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ARTICLE

INCOME, INCOME GAP AND HEALTH OF THE ELDERLY: EVIDENCE FROM CHINA

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ABSTRACT

With the rapid aging and the widening income gap, the health of the elderly related to income and the income gap is increasingly concerned in China. Based on the data of China Health and Nutrition Survey from 1997 to 2015, the paper focuses on the impact of income and income gap on the health of the elderly, providing empirical evidence for achieving healthy aging with income equity under the background of healthy China. The results show that income is the main factor affecting the health of the elderly, and the expansion of income gap is not conducive to the health of the elderly, especially in economically underdeveloped areas and rural areas.

KEYWORDS

The Elderly Health; Income; Influencing Factors

1. INTRODUCTION

China's population structure is experiencing rapid aging. With the continuous increase of the total elderly population, the proportion of the elderly population over the age of 65 will continue to rise and remain at a high level for a long time. Wang (2019) predicts that the proportion of the elderly population will continue to rise from 2019 to 2049, and the elderly population will account for 30% of the total population around 2049 [1]. The health problems of the elderly population in the context of rapid aging have also attracted various concerns. Health is an important indicator to measure the quality of life of the elderly and an important factor to measure the well-being of the elderly. Elderly people with poor health will occupy more social resources and increase social pension expenditures. The health problems and retirement of the elderly are closely related to a series of physiological, psychological and social adaptation changes, such as various role changes, physical aging, illness and loss of self-care ability, psychological aging and loss of cognitive ability. In addition, compared with children and adolescents, the elderly group has its own uniqueness, which is mainly reflected in the fact that the new elderly group represented by the "post-60s" has a relatively high family income level and strong spending power, and the number of this elderly group has increased. It will promote the development of the pension industry, which will be conducive to economic growth and the improvement of social welfare.

At present, the general health of the elderly is not optimistic. According to the research results of the Research Group on Health and Longevity of the Elderly in China (2010), more than half of the elderly of all ages, regardless of gender, suffer from different chronic diseases. The proportion of people over the age of 65 suffering from chronic diseases is basically stable at about 50% to 55%. In terms of self-care ability and care needs of the elderly in the 2010 survey on the elderly population, 14.6% of the urban elderly and 22.4% of the rural elderly have difficulty in at least one activity, and the proportion of elderly people who have difficulty taking a bath is the highest. In the critical period of the implementation of the "Healthy China 2030" strategy, clarifying the factors affecting the health status of the elderly can not only provide an effective policy basis for healthy aging, but also provide a long-term sustainable development for China to realize the second quality-based demographic dividend. ability. In the reality that the problem of rapid aging is still severe, academic research on this pressing issue is urgently needed.

The research literature on the factors affecting the health of the elderly is mainly carried out from two aspects: one type of literature believes that health has a direct impact on economic growth. Wang (2008) summarized the basic concepts and characteristics of health capital. By describing the health production function model and health demand, it points out the significance of health capital to economic development [2]. Liu (2009) mainly studied the estimation of health investment (flow) and health capital (stock) and the crowding out of physical capital by health [3]. Yu (2006) constructed an economic growth model including education capital and health capital, and analyzed the relationship between health investment, health capital and economic growth [4]. Liu (2010) defined health capital investment and explored the development trend of my country's health capital [5]. (2008) took China's cross-provincial data and used Arrow-Romer production function and Grossman (1972) utility function model to study the effect of healthy capital accumulation and healthy investment on economic growth [6]. Gu (2017) pointed out that healthy investment promotes the growth of healthy economy [7]. Yang (2006) analyzed the impact of human capital on economic growth by examining the endogenous growth model including education and health investment [8]. Pingping Peng (2011) took Jiangsu Province as an example, using data such as GDP, fixed asset investment, average years of education, and number of beds to test whether healthy capital can significantly affect economic growth [9]. Ma (2016), from the perspective of government investment, examines the public education factors that affect the impact of healthy

human capital on economic growth [10]. Lv (2009) reviewed healthy human capital and economic growth, pointing out that the paths through which healthy human capital affects wage rates and economic growth are labor productivity, labor supply, fertility, education and savings, etc., and the positive impact is in developing countries [11]. Existing, potential negative effects exist in developed countries. Another type of literature believes that in terms of the influencing factors of health, Qu et al. (2011) empirically analyzed the factors affecting residents' health capital mainly include education level, lifestyle and mentality [12]. Chu (2010) took rural residents as the research object and analyzed the income effect and influencing factors of rural residents' healthy human capital [13]. Ma (2007) empirically analyzed the health status of rural residents in my country, and analyzed the influencing factors of health from the perspectives of health care expenditure and per capita net income of farmers, and put forward relevant countermeasures [14]. Zhang (2009) conducted an empirical study on the self-assessed health status of rural residents based on personal characteristics, family and social characteristics, and regional characteristics, and concluded that the health of rural residents in my country is getting worse. Wang (2010) analyzed the regional differences in rural health human capital in my country, and pointed out that the main influencing factors of health demand are age, medical insurance, health service prices and income inequality, and analyzed the impact of health inequality on poverty [15].

Based on the perspective of income and income gap, this paper examines the influencing factors of the health status of the elderly in China, and explores the heterogeneity between urban and rural areas. The marginal innovative contributions of this paper are as follows: First, using an ordered probit model to comprehensively reveal the impact of household income, including high, middle, and low income on the health of the elderly in China; The causal relationship between, income gap and the health status of the elderly was effectively identified, and the understanding of the transmission mechanism of the health status of the elderly related to income and income gap was deepened.

2. THEORETICAL MODELS AND DATA SOURCES

2.1 Theoretical model

Whether modeling the mean or more general statistics, the ordered Probit model requires the explained variable to be the true health level. However, the self-assessed health data as the main measure of the health level is not a measure of the true health level, but a measure of the true health level. A qualitative reflection of true fitness levels. The true health level is unobservable. In econometrics, we use latent variables to y* represent the true health level and assume the following parametric model.

$$y^* = x'\beta + \varepsilon \tag{1}$$

Here, *x* is a control vector composed of multiple factors that may affect the health level, β is an unknown parameter vector, and ε is an unobservable error term, which is usually interpreted as all unobservable factors that affect the health level. For the sake of convenience, we omit the subscripts of urban and rural areas and use *y* qualitative variables that represent self-assessed health. The *y* value reflects the health status, so the *y* value is not important, but the size of the value reflects the good or bad health status. As an example, suppose there are three health states: poor, fair, and good. We can *y* represent it with the values 0 , 1, 2 , or -1, y0 , 2 , or even -0.01, 1.99, 10.8. In short, as long as the ordering remains unchanged, the information contained in it is the same, which also means that the *h* value has no practical significance, and the inequality coefficient constructed on this basis has no practical significance.

The relationship between qualitative variables and latent variables is determined by

$$y = \begin{cases} 0, & y^* < 0 \quad (2a) \\ 1, & 0 < y^* < \delta_1 \quad (2b) \\ 2, & \delta_1 < y^* \quad (2c) \end{cases} \tag{2}$$

Here δ1 is the unknown threshold parameter. Under the assumption that the error term and the control variable are independent of each other and obey the standard normal distribution, h the probability of taking a value is

$$\begin{aligned} \Pr ob(y=0|x) &= \Phi(-x'\beta) && (3a) \\ \Pr ob(y=1|x) &= \Phi(\delta_1 - x'\beta) - \Phi(-x'\beta) && (3b) \\ \Pr ob(y=2|x) &= 1 - \Phi(\delta_1 - x'\beta) && (3c) \end{aligned} \tag{3}$$

The log-likelihood function of the data is (y, x)

$$\begin{aligned} l(y,x,\beta,\delta_1) &= 1\{y=0\}\ln(\Pr ob(y=0|x)) \\ &+1\{y=1\}\ln(\Pr ob(y=1|x)) \\ &+1\{y=2\}\ln(\Pr ob(y=2|x)) \end{aligned} \tag{4}$$

Here 1{ } is the indicator function. The log-likelihood function of the sample is $\{y_i, x_i\}_{i=1}^{N}$

$$L(\beta,\delta_1) = \sum_{i=1}^{N} l(y_i, x_i, \beta, \delta_1) \tag{5}$$

Ordinal regression estimation is to maximize the log-likelihood function of the sample. After estimating the parameters, we can calculate the marginal effects, significance and directionality of the control variables. E.g,

$$\frac{\partial \Pr ob(y=0|x)}{\partial x} = -\phi(-\beta'x)\beta \tag{6}$$

$$\frac{\partial \Pr ob(y=1|x)}{\partial x} = (\phi(-\beta'x) - \phi(\delta_1 - \beta'x))\beta \tag{7}$$

$$\frac{\partial \Pr ob(y=2|x)}{\partial x} = -\phi(\delta_1 - \beta'x)\beta \tag{8}$$

Here $\phi(.)$ is the standard normal density function. It can be seen that $\Pr ob(y=0|x)$ the derivative of is obviously β opposite to the sign of , $\Pr ob(y=2|x)$ the derivative of is β consistent with the sign of , and the relationship between $\Pr ob(y=1|x)$ the derivative of and β the sign of is uncertain, it depends on the size between the density function $\phi(-\beta'x)$ and $\phi(\delta_1 - \beta'x)$ [16]. But the significance of all marginal effects is β consistent with the significance of.

2.2 Data sources

The China Health and Nutrition Survey (CHNS) is a collaboration between the Center for Population Research at the University of North Carolina and the Chinese Center for Disease Control and Prevention, and is the highest quality data source for research on health and nutrition issues in China. The survey has a large sample size, adopts a stratified sampling design, and the sample is random and nationally representative. This paper selects the data from 1997 to 2015, selects the age range of 60 to 70 years old and above, and deletes the missing observations of self-assessed health variables of the elderly over 60 years old. Finally, the number of valid samples is 35967, of which the urban sample is 13691 There are 22,276 rural samples.

2.3 Variable definition and description

The research sample is limited to the elderly over 60 years old. After eliminating the missing observations, there are 35,697 valid samples, including 13,691 urban elderly samples and 22,276 rural elderly samples, which is in line with the social status quo of the high proportion of rural elderly population.

Explained variable. Self-assessment health data is used as the main measure of health level. The advantages of this variable are: first, self-assessment of health reflects respondents' evaluation of their own health; The most frequently asked questions about health status in the survey; thirdly, individuals' evaluation of their own health status often reflects their own perceived physical status, and the validity is strong; fourthly, Liu et al. (2004) Research shows that self-rated health can even predict future mortality and morbidity [17]. The corresponding answers

to the questions about self-rated health in CHNS are 1= "very good", 2= "good", 3= "average", 4= "not good", and 5= "very bad".

The interval regression method proposed by Doorslaer (2006) was used to transform the self-rated health data into continuous data in the [0,1] interval [18]. The implicit assumption that this method is based on is that there is a stable mapping relationship between the health utility index and self-rated health status that potentially determines the true health status of the respondents. The specific steps are: 1. Take self-assessed health as the dependent variable, perform ordered Probit regression on relevant covariates including demographic and socioeconomic characteristics variables , actually measure a health variable, and use the adjusted corresponding threshold as the dependent variable, education, Socioeconomic characteristics such as income, gender, age, participation in social insurance and family environment are used as control variables for interval regression; 2. The obtained health base values corresponding to different health categories in the [0,1] interval. The higher the score, the higher the health level of the investigator.

Explanatory variables. Household income uses the logarithm of total household income to measure the household income status of the elderly, reflecting the non-linear relationship between income and health. The total household income includes the wage income, transfer income, self-employment income and household agricultural net income of all members of the family plus the annual income. Referring to the practice of Wang (2015), the household income when the total income is higher than the average level is classified as high income, the income when the total income is lower than the average level is classified as low income, and the income when the total income is equal to the average level is classified as middle income [19]. The Gini coefficient of household income refers to the average value of the Gini coefficient of the community where the family is located. It is calculated according to the community without weighting the number of people. In the sample data, the number of households in each community is about 18.

Control variables. Gender generates a gender dummy variable based on "what is your gender" in the questionnaire. Women are counted as 0 and men are counted as 1. Ages were divided into three groups according to the actual age of the respondents, 60-65 years old, 65-70 years old and over 70 years old, and dummy variables were generated. Marriage According to "your current marital status" in the questionnaire, a dummy variable of marital status is generated, in which the answer of "married" is compiled into a dummy variable of "married", which is counted as 1, and the answer of "divorced", "widowed", "separated" and "Don't know"

Table 1: Descriptive Statistics

Variable Name	Variable Definitions	All		Town Sample		Rural Sample	
		Mean	SD	Mean	SD	Mean	SD
Self-assessed health	continuous variable	2.13	0.148	2.26	0.148	2.33	0.132
Household income	Togarithm, continuous variable	10.19	0.975	10.23	0.975	9.87	0.859
Household Income Gini Coefficient	Togarithm, continuous variable	0.45	0.131	0.361	0.212	0.522	0.1312
Work	yes=1, no=0	0.61	0.491	0.62	0.491	0.87	0.341
Education level	Continuous variable	8.94	0.589	9.58	0.257	6.78	0.415
Male	yes=1, no=0	0.46	0.325	0.48	0.325	0.47	0.338
60 to 65 years old	yes=1, no=0	0.30	0.130	0.16	0.130	0.23	0.092
65-70 years old	yes=1, no=0	0.25	0.387	0.18	0.387	0.16	0.369
over 70 years old	yes=1, no=0	0.18	0.458	0.30	0.458	0.31	0.462
Married	yes=1, no=0	0.96	0.192	0.96	0.192	0.98	0.153
Medical insurance	attend=1, no=0	0.55	0.498	0.55	0.498	0.29	0.453
Smoking	yes=1, no=0	0.67	0.472	0.67	0.472	0.68	0.468
Drink wine	yes=1, no=0	0.27	0.443	0.27	0.443	0.07	0.261
Normal weight	yes=1, no=0	0.59	0.493	0.59	0.493	0.75	0.433
Overweight	yes=1, no=0	0.31	0.465	0.31	0.465	0.20	0.400
Obesity	yes=1, no=0	0.11	0.300	0.12	0.300	0.05	0.220
East area	yes=1, no=0	0.45	0.498	0.38	0.498	0.30	0.458
Western Region	yes=1, no=0	0.19	0.391	0.19	0.391	0.36	0.481
Central Region	yes=1, no=0	0.23	0.389	0.16	0.389	0.20	0.401
1997 _	yes=1, no=0	0.04	0.192	0.04	0.192	0.08	0.101
2004 _	yes=1, no=0	0.29	0.455	0.29	0.455	0.34	0.473
2006 _	yes=1, no=0	0.37	0.483	0.37	0.483	0.32	0.468
2010 _	yes=1, no=0	0.30	0.459	0.30	0.459	0.33	0.470
2015 _	yes=1, no=0	0.29	0.432	0.29	0.473	0.38	0.521
Observations (pieces)		35967		13691		22276	

Source: China Health and Nutrition Survey (1997-2015), the same as the table below.

is compiled into "unmarried" and counted as 0. Work. Dummy variables are generated according to the coding of "Do you currently have a job" in the questionnaire, including unemployment or quitting the labor market as 0, and working as 1. The educational level generates a continuous variable of education based on "how many years of education have you been" in the China Health and Nutrition Questionnaire. Lifestyle dummy variables were generated by coding "Do you smoke and drink alcohol" in the questionnaire. The value of smoking is 1, and the value of non-smoking is 0; the value of drinking is 1, and the value of non-drinking is 0. The medical insurance generates a dummy variable according to the coding of "Do you have medical insurance" in the questionnaire. The value of participating in medical insurance is 1, and the value of not participating in medical insurance is 0. Body mass index is an important standard commonly used internationally to measure the degree of obesity. According to the World Health Organization (WHO) coding of Asian body mass index, three dummy variables of normal weight, overweight and overweight were generated. Among them, the self-reported weight/height squared score between 18.5-23 kg/m^2 is normal weight, the score between 23-27.5 kg/m^2 is overweight, and the score above 27.5 kg/m^2 obesity. The regional dummy variables are coded according to the province where the respondents are located, and are divided into three dummy variables in the eastern, western and central regions.

3. EMPIRICAL RESULTS

3.1 Benchmark model

The semi-parametric estimation method of the ordered probit model was used to test the influence of income and income gap on the health status of the elderly. The results of the regression test are shown in Table 2. Model (1) reports total household income and Gini coefficient of household income as core explanatory variables, in which total household income includes high income, middle income and low income; controlling for work, education level, gender, age, marriage, medical insurance, smoking, alcohol consumption, body mass index, region and year. In order to examine the impact of regional income differences on the health status of the elderly, model (2) in Table 2 adds the Gini coefficient of family income to model (1), and introduces the cross term of regional variables and family income.

Table 2 show that family income has a positive and significant impact on health. The increase in income improves the health level of the elderly. Every unit of income increases the health level of the elderly by 2.2%, which is an important factor affecting the health of the elderly. In addition, compared with high-income seniors, middle-income has a positive and significant impact on the health of the elderly, but low-income has a negative and significant impact on the health of the elderly. Although the income of the low-income elderly increased by 3.9%, the health level of the elderly decreased by 7.2%, indicating that because the average health level of the low-income elderly is lower, even an increase in income cannot effectively increase their health level.

Model (2) adds income disparity, that is, the family income Gini coefficient variable. The result shows that income disparity has a negative impact on the health of the elderly, and income disparity reduces the health level of the elderly by 1.6%. It is worth noting that after adding the income gap, the income gap increases by one unit, the health of the urban elderly increases by 3.8 %, and the health of the rural elderly population decreases by 2.3 %. The income gap widens the health gap of the rural elderly and is particularly detrimental to the health of the rural elderly. The possible reasons are that the appropriate widening of the urban income gap in economically developed provinces increases the supply of public medical insurance services, and the increase in public spending and the number of public hospital beds improves the health of the elderly in urban areas. In rural areas, the elderly have widened their health disparities due to insufficient supply of public medical services and widening income disparities.

The result of adding the interaction term between region and household income in model (2) shows that the household income in the eastern region increases and the health of the elderly decreases by 1.1 % .The possible reasons are: when measuring the income level , this paper separates the elderly personal income from the total household income, and the contribution of heterogeneous individuals to the total household income is different, so that the income variable cannot be clearly defined and reflect the actual income of the individual. ; In addition, when dividing the income level, the income above the average level is classified as high income, the income equal to the average level is classified as middle income, and the income below the average level is classified as low income. This classification method fails to exclude other factors. impact, amplifying the healthy income effect.

regression results of urban and rural samples, after adding the

Table 2: The Estimated Results of the Marginal Effect of the Healthy Ordered Probit Model for the Elderly

	All Samples		Town Sample		Rural Sample	
	model (1)	Model (2)	model (1)	Model (2)	model (1)	Model (2)
Household income	0.022***	0.069***	0.083	0.011	0.020*	0.096
	(3.12)	(3.36)	(0.92)	(0.10)	(2.71)	(3.28)
Medium income	0.039***	0.091**	0.080**	0.026***	0.028**	0.007***
	(0.05)	(0.07)	(0.17)	(0.17)	(0.08)	(0.08)
Low income	-0.072***	0.005**	-0.047*	0.084***	-0.058*	0.029***
	(0.07)	(0.07)	(0.17)	(0.15)	(0.08)	(0.09)
Household Income Gini Coefficient		- 0.016**		0.038**		-0.023**
		(0.05)		(0.21)		(0.16)
Eastern Region × Household Income		-0.011***		0.013**		-0.021***
		(0.03)		(0.04)		(0.02)
Western Region × Household Income		0.019**		0.008**		0.019**
		(0.03)		(0.05)		(0.06)
p	0.000	0.000	0.000	0.000	0.000	0.000
N	35967	35967	13691	13691	22276	22276

Note: The above coefficient values use overall sample data, urban data and rural data respectively ; *** , ** , * indicate significant at the 1% , 5% and 10% statistical levels ; standard errors are in brackets ; The P value is the P value of the LR statistic ; high income, 2005 , 60-65 years old, normal weight, central region, central region × income was removed from the model due to multicollinearity ; control variables were work, education, Gender, age, marriage, health insurance, smoking, drinking, body mass index, region and year .

interaction term of region and income in model (2), with the central region as the control group, the urban household income in the eastern region increased, and the health level of the urban elderly increased by 1.3 %. The health of the elderly in rural areas fell by 2.1 percent. The income of urban households in the western region increased, and the health level of the elderly in urban and rural areas increased by 0.8 % and 1.9 % respectively. Therefore, based on the urban and rural samples, after adding the interaction term of region and income, the conclusion that income is the main influencing factor of the health status of the elderly still holds.

3.2 Robustness test

Endogenous problems of health and income mainly come from two aspects: First, omitted variables. If there is a correlation with income, the omitted variable will be in the random disturbance term, then there will be an endogeneity problem between the two; the second is the mutual influence of self-assessed health as an explanatory variable and explanatory variable income, that is, the higher the income of older adults experience better health with access to more health resources and medical services. The healthier the elderly, with their good physical condition, have more opportunities to participate in work and earn higher income. Therefore, it is difficult to ensure the consistency of the regression results by using a simple ordinal probit model regression. It is necessary to find suitable instrumental variables to replace the endogenous income variable to solve the endogeneity problem between income and self-assessed health.

The average body health index of family members, namely normal weight, overweight and overweight, is used to solve the endogeneity problem caused by missing variables and mutual causality between health and income. On the one hand, the body health index measured by the ratio of the average weight and height of family members will affect income, and generally shorter men and fatter women have higher incomes (Zhang 2015); on the other hand, the average body weight of family members The health index is the average health level of family members and does not affect the physical health of the elderly.

The corresponding estimation results are reported in the first-stage regression (1) of Table 3. When the average body health index of family members was introduced, the estimated coefficients of overweight family members and overweight family members showed a significant impact on the income of the elderly. Therefore, the health index of family members is effective as an instrumental variable. The results of the 2SLS estimation of the health status model using the average physical health index of family members as an instrumental variable are shown in the second-stage regression (2) of the national sample in Table 3. The p value of the Hausman test result was 0.0657, and the systematic difference between the two regression results was obvious. The Hausman test results of the second-stage regressions (3) and (4) in urban and rural areas were also less than 0.1, indicating an endogeneity problem between income and health.

Sargan's test results were all greater than 0.1, indicating that the body mass index of family members was an effective instrumental variable. The regression estimation results of the second stage (3) of the urban sample in Table 3 show that the estimation result of the income variable is positive and significant at the 1% level. The high estimated coefficient of the average body health index of family members indicates that even if the elderly are obese, they tend to think that they are in good health, leading to an overestimation of the effect of body mass index in the model. After controlling for the endogenous bias caused by BMI, income remained the main factor affecting the health status of the elderly.

4. MAIN CONCLUSIONS AND POLICY RECOMMENDATIONS

4.1 Main conclusions

An ordered probit model was established to estimate the influencing factors of the health status of the overall sample, urban and rural elderly,

Table 3: Estimated Results of the Elderly Health: 2sls Method

	Total Sample		Town Sample	Rural Sample
	first stage (1)	second stage (2)	second stage (3)	second stage (4)
Household income	0.071***	0.010***	0.048***	-0.069
	(3.02)	(4.33)	(0.051)	(0.026)
Household Income Gini Coefficient	0.392**	0.451**	0.213	-0.351
	(2.11)	(3.75)	(1.75)	(2.61)
Family members are over-weight	-0.341***	-0.341**	-0.018*	-0.440*
	(0.08)	(0.21)	(0.31)	(0.25)
Family member obesity	-0.252***	-0.178*	0.069**	-0.266***
	(0.09)	(0.35)	(0.11)	(0.65)
Western Region × Income	0.001*	0.006*	0.123**	0.034**
	(1.78)	(1.86)	(2.55)	(2.75)
Central Region × Income	0.109**	0.218*	0.315**	0.135**
	(1.65)	(1.98)	(2.36)	(2.98)
	(-0.69)	(-3.92)	(0.10)	(0.05)
R^2	0.119	0.702	0.276	0.430
Hausman test		0.0657	0.0432	0.1032
Sargan test		0.3022	0.1532	0.3086
N	35967	35967	13691	22276

Note: The coefficients use overall, urban and rural data; ***, ** indicate that the t-test value is significant at the 1% and 5% statistical levels; the standard errors are in parentheses ; the Hausman and Sargan tests report the corresponding statistics The sign and significance of the one-stage regression coefficient in urban and rural areas are consistent with the national sample, which is not reported ; family members with normal weight are the control group; control variables include work, education, gender, age, marriage, Medicare, smoking, drinking, body mass index, region and year.

respectively. The main conclusions are as follows: the increase of income improves the health status of the elderly, and the result of adding the interaction term still proves that income is the main factor affecting health; the widening income gap improves the health level of the overall and urban elderly, but makes the elderly in rural areas worse. decline in health. The regression results of urban and rural samples show that income reduces the health of the elderly in rural areas more than in urban areas. Using the average body mass index of family members as an instrumental variable, the endogeneity of health related to income was examined, and it was found that income was still the main factor affecting the health of the elderly.

4.2 Policy Suggestions

Firstly, reduce income gaps, especially between regions and between urban and rural areas. First, the healthy income determination hypothesis holds that an individual's health status is not only affected by personal income or social average income, but also social income gaps play a role [20]. The widening income gap between regions and between urban and rural areas will reduce the supply of government public medical services, putting the elderly in low-income areas and poor rural areas at a more disadvantaged position. Therefore, from the perspective of government public policy, by strengthening public health investment, improving the accessibility and utilization efficiency of basic medical services, and alleviating the adverse impact of income disparity on the health of the elderly, the health of the elderly in poverty-stricken areas and rural areas can be improved.

Secondly, increase public investment in health facilities in poor and backward areas and rural areas, and improve the health capital level of the elderly population. The effect of income disparity on health shows that in the eastern region with high income disparity, the health of farmers with lower income is more vulnerable to income shocks, leading to the differentiation of the health status of the elderly. The empirical results of this paper show that the more prominent the contradiction between unbalanced development between underdeveloped regions and within urban and rural areas, the greater the difference in the health status of the elderly will be. According to the National Health Service Survey, in 2015, the poverty rate due to diseases in underdeveloped areas reached 22.3%, and even more than 48% in poor rural areas. The empirical results also found that participating in medical insurance will improve the health of the elderly population, especially in the underdeveloped western regions and rural elderly population. Therefore, the government should improve the social medical insurance system (public medical care, commercial insurance, and cooperative medical care), and alleviate the current situation of health inequality between regions and between urban and rural areas by increasing subsidies and necessary medical assistance for their participation in cooperative medical care.

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