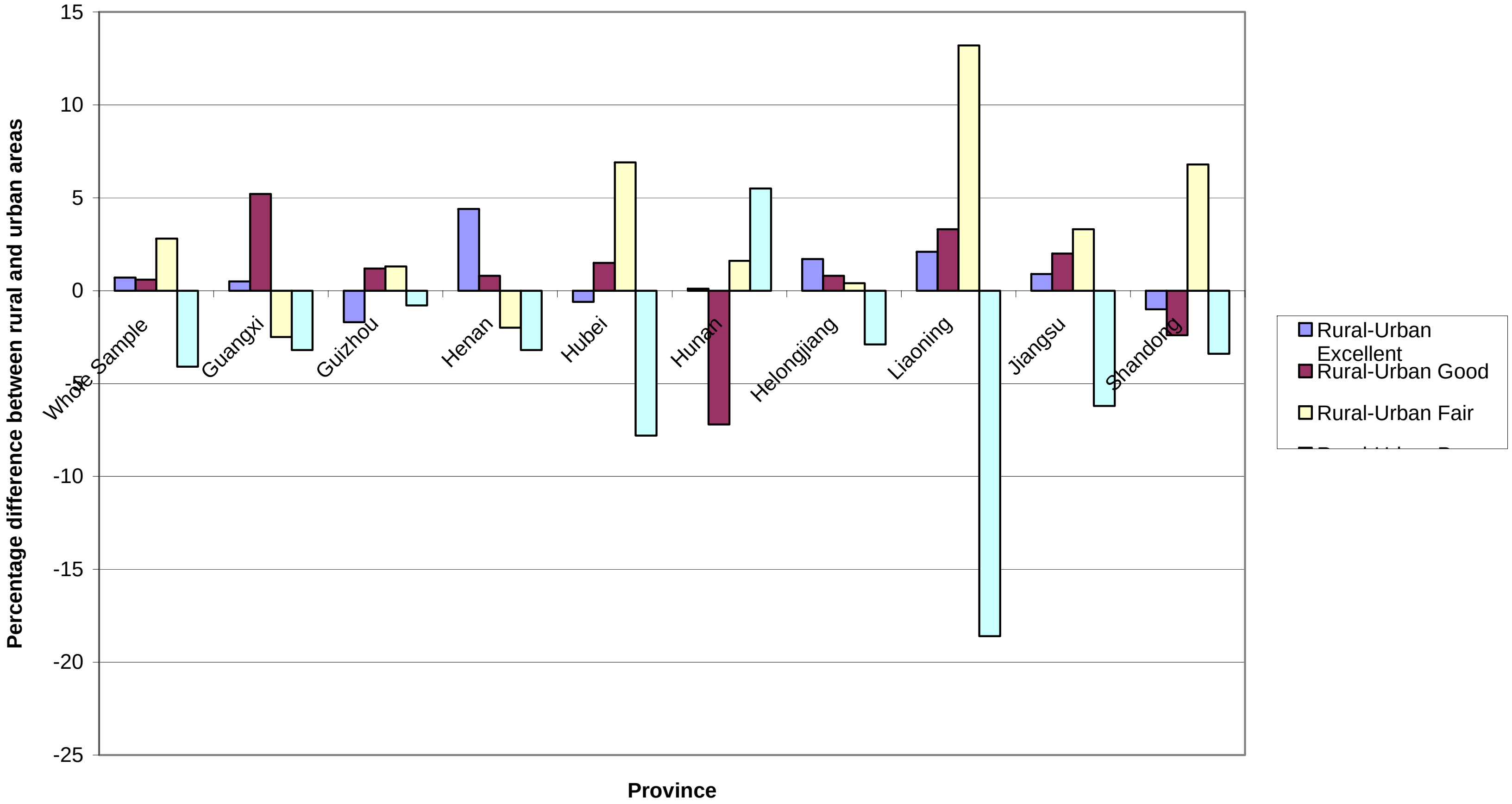

Figure 3 Self-Reported Health Status in 2000

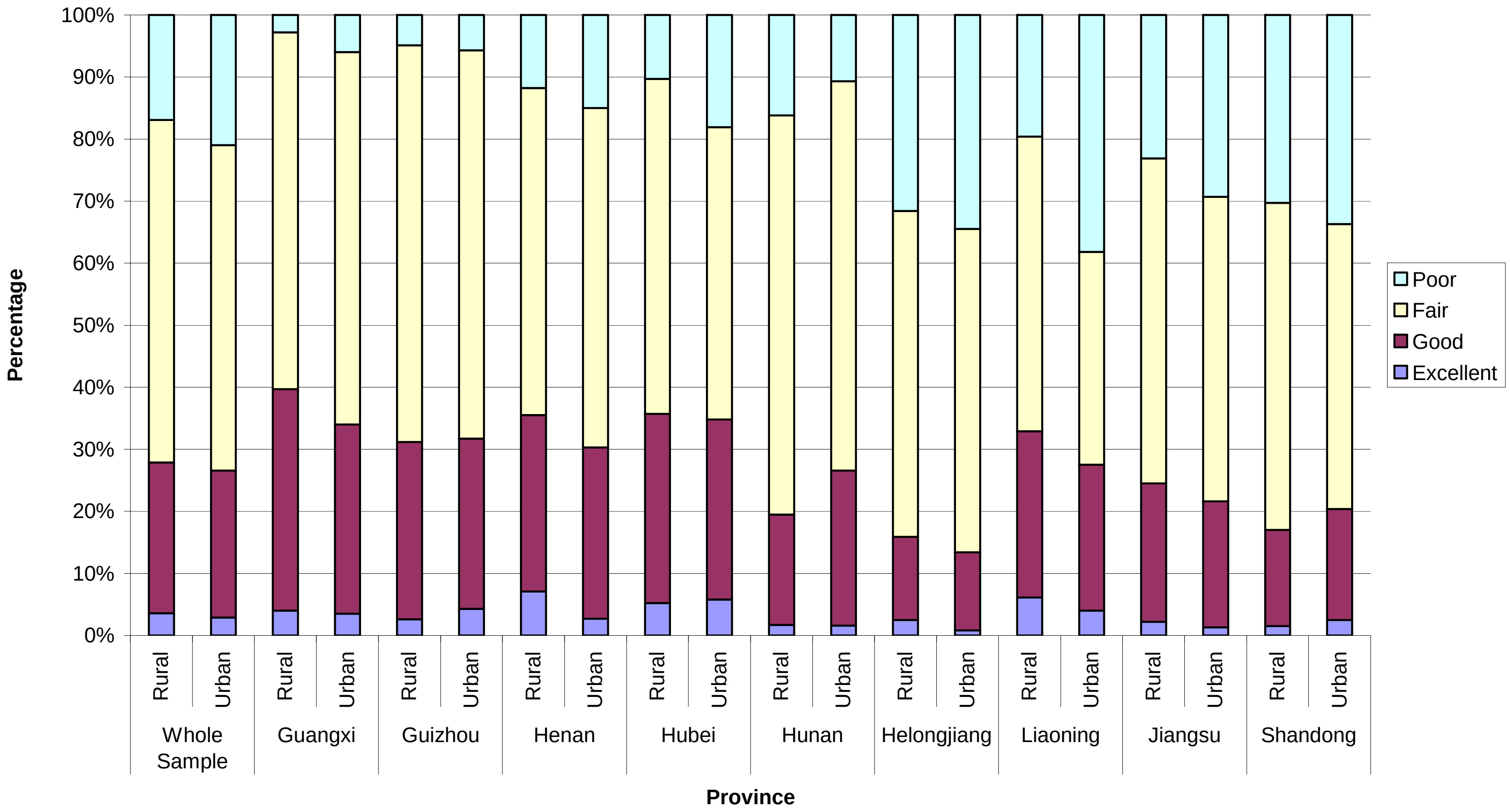

Figure 4 Female Self-Reported Health Status in 2000

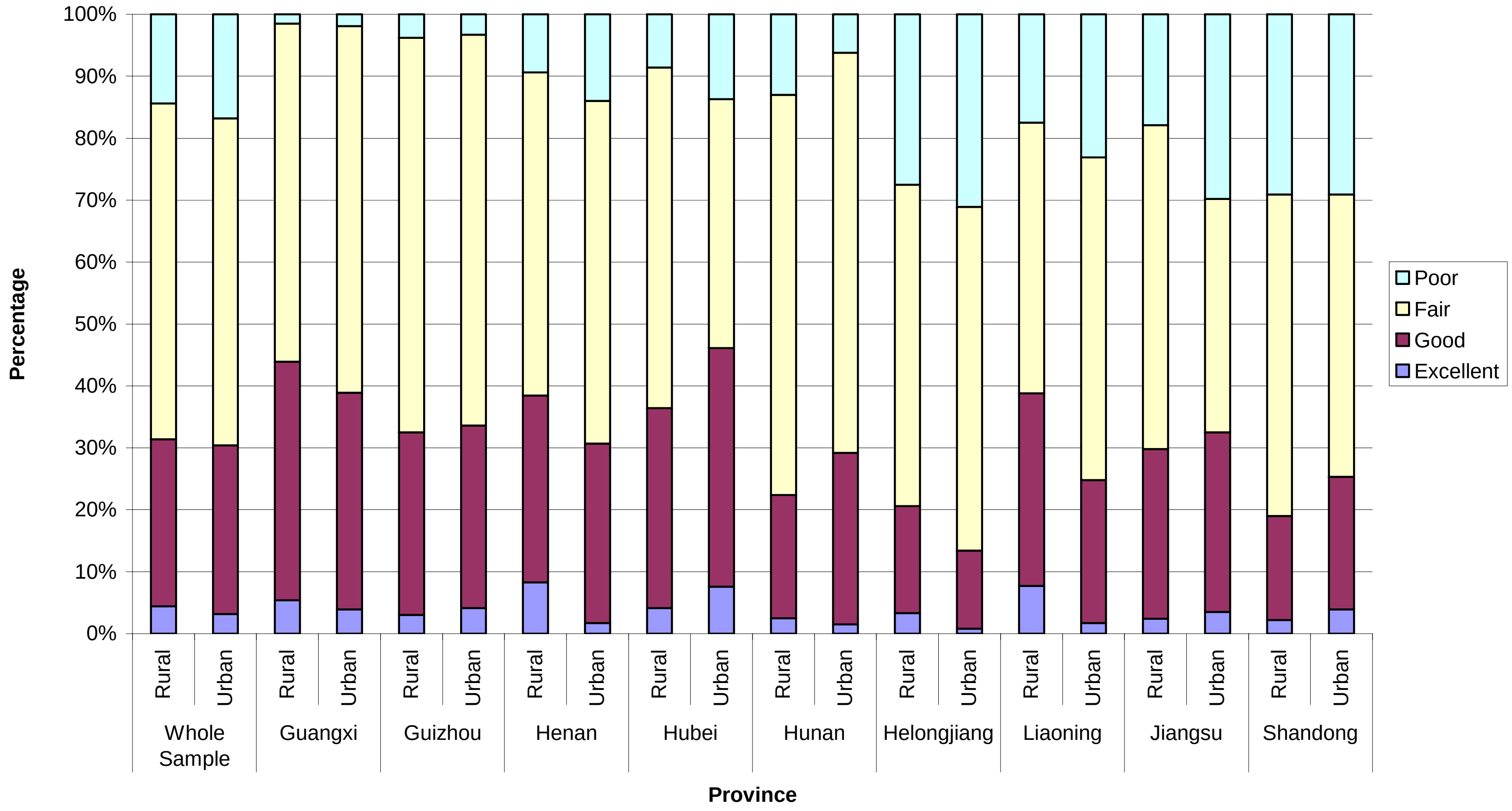

Figure 5 Male Self-Reported Health Status in 2000

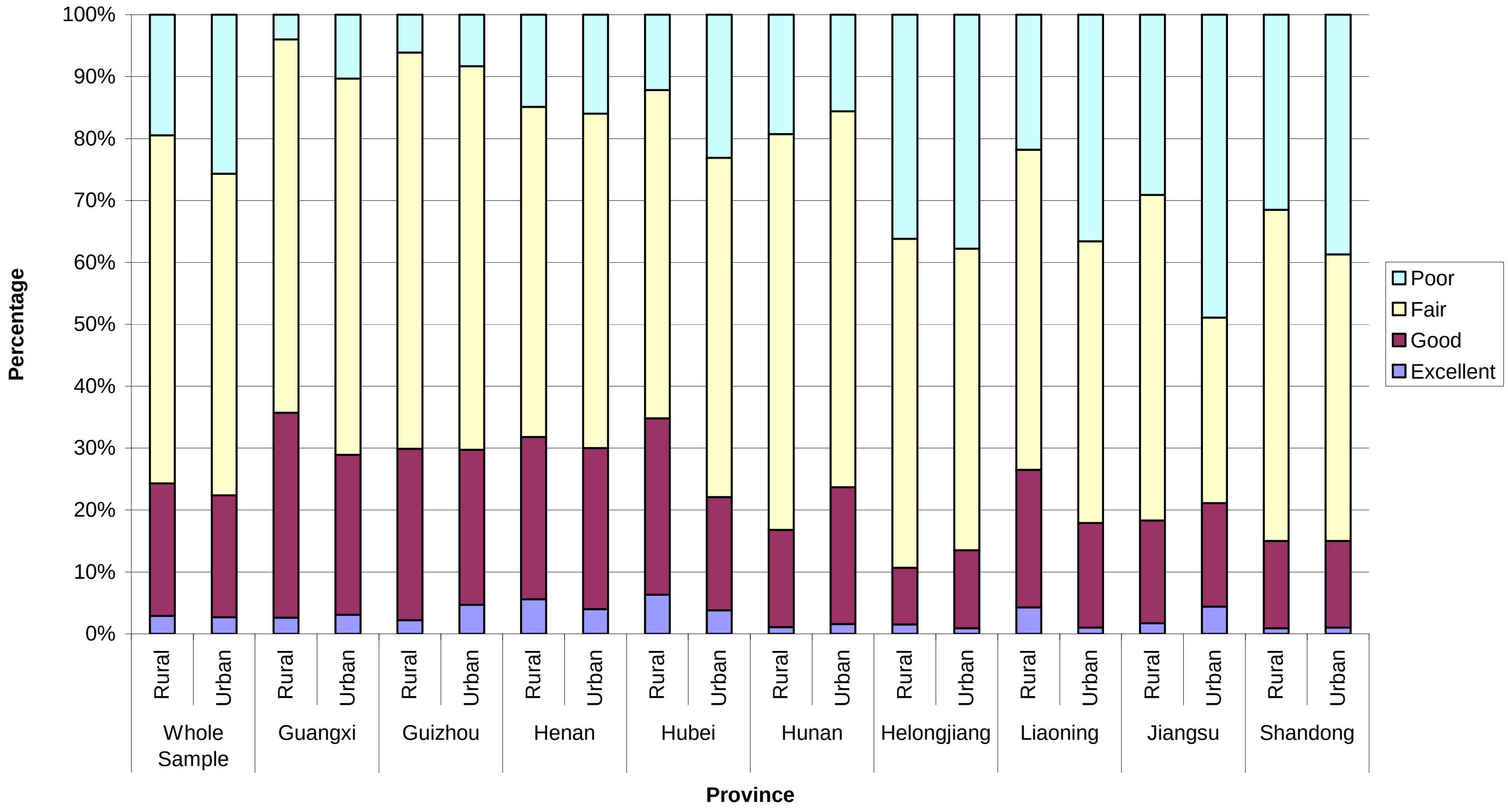

Table 1 Rural and Urban Per Capita Income in 2000 (Unit: RMB Yuan)

	Average*	Guangxi	Guizhou	Henan	Hubei	Hunan	Heilongjiang	Jiangsu	Liaoning	Shandong
Net Income in Rural Area	2272.04	1864.51	1374.16	1985.82	2268.59	2197.16	2148.22	2355.58	3595.09	2659.20
Disposable Income in Urban Area	5669.671	5834.43	5122.21	4766.26	5524.54	6218.73	4912.88	5357.79	6800.23	6489.97
Ratio of Rural to Urban	0.40	0.32	0.27	0.42	0.41	0.35	0.44	0.44	0.53	0.41

Source: http://www.stats.gov.cn/tjsj/ndsj/2001c/j1012c.htm and http://www.stats.gov.cn/tjsj/ndsj/2001c/j1019c.htm. (Last accessed date: November 25, 2005)

Note: * Average income of the nine provinces considered in this paper.

Table 2 Descriptive Statistics of Rural Sample

Variables	Label		Female		Male	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Female	0.5178	0.4997	1	0	0	0
Age: 18–22	0.0807	0.2723	0.0726	0.2596	0.0893	0.2852
Age: 23–30	0.1640	0.3703	0.1599	0.3666	0.1685	0.3744
Age: 31–35	0.1072	0.3094	0.1101	0.3130	0.1041	0.3055
Age: 36–40	0.1227	0.3282	0.1254	0.3313	0.1198	0.3248
Age: 41–45	0.1173	0.3218	0.1217	0.3270	0.1126	0.3161
Age: 46–50	0.1328	0.3394	0.1359	0.3428	0.1295	0.3358
Age: 51–55	0.1080	0.3104	0.1060	0.3078	0.1102	0.3132
Elementary school	0.4478	0.4973	0.5320	0.4991	0.3571	0.4793
Junior high school	0.3961	0.4891	0.3354	0.4722	0.4616	0.4986
Senior high school	0.1348	0.3415	0.1144	0.3184	0.1567	0.3636
College and above	0.0167	0.1282	0.0129	0.1128	0.0208	0.1428
Working time	9.8804	19.6733	7.2243	17.0110	12.7330	21.8259
Wage	130.5936	405.0311	76.9049	237.4707	188.2545	522.7993
Household size	4.1886	1.3195	4.2137	1.3405	4.1618	1.2963
Insured	0.1371	0.3440	0.1287	0.3349	0.1463	0.3535
Cost of flu treatment	26.6220	34.0223	26.5563	33.8682	26.6924	34.1936
Household income	5065.128	4179.652	5121.195	4235.37	5004.9	4118.962
Underweight	0.0560	0.2300	0.0584	0.2346	0.0535	0.2250
Overweight	0.0427	0.2021	0.0404	0.1970	0.0450	0.2074
Suburb	0.2801	0.4491	0.2785	0.4484	0.2819	0.4500
Liaoning (Northeastern region)	0.1258	0.3317	0.1258	0.3317	0.1259	0.3318
Heilongjiang (Northeastern region)	0.1200	0.3250	0.1202	0.3252	0.1198	0.3248
Jiangu (Coastal region)	0.1196	0.3245	0.1217	0.3270	0.1174	0.3220
Shandong (Coastal region)	0.1010	0.3014	0.1022	0.3030	0.0997	0.2997
Henan (Middle region)	0.1002	0.3003	0.1048	0.3064	0.0953	0.2937
Hubei (Middle region)	0.1060	0.3079	0.1097	0.3126	0.1021	0.3029
Hunan (Middle region)	0.1095	0.3123	0.1060	0.3078	0.1134	0.3171
Guangxi (Western region)	0.1045	0.3059	0.0973	0.2965	0.1122	0.3157
Guizhou (Western region)	0.1132	0.3169	0.1123	0.3158	0.1142	0.3181
Married	0.1471	0.3543	0.1115	0.3149	0.1854	0.3887
Sample Size		5158		2671		2487

Table 3 Descriptive Statistics of Urban Sample

Label	Whole		Female		Male	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Female	0.5287	0.4993	1	0	0	0
Age: 18–22	0.0668	0.2497	0.0604	0.2383	0.0668	0.2497
Age: 23–30	0.1497	0.3569	0.1486	0.3558	0.1497	0.3569
Age: 31–35	0.1129	0.3166	0.1151	0.3193	0.1129	0.3166
Age: 36–40	0.1605	0.3672	0.1588	0.3657	0.1605	0.3672
Age: 41–45	0.1281	0.3343	0.1281	0.3344	0.1281	0.3343
Age: 46–50	0.1345	0.3413	0.1411	0.3483	0.1345	0.3413
Age: 51–55	0.0820	0.2744	0.0826	0.2755	0.0820	0.2744
Elementary school	0.1547	0.3617	0.1851	0.3885	0.1547	0.3617
Junior high school	0.3249	0.4684	0.3381	0.4733	0.3249	0.4684
Senior high school	0.3668	0.4820	0.3579	0.4796	0.3668	0.4820
College and above	0.1472	0.3544	0.1114	0.3148	0.1472	0.3544
Working time	23.7688	22.9707	20.7150	22.9576	23.7688	22.9707
Wage	357.4281	684.6482	275.3835	557.0478	357.4281	684.6482
Household size	3.6942	1.1964	3.7019	1.2010	3.6855	1.1918
Insured	0.3808	0.4857	0.3537	0.4784	0.4108	0.4922
Cost of flu treatment	42.9050	42.8810	42.7202	42.7190	43.1123	43.0838
Household income	6475.716	4556.657	6459.234	4540.838	6494.203	4576.646
Underweight	0.0633	0.2436	0.0724	0.2593	0.0531	0.2244
Overweight	0.0349	0.1835	0.0306	0.1724	0.0396	0.1951
Working?	0.7295	0.4443	0.6546	0.4757	0.8135	0.3897
Informal sector	0.4742	0.4995	0.4150	0.4930	0.5406	0.4986
Big city	0.4600	0.4985	0.4587	0.4985	0.4615	0.4988
High-income city	0.3697	0.4828	0.3686	0.4827	0.3708	0.4833
Mid-income city	0.2528	0.4347	0.2526	0.4347	0.2531	0.4350
Liaoning (Northeastern region)	0.1006	0.3009	0.1059	0.3078	0.0948	0.2931
Heilongjiang (Northeastern region)	0.1340	0.3408	0.1263	0.3323	0.1427	0.3500
Jiangu (Coastal region)	0.1095	0.3123	0.1133	0.3171	0.1052	0.3070
Shandong (Coastal region)	0.1001	0.3003	0.1003	0.3005	0.1	0.3002
Henan (Middle region)	0.1055	0.3073	0.1068	0.3090	0.1042	0.3056
Hubei (Middle region)	0.1109	0.3141	0.1114	0.3148	0.1104	0.3136
Hunan (Middle region)	0.1267	0.3327	0.1263	0.3323	0.1271	0.3332
Guangxi (Western region)	0.0987	0.2983	0.0966	0.2955	0.1010	0.3015
Guizhou (Western region)	0.1139	0.3178	0.1133	0.3171	0.1146	0.3187
Married	0.1586	0.3654	0.1326	0.3393	0.1878	0.3907
Sample Size		2037		1077		960

Table 4 Estimates from Basic Ordered Probit Models for the Rural Sample

A. Specification I						
Dependent variable：Self-reporting Health Status						
Ind. Variable	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.1877	0.000	—	—	—	—
Age in 2000	−0.2405	0.001	−0.2349	0.031	−0.2252	0.030
Age squared	0.0057	0.006	0.0058	0.053	0.0050	0.086
Age cubed	−0.000047	0.011	−0.000051	0.055	−0.000038	0.139
Elementary school	Reference group					
Junior high school	0.0875	0.020	0.0263	0.619	0.1411	0.009
Senior high school	0.0695	0.191	0.0589	0.445	0.0818	0.270
College and above	0.1569	0.237	0.2497	0.239	0.0799	0.640
Household size	−0.0122	0.324	−0.0012	0.945	−0.0273	0.134
Insured	0.0726	0.135	0.0028	0.967	0.1367	0.050
Cost of flu treatment	0.0030	0.000	0.0027	0.000	0.0033	0.000
Married	−0.1151	0.073	−0.0046	0.963	−0.1830	0.032
Pseudo R^2	0.0297		0.0285		0.0255	
Sample size	4684		2439		2245	
B. Specification II						
Ind. Variable	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.1680	0.000	—	—	—	—
Age: 18–22	Reference group					
Age: 23–30	0.1633	0.002	0.2497	0.001	0.0910	0.225
Age: 31–35	−0.0560	0.354	0.1156	0.166	−0.2342	0.008
Age: 36–40	−0.1722	0.003	−0.0803	0.319	−0.2718	0.001
Age: 41–45	−0.0791	0.179	0.0412	0.611	−0.2128	0.014
Age: 46–50	−0.2388	0.000	−0.1864	0.018	−0.2978	0.000
Age: 51–55	−0.3766	0.000	−0.3083	0.000	−0.4569	0.000
Elementary school	Reference group					
Junior high school	0.1332	0.000	0.0965	0.065	0.1644	0.002
Senior high school	0.1115	0.036	0.1161	0.133	0.1022	0.167
College and above	0.1584	0.233	0.2541	0.232	0.0701	0.682
Household size	−0.0036	0.772	0.0098	0.560	−0.019	0.285
Insured	0.0487	0.315	−0.0147	0.829	0.1142	0.101
Cost of flu treatment	0.0029	0.000	0.0025	0.001	0.0034	0.000
Married	0.1811	0.000	0.3391	0.000	0.0672	0.315
Pseudo R^2	0.0245		0.0223		0.0228	
Sample size	4684		2439		2245	

Table 5 Estimates from Ordered Probit Models for the Rural Sample with Additional Variables

Dependent variable：Self-reporting Health Status						
Ind. Variable	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.1746	0.000	—	—	—	—
Age: 18–22	Reference Group					
Age: 23–30	0.1672	0.002	0.2332	0.002	0.1185	0.121
Age: 31–35	−0.0691	0.259	0.1106	0.191	−0.2566	0.004
Age: 36–40	−0.1385	0.020	−0.0744	0.362	−0.2085	0.016
Age: 41–45	−0.0534	0.371	0.0559	0.494	−0.1722	0.050
Age: 46–50	−0.2075	0.000	−0.1596	0.046	−0.2551	0.003
Age: 51–55	−0.3402	0.000	−0.2799	0.001	−0.4114	0.000
Elementary school	Reference Group					
Junior high school	0.1819	0.000	0.1443	0.007	0.2232	0.000
Senior high school	0.2105	0.000	0.2466	0.002	0.1883	0.014
College and above	0.3552	0.010	0.4869	0.026	0.2519	0.157
Household size	0.0554	0.000	0.0631	0.001	0.0451	0.022
Insured	0.0326	0.554	−0.0227	0.772	0.0984	0.207
Cost of flu treatment	0.0028	0.000	0.0027	0.001	0.0028	0.001
Income	0.000045	0.010	0.000041	0.088	0.000050	0.049
Near City	−0.3726	0.000	−0.3704	0.000	−0.3863	0.000
Liaoning (Northeastern)	0.0705	0.328	0.0428	0.665	0.0950	0.370
Heilongjiang (Northeastern)	0.7017	0.000	0.6427	0.000	0.7656	0.000
Jiangu (Coastal)	0.3310	0.000	0.2676	0.010	0.4004	0.000
Shandong (Coastal)	0.6700	0.000	0.7004	0.000	0.6291	0.000
Henan (Middle)	Reference Group					
Hubei (Middle)	−0.0121	0.864	0.0508	0.599	−0.0928	0.376
Hunan (Middle)	0.3584	0.000	0.3872	0.000	0.3239	0.003
Guangxi (Western)	−0.2386	0.001	−0.2244	0.023	−0.2547	0.014
Guizhou (Western)	0.0296	0.672	0.1162	0.226	−0.0621	0.545
Married	0.2360	0.000	0.3550	0.000	0.1548	0.024
Pseudo R^2	0.0642		0.0584		0.0689	
Sample size	4684		2439		2245	

Table 6 Estimates from Basic Ordered Probit Model for the Urban Sample

A. Specification I						
Dependent variable：Self-reporting Health Status						
Ind. Variable	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.2580	0.000	—	—	—	—
Age in 2000	0.2487	0.040	0.2735	0.110	0.2349	0.177
Age squared	−0.0074	0.026	−0.0082	0.080	−0.0070	0.148
Age cubed	0.000066	0.027	0.000074	0.077	0.000060	0.165
Elementary school	Reference Group					
Junior high school	0.2035	0.014	0.1953	0.072	0.2425	0.062
Senior high school	0.3167	0.000	0.3461	0.003	0.3281	0.011
College and above	0.4506	0.000	0.6323	0.000	0.3530	0.018
Household size	0.0316	0.160	0.0509	0.103	0.0160	0.624
Insured	−0.0932	0.113	−0.1757	0.034	−0.0189	0.822
Cost of flu treatment	−0.0007	0.268	−0.0007	0.419	−0.0007	0.425
Married	0.0721	0.490	0.0349	0.812	0.1024	0.501
Pseudo R^2		0.0371		0.0314		0.0319
Sample size		1842		969		873
B. Specification II						
Ind. Variable	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.2478	0.000	—	—	—	—
Age: 18–22	Reference group					
Age: 23–30	0.2231	0.010	0.1780	0.136	0.2823	0.028
Age: 31–35	0.1145	0.237	0.0673	0.614	0.1826	0.198
Age: 36–40	0.0254	0.769	−0.0342	0.774	0.0955	0.449
Age: 41–45	−0.1403	0.125	−0.0129	0.919	−0.2641	0.046
Age: 46–50	−0.2662	0.004	−0.2548	0.044	−0.2739	0.040
Age: 51–55	−0.2558	0.019	−0.1547	0.308	−0.3596	0.021
Elementary school	Reference Group					
Junior high school	0.2348	0.004	0.2377	0.027	0.2531	0.050
Senior high school	0.3423	0.000	0.3784	0.001	0.3369	0.009
College and above	0.4738	0.000	0.6897	0.000	0.3341	0.027
Household size	0.0398	0.076	0.0611	0.050	0.0195	0.551
Insured	−0.1028	0.080	−0.1884	0.022	−0.0264	0.753
Cost of flu treatment	−0.0007	0.257	−0.0007	0.412	−0.0007	0.450
Married	0.1984	0.013	0.1426	0.216	0.2272	0.046
Pseudo R^2		0.0341		0.0277		0.0326
Sample size		1842		969		873

Table 7 Estimates from Ordered Probit Models for the Urban Sample with Additional Variables

Dependent variable：Self-reporting Health Status						
Ind. Variable	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.2683	0.000	—	—	—	—
Age: 18–22	Reference Group					
Age: 23–30	0.2162	0.015	0.1532	0.210	0.2701	0.040
Age: 31–35	0.1144	0.243	0.0679	0.615	0.1647	0.256
Age: 36–40	0.0117	0.894	−0.0468	0.700	0.0571	0.658
Age: 41–45	−0.0999	0.282	0.0189	0.884	−0.2282	0.090
Age: 46–50	−0.2715	0.004	−0.3326	0.010	−0.2050	0.132
Age: 51–55	−0.2639	0.017	−0.2497	0.107	−0.2868	0.073
Elementary school	Reference Group					
Junior high school	0.1713	0.042	0.1250	0.259	0.2064	0.119
Senior high school	0.2425	0.006	0.2259	0.057	0.2516	0.060
College and above	0.3053	0.007	0.4778	0.004	0.1921	0.238
Household size	0.0751	0.002	0.0995	0.003	0.0601	0.093
Insured	−0.0557	0.375	−0.1545	0.079	0.0451	0.621
Cost of flu treatment	−0.0018	0.014	−0.0015	0.133	−0.0022	0.045
Household income	0.0000053	0.404	0.0000043	0.625	0.0000048	0.603
Big city	0.1141	0.126	0.1816	0.079	0.0398	0.717
High-income city	−0.0385	0.548	−0.1111	0.210	0.0393	0.674
Mid-income city	0.3329	0.000	0.2326	0.035	0.4552	0.000
Liaoning (Northeastern)	0.3992	0.001	0.2382	0.124	0.5921	0.001
Heilongjiang (Northeastern)	0.5766	0.000	0.6210	0.000	0.5648	0.001
Jiangu (Coastal)	0.4086	0.000	0.3293	0.037	0.5163	0.003
Shandong (Coastal)	0.5395	0.000	0.4558	0.005	0.6493	0.000
Henan (Middle)	Reference Group					
Hubei (Middle)	−0.0162	0.889	−0.2463	0.121	0.2256	0.192
Hunan (Middle)	0.0842	0.466	0.0089	0.955	0.1553	0.356
Guangxi (Western)	−0.2324	0.040	−0.2944	0.060	−0.1583	0.336
Guizhou (Western)	−0.2352	0.032	−0.2605	0.083	−0.2374	0.143
Married	0.2611	0.001	0.2051	0.080	0.2992	0.010
Pseudo R^2	0.0696		0.0647		0.0749	
Sample size	1842		969		873	

Table 8 Estimates from Ordered Probit Models for the Urban Working Sample by Gender

Dependent variable：Self-reporting Health Status						
Label	Whole		Female		Male	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.2985	0.000	—	—	—	—
Age: 18–22	Reference Group					
Age: 23–30	0.2012	0.056	0.1587	0.294	0.2509	0.098
Age: 31–35	0.1270	0.260	0.0977	0.547	0.1644	0.309
Age: 36–40	0.0106	0.915	0.0436	0.762	−0.0167	0.905
Age: 41–45	−0.1579	0.137	−0.0185	0.908	−0.2648	0.068
Age: 46–50	−0.2726	0.015	−0.2148	0.209	−0.2987	0.049
Age: 51–55	−0.3475	0.016	−0.1250	0.596	−0.4461	0.017
Elementary school	Reference Group					
Junior high school	0.1978	0.072	0.0904	0.572	0.2509	0.104
Senior high school	0.3568	0.001	0.3273	0.048	0.3596	0.021
College and above	0.3712	0.006	0.6182	0.003	0.1937	0.288
Working time	0.0008	0.646	0.0038	0.114	−0.0026	0.277
Wage	0.000036	0.453	0.000102	0.227	0.000011	0.862
Household size	0.0667	0.024	0.0974	0.030	0.0503	0.212
Insured	−0.1469	0.063	−0.3389	0.004	−0.0114	0.917
Cost of flu treatment	−0.0026	0.005	−0.0026	0.070	−0.0027	0.027
Household income	0.0000021	0.804	−0.0000052	0.665	0.0000063	0.586
In formal sector	0.0702	0.384	0.0616	0.598	0.0916	0.423
Big city	0.0972	0.281	0.0505	0.707	0.0865	0.490
High-income city	−0.0377	0.618	−0.1253	0.262	0.0233	0.825
Mid-income city	0.2253	0.019	−0.0385	0.789	0.4005	0.002
Liaoning (Northeastern)	0.3037	0.030	0.1047	0.608	0.5274	0.008
Heilongjiang (Northeastern)	0.5036	0.000	0.5587	0.006	0.5181	0.006
Jiangu (Coastal)	0.4081	0.004	0.3894	0.066	0.4913	0.011
Shandong (Coastal)	0.5435	0.000	0.4731	0.041	0.6462	0.002
Henan (Middle)	Reference Group					
Hubei (Middle)	−0.1551	0.279	−0.4602	0.031	0.1100	0.580
Hunan (Middle)	0.0858	0.544	−0.0059	0.979	0.1504	0.421
Guangxi (Western)	−0.2569	0.065	−0.2487	0.227	−0.2535	0.187
Guizhou (Western)	−0.2649	0.044	−0.2166	0.268	−0.3317	0.067
Married	0.1869	0.069	0.0233	0.878	0.2756	0.055
Pseudo R^2	0.0734		0.0773		0.0819	
Sample size	1356		638		718	

Table 9 Estimates from Ordered Probit Models for the Urban Working Sample by Sector

Dependent variable：Self-reporting Health Status						
Ind. Variable	Whole		Formal Sector		Informal Sector	
	Coefficients	*P*-value	Coefficients	*P*-value	Coefficients	*P*-value
Female	−0.2985	0.000	−0.2879	0.000	−0.2694	0.010
Age: 18–22	Reference Group					
Age: 23–30	0.2012	0.056	0.2523	0.078	0.0558	0.732
Age: 31–35	0.1270	0.260	0.1971	0.151	−0.0310	0.884
Age: 36–40	0.0106	0.915	0.1109	0.382	−0.1372	0.406
Age: 41–45	−0.1579	0.137	−0.1603	0.245	−0.1588	0.354
Age: 46–50	−0.2726	0.015	−0.3042	0.029	−0.1478	0.453
Age: 51–55	−0.3475	0.016	−0.1915	0.303	−0.6322	0.009
Elementary school	Reference Group					
Junior high school	0.1978	0.072	0.1834	0.327	0.2498	0.075
Senior high school	0.3568	0.001	0.3648	0.042	0.3890	0.015
College and above	0.3712	0.006	0.4101	0.037	0.4219	0.118
Working time	0.0008	0.646	−0.0002	0.944	−0.0005	0.812
Wage	0.000036	0.453	0.000025	0.684	0.000050	0.531
Household size	0.0667	0.024	0.0735	0.068	0.0466	0.313
Insured	−0.1469	0.063	−0.1272	0.179	−0.1507	0.364
Cost of flu treatment	−0.0026	0.005	−0.0026	0.016	−0.0036	0.069
Household income	0.0000021	0.804	−0.0000093	0.387	0.000024	0.075
In formal sector	0.0702	0.384	—	—	—	—
Big city	0.0972	0.281	0.1034	0.384	0.1212	0.426
High-income city	−0.0377	0.618	−0.0990	0.305	0.0189	0.898
Mid-income city	0.2253	0.019	0.1986	0.145	0.2357	0.116
Liaoning (Northeastern)	0.3037	0.030	0.6355	0.000	−0.3754	0.151
Heilongjiang (Northeastern)	0.5036	0.000	0.6144	0.000	0.8302	0.013
Jiangu (Coastal)	0.4081	0.004	0.5283	0.004	0.3536	0.158
Shandong (Coastal)	0.5435	0.000	0.7979	0.000	0.2913	0.248
Henan (Middle)	Reference Group					
Hubei (Middle)	−0.1551	0.279	0.0409	0.825	−0.4342	0.078
Hunan (Middle)	0.0858	0.544	0.2136	0.269	−0.1676	0.446
Guangxi (Western)	−0.2569	0.065	−0.1983	0.318	−0.4427	0.038
Guizhou (Western)	−0.2649	0.044	−0.0823	0.624	−0.4980	0.025
Married	0.1869	0.069	0.3824	0.009	−0.0253	0.866
Pseudo R^2	0.0734		0.0773		0.0855	
Sample size	1356		638		865	