Academic Journal of Management and Social Sciences
ISSN: 2958-4396 | Vol. 2, No. 3, 2023

Study on Health Effect and Health Equity of Long-term Care Insurance Pilot Policy in China

Xiu Luo, Panpan Yang and Yibing Li *

School of International Pharmaceutical Business, China Pharmaceutical University, Nanjing, China

Abstract: Long-term care insurance (LTCI) is an important measure to actively cope with the aging population in China. In this paper, CHARLS data is used to study the health effects of pilot policies of LTCI through DID model and PSM-DID model, and Dagum Gini coefficient is used to analyze the sources of differences in health equity between urban and rural areas. Results show that the implementation of LTCI has an improvement effect on self-reported health status, but the results after propensity score does not significantly support the conclusion of the improvement effect. In addition, the health inequality mainly comes from the internal differences respectively existed in urban and rural areas, and the difference in self-reported health status of the elderly in the treatment group is more obvious. Therefore, future institutional design should focus on policy coverage of the population and improving services.

Keywords: Long-term Care Insurance; Health Effect; Health Equity.

1. Introduction

According to research predictions, there will be 38.5238 million disabled elderly people in 2025 and 62.822 million in 2050, including 9.321 million severely disabled people [1]. The demand for elderly long-term care is huge, but at the same time, the nursing market is insufficient and there is a significant supply and demand gap. In this context, China issues guidance on conducting pilot projects in 2016 and 2020. Subsequently, policy documents such as the 14th Five Year Plan points out the gradual establishment of a LTCI system to actively respond to the aging population. From the perspective of active aging, LTCI emphasizes providing appropriate, high-quality, and accessible care services for disabled elderly people in the health dimension [2] and meeting their long-term care needs. Therefore, it is necessary to study the health effects of LTCI pilot policies and consider the sources of health inequality between urban and rural areas, in order to provide certain empirical references for the construction of the formal LTCI system.

There is no consensus in the literature on the health effects of LTCI. Hughes et al. [3] finds that a long-term home care program significantly reduces the risk of long-term hospitalization and improves the health level of individuals. Yasutake et al. [4] study the intervention of OHN plan, one plan in Japan's LTCI, and the results confirm that it has a reducing effect on accidental disability. In China, Wang Z et al. [5] use the actual reimbursement data of Shanghai medical insurance and DID method to investigate the impact of LTCI on medical expenses, and results show that home care subsidies can increase the utilization of medical services and improve the health of the care recipients. Liu H et al. [6] investigate the effect of the pilot implementation of LTCI policy by using DID method, concluding that LTCI significantly improves the health level. They also use the Theil index to measure the health equity, showing that low-income people have greater benefits in terms of inequality.

Therefore, the marginal contribution of this paper is to include self-pilot cities into the treatment group sample, enriching the empirical basis for the study of policy health effects. The sources of health inequality between urban and rural areas are studied with the latest Gini coefficient.

2. Data and Methods

2.1. Data Source and Samples Selection

The database of the China Health and Retirement Longitudinal Study (CHARLS) is a high-quality micro-data mainly conducted for middle-aged and elderly families and individuals over the age of 45, covering basic information, health status and function, cognition and depression, medical care and insurance, family income and other contents. The information is so comprehensive that can meet the research needs of this paper. In this paper, the data of the national tracking survey in 2011, 2013, 2015 and 2018 are used, and the observed values with missing variable information are removed to form the disequilibrium panel data of the four years.

Before 2018, a total of 33 cities have implemented LTCI pilot projects, including national pilot cities and self-pilot cities. In order to improve the reliability of research conclusions, based on the availability and science of data, a total of 15 cities are included in the treatment group. Table 1 shows the specific treatment group samples, the respondents who are insured by the LTCI in pilot cities are finally included in the treatment group, and the non-insured people are automatically classified as the control group along with other cities.

Table 1. Treatment group sample

Types of medical insurance	Cities
Urban workers	Shangrao, Jinan, Chengde, Anqing, Chengdu, Guangzhou, Linyi, Qiqihar
Urban workers and urban residents	Jilin City
Urban workers and urban and rural residents (or new rural cooperative medical insurance)	Xuzhou, Jingmen, Shanghai, Jiaxing, Linfen and Suzhou

2.2. Research Methods

2.2.1. DID Model

The difference-in-difference (DID) model, formula of which is as followed, is used as the baseline regression to measure the health effects of the policy.

$$Y_{it} = \alpha + \beta post_t * treat_i + \gamma X_{it} + \mu_i + \delta_t + \varepsilon$$

2.2.2. PSM-DID Model

As a method to calculate the propensity score of samples' control variables, propensity score matching (PSM) method according to this score matches treatment group and control group samples as similar as possible, and then calculates the average treatment effect. The formula for calculating propensity scores is as follows:

$$\omega(X_i) = Pr(treat_{\text{it}} = 1|X_i) = \frac{\exp(\beta X_i)}{1 + \exp(\beta X_i)}$$

2.2.3. Dugum Gini Coefficient

As an improved inequity measure method, Dugum Gini coefficient effectively overcomes the problem that traditional Gini coefficient and Theil index have in the distribution status of subsamples and regional differences [7]. In this paper, it is used to investigate the differences between urban and rural areas in health equity. The specific calculation process is as follows:

$$G = G_w + G_{nb} + G_t$$

$$G_w = \sum_{j=1}^{k} G_{jj} P_j S_j$$

$$G_{nb} = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jh}(P_j s_h + P_h s_j) D_{jh}$$

$$G_t = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jk}(P_j s_h + P_h s_j)(1 - D_{jk})$$

$$G_{jh} = \frac{\sum_{i=1}^{n_j} \sum_{r=1}^{n_k} |y_{ji} - y_{hr}|}{n_j n_h (\overline{Y}_j + \overline{Y}_h)}$$

$$G_{jj} = \frac{\frac{1}{2\overline{Y}_j} \sum_{i=1}^{n_j} \sum_{r=1}^{n_j} |y_{ji} - y_{hr}|}{n_j^2}$$

2.3. Variable Definition

Table 2 shows the detailed definitions of variables. In order to investigate the health impact of LTCI for middle-aged and elderly people, take self-reported health condition as explained variable. Compared with ADL and chronic diseases, self-reported health status can better reflect the feelings of middle-aged and elderly subjects and reflect the health effects brought by policies. It consists of five grades: "1 Very good" "2 Good" "3 Fair" "4 Poor" and "5 Poor". The core explanatory variable of this paper is DID, and the control variables are selected according to Anderson service utilization model.

Table 2. Variables definition

Variables	Variables' type	Definition
self_health	Explained variable	On a scale of 1 to 5, the higher the score, the worse the self-reported health status.
DID	Core explanatory variable	The core explanatory variable that indicates whether the respondents participate in long-term care insurance.
gender	Forward leaning factor	Female =1, Male =0.
age		Current age (age≥45 years old)
marriage		Married and living with spouse =1, Married but temporarily separated for reasons such as work =2, Separation =3, Divorced =4, Bereavement =5, Unmarried =6, Cohabitation =7.
education		Illiteracy or semi-illiteracy =1, Primary school =4, Middle school =6, High school =8, University =11, Master's =13, Doctor's and above =16.
lninc	Enabling factor	Household income = household income + transfer income + agricultural income + self-employment income, and then logarithmically treated.
children		The number of children still alive.
ADL	Demand factor	The higher the score, the more independent and less dependent.
chr_diseases		Having chronic diseases or not, yes=1, no=0.
dep		Subtract 10 points from the total score of 10 questions.

3. Results

3.1. Descriptive Statistics

Table 3. Descriptive statistics of variables

Variables	All samples				2018		2015	
	Mean	Min	Max	sd	mean	sd	mean	sd
self_health	3.548	1	5	1.03	3.221	0.971	4.144	0.849
gender	0.561	0	1	0.496	0.566	0.496	0.552	0.497
age	60.85	45	93	9.653	60.537	9.398	61.413	10.078
marriage	2.203	1	7	1.778	2.241	1.793	2.134	1.479
education	3.425	1	16	2.637	3.376	2.615	3.513	2.675
lninc	7.476	0	14.45	3.607	8.702	2.459	5.243	4.238
children	3.151	0	14	1.718	3.081	1.686	3.278	1.767
ADL	0.136	0	6	0.544	0.317	0.543	0.132	0.546
chr_diseases	0.899	0	1	0.302	1	0	0.714	0.452
dep	9.725	0	30	6.422	9.952	6.479	9.312	6.297

The descriptive statistical results of 8536 samples are shown in Table 3. Overall, the average self-reported health status in the middle-aged and elderly is about 3.5. Compared with self-reported health in 2015, it shows an obvious

improvement, indicating that LTCI may indeed have positive health effects. Among the control variables, compared to 2015, the average age and education level of respondents decreases in 2018, household income increases, and depression scores and chronic diseases become worse.

3.2. Health Effects

3.2.1. Results of DID Baseline Regression

DID method is used to process variables as shown in the Table 4.

It can be seen from the baseline regression results that the regression coefficients of the core explanatory variables under the first three models are significantly negative ($p < 0.01$). And the regression coefficients remain significant ($p < 0.1$) in model (4), indicating that LTCI reduces the score of self-reported health status by 0.21 points, showing that LTCI has a positive effect on health status.

3.2.2. Regression Results of PSM-DID

The test results of PSM in this paper are shown in Table 5. compared with before matching, the samples' standard deviation is less than 10%. Except the chronic disease variables, the absolute standard deviation of other control variables is greatly reduced. The T-test and the P-value are also significantly greater than before. So, the samples after matching can be used for the empirical results of DID.

Table 4. Results of DID baseline regression

	Model (1)	Model (2)	Model (3)	Model (4)
DID	-0.525***	-0.279***	-0.428***	-0.209*
	(0.069)	(0.064)	(0.131)	(0.117)
Control variables	NO	YES	YES	YES
Individual fixed	NO	NO	YES	YES
Time fixed	NO	NO	NO	YES
N	8536	8536	8536	8536
r-squared			0.255	0.492

Note: Standard errors in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

Table 5. Results of PSM

Variables	Unmatched	Mean		%Bais	%Reduct Bias	t-Test	
	Matched	Treated	Control			t	P > t
gender	U	0.578	0.562	3.3	99.1	0.450	0.653
	M	0.578	0.579	-0.0		0.000	0.998
age	U	60.659	61.008	-3.7	88.3	0.49	0.622
	M	60.659	60.7	-0.4		0.004	0.966
marriage	U	2.124	2.216	-5.2	85.9	0.69	0.95
	M	2.124	2.111	0.7		0.07	0.99
education	U	4.573	3.351	44.1	94.7	0.29	0.000
	M	4.573	4.638	-2.4		0.21	0.832
lninc	U	9.718	7.652	70.1	94.8	0.12	0.000
	M	9.718	9.611	3.6		0.45	0.653
children	U	2.460	3.181	-44.4	98.7	0.66	0.000
	M	2.460	2.450	0.6		0.06	0.952
ADL	U	0.086	0.141	-12.2	96.1	0.34	0.180
	M	0.865	0.084	0.5		0.06	0.955
chr_diseases	U	1.000	1.000	•	•	•	•
	M	1.000	1.000	•		0.00	1.000
dep	U	8.789	9.919	-18.5	89.6	0.34	0.019
	M	8.789	8.672	1.9		0.19	0.846

Table 6. Regression results of PSM-DID.

	Model (1)	Model (2)	Model (3)	Model (4)
DID	-0.451***	-0.251***	-0.550***	-0.205
	(0.070)	(0.066)	(0.169)	(0.165)
Control variables	NO	YES	YES	YES
Individual fixed	NO	NO	YES	YES
Time fixed	NO	NO	NO	YES
N	7275	7275	7275	7275
r-squared			0.167	0.487

Note: Standard errors in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

As shown in Model (1) to model (4) in Table 6, it is the same as the treatment of baseline regression. In the first three models, the core explanatory variable has a positive effect on improving self-reported health ($p < 0.01$). However, the core explanatory variable coefficient under bidirectional fixed effect is not statistically significant. The matched valid samples show that the effect of LTCI on the health status of middle-aged and elderly people is still not obvious.

3.3. Robustness Test

Drawing on the method of Ma Chao et al. [8], The counterfact test is used to artificially advance the occurrence time of the policy. The years 2013 and 2011 are set as one phase of $treat_{t-1}$ and two phases of $treat_{t-2}$ before the implementation of the policy, and they are put into the regression equation respectively to test whether there is obvious health effect. If the coefficient of the core explanatory variable is significant, it indicates that the regression results are not credible; Otherwise, the results are

credible. As shown in Table 7, the coefficients of core explanatory variable are not significant, indicating that LTCI does have health effects under DID method.

Table 7. Robustness test

	2013	2011
DID	-0.088	0.001
	(0.093)	(0.129)
N	11438	9002
r-squared	0.418	0.038

Note: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.4. Health Equity

CHARLS 2018 data are used and divided into control group and treatment group to study the differences in health equity between urban and rural areas after the implementation of the policy. As shown in Table 8, treatment group has slightly bigger health difference than control group. The main sources of the differences in health status between the two groups are intra-regional differences and hypervariable density, indicating that inequalities are more pronounced within urban and rural each group than between urban and rural. The treatment group shows more obvious inequities in self-reported health status of rural middle-aged and elderly people. Because rural LTCI resources are not abundant, which restricts the health effect to a certain extent, as shown by greater regional differences in self-reported health in rural areas.

Table 8. Health equity analysis

		Control group	Treatment group
Overall difference		0.157	0.162
Intra-regional difference	Number	0.105	0.081
	Contribution rate	67.10%	49.72%
Inter-regional difference	Number	0.010	0.015
	Contribution rate	6.68%	9.229%
Hypervariable density	Number	0.041	0.067
	Contribution rate	26.23%	41.06%
Urban interior		0.156	0.155
Rural interior		0.156	0.168

4. Conclusion

The participation, health and security of the elderly constitute the three pillars of active aging. Starting from the health dimension, this paper selects 15 first batch of pilot cities in China and uses the mixed panel data of CHARLS to analyze the health effects of LTCI. This paper concludes that the implementation of LTCI has an improvement effect on self-reported health status, but the results after PSM do not significantly support the conclusion of the improvement effect. The counterfact test proves that policy implementation does have a positive effect on self-reported health status. In addition, the health inequality mainly comes from the internal differences respectively existed in urban and rural areas, and the difference in self-reported health status of the elderly in the treatment group is more obvious.

The suggestions are accordingly as followed: On the one hand, we should expand the coverage population of LTCI, build a continuous care service system from prevention to health promotion, and meet the health needs of elderly people in rural areas. On the other hand, encourage social forces to participate in long-term care supply services by providing tax incentives and other measures.

References

[1] GUO Q, WU Z, “Long-term care demand prediction and cost estimation of disabled elderly based on Markov model”, Chinese Journal of Health Statistics, 2021, Vol. 38(06), p870-873.

[2] SUN J, “Research on China's Long-Term Care Insurance Policy from the Perspective of Active Aging--Comparative Analysis based on Pilot Cities”, Shandong University, 2021.

[3] HUGHES S L, MANHEIM L M, EDELMAN P L, et al, “Impact of long-term home care on hospital and nursing home use and cost”, Health services research, 1987, Vol. 22(1), p19.

[4] YASUTAKE T, TAKASHI W, KEMMYO S, et al, “Effects of a community-based program for oral health and nutrition on cost-effectiveness by preventing disability in Japanese frail elderly: a quasi-experimental study using propensity score matching”, Journal of the American medical directors association, 2017, Vol. 18(8), p678-685.

[5] WANG Z, FENG J, “The Substitution Effect of Long-Term Care Insurance on Health Expenditure and Comparison of Different Compensation Modes”, China Economic Quarterly, 2021, Vol. 21(02), p557-576.

[6] LIU H, HU T, “Policy Effect of Long-Term Care Insurance from the Perspective of Medical Compensation and Health Insurance Equity”, Scientific Research on Aging, 2022, Vol. 10(02), p37-53.

[7] YANG H, CHEN H, “Regional Difference and Convergence of Equalization of Basic Public Services in Urban and Rural Areas in China”, Journal of Quantitative & Technological, 2020, Vol. 37(12), p127-145.

[8] MA C, GU H, LI J, “A study on the rural-urban disparities of healthcare in China-Evidence from counterfactual analysis”, Economist, 2012, Vol. (12), p10.