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Impact of the New Cooperative Medical Scheme on Health Care Service Utilization in Rural China

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Using the 2000, 2004, and 2006 CHNS longitudinal survey data and econometric methods (random-effect probit regression model and DID methods), this study conducted an empirical analysis to estimate the impact of NCMS. The major conclusions are as follows. First, predisposing factors, enabling factors, health care need factors, and lifestyle factors affect health care utilization. Second, results using DID methods indicate that NCMS did not affect health care service utilization (outpatient and inpatient) of individuals when ill, but it might increase the possibility of getting a health examination. Third, there is no difference in health care service utilization (both outpatient and inpatient) between the NCMS enrollment group and the non-enrollment group in both working age group (15~59) and the elderly group (60 and over). Therefore, it can be said that NCMS did not affect the health care utilization in both the group. However, NCMS positively affects disease prevention behavior (visiting the hospital to receive a health examination) in the working age group, but the effect did not appear in the elderly group.

Keywords: New Cooperative Medical Scheme (NCMS), health care service utilization, rural China

Introduction

In rural China, the Cooperative Medical Scheme (CMS), played a major role in preventing infectious diseases and providing primary health care as a part of the people's commune systems in the planned economy period of 1949–1977. However, in the economic transition period (after 1978), as the people's communes were eliminated and the rural household responsibility system was implemented, CMS enrollment rates decreased dramatically (from 90% in 1981 to merely 5%–10% in the 1990s) (Liu *et al.*, 1995; Wagstaff & Linedelow, 2008; Cheng *et al*., 2015). In addition, since the 1990s, the Chinese government enforced health care service market reform, moving from planned systems to a competitive market. Therefore, total health care expenses for individuals increased dramatically. As a result, a person with a serious illness risked poverty from high health care expenditures, which became the responsibility of the patients themselves. In this way, health care inequality resulting from income inequality became a serious problem in rural areas. To address this social

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problem, the Chinese government introduced a new public health insurance program in rural areas, the New Cooperative Medical Scheme (NCMS) in 2003. Enrollment in NCMS is optional, and it covers all residents within the rural registrations. Although the NCMS financial foundation is supported by the central and local governments, participants have to pay medical insurance premiums. Since local insurance funds are insufficient, the government repayment accounts are low, a majority of health care expenditures are paid by patients themselves. Therefore, even if the individuals participate in health insurance and join NCMS, they may still not access health care services when required, worried that the higher health care expenditures could drive them into poverty. Did the implementation of NCMS affect the use of health care services in rural China? An empirical study evaluates the impact of the new public health insurance system in China.

Previous empirical studies have investigated this issue[1]. For example, Wagstaff *et al.*(2009), Shi *et al* .(2010), You & Kobayashi (2011), Lu *et al.*(2012), Li & Zhang (2013), Li *et al.* (2014) used cross-section data to estimate the impact of NCMS on health care service utilization (i.e., the probability of access to a hospital and health care expenditures when needed). In addition, Wagstaff & Lindelow (2008), Lei & Lin (2009), and Cheng *et al.* (2015) used panel data to address the heterogeneity problem of this issue. However, the estimated results were not consistent caused by the utilization of the different measurement methods and datasets, and some problems remain unanswered. First, although DID (difference in difference) analysis is an appropriate method for policy assessment, which is often used in empirical studies, this method is rarely used for this issue in China. Second, for the determinants of health care demand and health care service utilization behavior, the Anderson model (Anderson & Newman 1973; Anderson,1995) is generally used in studies pertaining to medicine and health economics, and it has not been used on this issue in China[2].

In this study, using three waves (2000, 2004, and 2006) panel data of the China Health and Nutrition Survey (CHNS), we investigate the impact of NCMS on health care service utilization: the probability of accessing a hospital (inpatient and outpatient) and the probability of receiving a health examination. This study uses a DID analysis method based on the Anderson behavior model to address the aforementioned problems.

This study is structured as follows: part 2 introduces the framework of the empirical analysis, including models and datasets; part 3 presents estimation results; and part 4 gives a summary of the conclusions.

Methodology

Models

Probit regression models are utilized to measure probability of the health care service utilization.

First, to address the heterogeneity problem, random effect probit regression model is used, they are expressed as eqs. (1)~(3).

$$y_{it}^{*} = a_t + \beta_1 NCMS_{it} + \beta_2 X_{it} + u_i + v_{it} \quad (1)$$

[1] For empirical studies on the impacts public health care insurance reform on the health care service utilizations, please see Currie & Gruber (1996a, 1996b, 1997), Decker & Rember(2004), Currie *et al.*(2008), Card *et al.*(2008), Finkelstein & McKnight (2008). In these studies, micro-data based on social natural experiments by RAND are used to estimate the impacts of Medicare and Medicaid performed in the U.S. For empirical studies on developing countries, please see Jowett et al. (2004) and Sepehri *et al.* (2006) for Vietnam, Panopoulu & Velez (2001), Trujilo *et al.* (2005) for Columbia, and Gakidou *et al.* (2006) for Mexico.

[2] Li & Zhao (2006), You & Kobayashi (2011), Li & Zhang (2013) utilized Anderson's behavior model to take empirical studies on health care service utilization, but they didn't take analysis on the health insurance system.

$$y_{it}^{*} = \begin{cases} 1 & \text{if } y_{it}^{*} > 0 \\ 0 & \text{if } y_{it}^{*} \le 0 \end{cases} \tag{2}$$

$$P(y_{it} = 1) = p_{it} = P(u_i + v_{it} = 1 - a_t - \beta_1 NCMS_{it} - \beta_2 X_{it}) \tag{3}$$

In eqs. (1) ~ (3), i denotes individuals; t denotes survey year (2000, 2004, 2006); $P(y_{it} = 1)$ indicates the dependent variable (e.g., equal to 1 if the individual has gone to the hospital (inpatient or outpatient) when ill and equal to 0 if not; equal to 1 if the individual has received a health examination in the last year, equal to 0 if not), y_i^{*} is a continuous but unobservable latent variable, we only observe the actual variable as expressed in eq. (3); α is a constant, v_{it} is the usually error term, μ is the error result from individual heterogeneity , which appears randomly with time periods. Using random effect probit regression model, bias result from μ error can be addressed. X are factors affecting the health care utilization behavior introduced in the Anderson model; $NCMS$ expresses the enrollment of NCMS system (equal to 1 if the individual has participated to NCMS system and equal to 0 if not); β_1、β_2 are estimated parameters. If β_1 is positively statistically significant, it indicates that compared with the group who hasn't participated to NCMS, the probability to go to hospital (outpatient or inpatient) is higher for the enrollment group.

Second, it is thought the situations before and after NCMS implementation perhaps different, and there maybe exists unobserved attitude difference between the enrollment group and no-enrollment group. To address these problems, DID methods is utilized, it is expressed in eq. (4)

$$y_{it}^{*} = a_t + \gamma_1 Treatment_{it} + \gamma_2 Year_t + \gamma_3 DID_{it} + \gamma_4 X_{it} + \varepsilon_{it} \tag{4}$$

In eq.(4), $Treatment$ express treatment group dummy. Using CHNS panel data, treatment group and control group are conducted as follows. Control group is the group who hasn't participated to NCMS in both 2000 when NCMS hasn't be implemented and in 2004 (or 2006) when NCMS has be implemented. Treatment group is the group who hasn't participated to NCMS in 2000, but has participated to NCMS in 2004 (or 2006). $Year$ is year dummy when NCMS has be implemented (here, 2004dummy or 2006dummy). X are factors affecting the health care service utilization. γ_1、γ_2、γ_3、γ_4 are estimated coefficients. When γ_3 are positively statistically significant, it indicates that compared with the group who hasn't participated to the NCMS, the probability to go to hospital (outpatient or inpatient) is higher in the enrollment group. Estimates results based on eq.(2) is the most inclement assessment methods to evaluate the impact of NCMS.

Data

This study employs three waves panel data of CHNS. CHNS is a nationwide longitudinal survey conducted by the Carolina Population Center at the University of North Carolina and the National Institute for Nutrition and Health (NINH, former National Institute of Nutrition and Food Safety) at the Chinese Center for Disease Control and Prevention (CCDC). The survey was conducted by an international team of researchers whose backgrounds include nutrition, public health, economics, sociology, Chinese studies, and demography. The survey took place over a 7-day period using a multistage, random cluster process to draw a sample of about 7,200 households with over 30,000 individuals in 15 provinces and municipal cities that vary substantially in geography, economic development, public resources, and health indicators. I utilized 9 provinces samples[3] which are all covered in 2000~2006. Samples are composed of 16150 in 2000, 9856 in

[3] 9 provinces are Jiangsu, Liaoning, Heilongjiang, Shandong, Henan, Hubei, Hunan, Guangxi, Guizhou.

2004, 9788 in 2006.

The independent variables of health care service utilization are binary variables (e.g., equal to 1 if the individual has gone to the hospital (inpatient or outpatient) when ill and equal to 0 if not; equal to 1 if the individual has received a health examination in the last year, equal to 0 if not.

Anderson & Newman (1973), Anderson (1995) pointed out that four kinds of factors affect the health care seeking behavior-they are predisposing factors[4], enabling factors, health care need factors, and life-style factors. Independent variable settings based on Anderson model are as follows.

First, age, education dummy, gender dummy are used as index of "predisposing factors". Based on Grossman's health capital model (Grossman, 1972), it is thought the probability of health care service utilization (or seeking the health care service) is higher in both the elderly group and higher education group. Using the gender dummy, the gender gaps in health care demand can be controlled.

Second, characterized by Andersen as a personal enabling factor, health insurance, income, health supply status are used as index of "enabling factors" in previous studies. NCMS is a binary dummy. The participants' income is reported as the household income per capita, which divides the total household income[5] by the household size. Province dummies are utilized to control the regional disparity of health care supply status.

Third, self-reported health status, hypertension dummy, diabetes dummy are utilized as index of health care need factors. It is thought that the probability will be higher in the groups with hypertension or diabetes diseases, and in the group who reported his (hers) health status is poor.

Fourth, smoking status (equal to 1 if the individual is smoking in survey year or has smoked in the past and equal to 0 if not), drinking frequency dummy, doing health exercise (equal 1 if the individual is doing health exercise in survey year and equal to 0 if not), living environment variables[6] are setting as index of "life-style factors".

Econometric Analysis Results

What Determines Health Care Service Utilization?

A random-effect probit regression model was used to estimate the determinants of health care service utilization as shown in Table 2. The main conclusions are as follows:

First, the coefficients of NCMS in Estimation (1) Entirety (outpatient + inpatient), Estimation (2) Outpatient, and Estimation (4) Health Examination are positively significant, but the coefficient is insignificant in Estimation (3) Inpatient. These results indicate that after addressing the heterogeneity problem and holding the other factors constant, the probabilities of visiting a hospital for the outpatient and receiving a health examination are higher in the NCMS enrollment group compared with the non-enrollment group. However, participation in NCMS has no positive effect on inpatient hospital visits.

Second, holding the other factors constant, compared to 2000, the probabilities of visiting a hospital for outpatient services and receiving a health examination are higher in the NCMS enrollment group in both 2004 and 2006. These results show that compared with the period when NCMS was not in place, the probabilities of utilizing health care services during the NCMS implementation period (2004 or 2006) are higher in both the enrollment and non-enrollment groups.

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[4] Predisposing factors are socio-demographic factors such as education, age, gender, marital status.

[5] Here, Income composes of agriculture revenue, farming revenue, fruit revenue, no- agriculture revenue, and transfer income.

[6] Living environment variables composed water (drink water in home or out home), toilet (in home or out home), waste status(whether or not there are waste nearby the house).

Third, predisposing factors affect the probability of health care service utilization. For example, the probability of outpatient service is higher in the higher education and older groups, and the probability of receiving a health examination is higher in the age group 30–39. However, the coefficients of the attribute factors are all insignificant in probability estimations of inpatient visits.

Fourth, considering need factors, individuals with poor health and chronic diseases (such as hypertension or diabetes) are more likely to visit a hospital for outpatient or inpatient care. However, compared with the group who report their health status as very good, the probability of receiving a health examination is lower in the group who report their health status as good. These results can be explained by understanding that the group that says their health is very good is more health conscious and aware of disease prevention.

Fifth, in the estimated results for enabling factors, except for the effects of the NCMS which are described above, the coefficients of geographic regions are significant in Estimations (1) and (2). These results show that the situations of health care supply, which is different by region, affects health care service utilizations.

Sixth, as pointed out in previous studies, lifestyle factors affect health care service utilization behavior; however, the relationship between the frequency of drinking alcohol and rate of using health care service is not linear. In addition, the possibility of receiving health care service is lower in the group living in a lower hygiene status, such as not having a toilet at home.

Did NCMS Affect Health Care Service Utilization?

Table 2 shows that compared with the period before the NCMS implementation (2000), the probability of seeking health care service is higher in both the age groups during the NCMS implementation periods of 2004 and 2006). Measurement bias resulting from the differentials of health care service utilizations by groups and periods may exist in these estimations. To address these problems (e.g., enrollment selection bias based on group attributes differences, time series bias) and conduct more exacting empirical studies to assess the impact of NCMS, analysis using the DID methods were conducted and these estimated results are summarized in Tables 3 and Table 4. The main findings are as follows.

First, the coefficients of DID items in Estimations (1), (2), and (3) are insignificant. They indicate that there is no difference of health care service utilization (both outpatient and inpatient) between the NCMS enrollment group and the non-enrollment group. In other words, holding the other factors constant when the heterogeneity problem and group selection bias problems are considered, NCMS did not affect patients access to hospital (either outpatient or inpatient) in the short-term after the NCMS system implementation (2004 or 2006).

Second, the coefficients of DID items in Estimation (4) are positively significant at the 1% statistical level. It shows that compared with the non-enrollment group, the NCMS enrollment group has a higher tendency to receive a health examination. Results indicate that NCMS enrollment might promote disease prevention behavior.

Did NCMS Affect Health Care Service Utilization by Age Groups?

Health care status is different by age groups. For example, morbidity and mobility are higher for the older group than for the younger group. Therefore, it can be surmised that health care service utilization is different by age groups. Using two sub-samples, the impact of NCMS on health care service utilization is estimated by two groups: age 16–59 (the working age group) and age 60 and over (the elderly group).

Table 1
Statistics Description

		Total samples	Enrollment group	Non-enrollment group
Waves	Years			
	2000y	46.0%	11.4%	52.9%
	2004y	26.9%	18.1%	28.6%
	2006y	27.1%	70.5%	18.5%
predisposing	Age category			
factors	age20~29	2.5%	2.2%	2.6%
	age30~39	11.7%	8.5%	12.5%
	age40~49	21.1%	19.2%	21.6%
	age50~59	22.8%	27.2%	21.6%
	age60~69	22.1%	23.2%	21.8%
	age70~79	12.1%	12.5%	12.0%
	age 70 and over	7.7%	7.2%	7.9%
	Education category			
	Not enrollment	17.4%	19.1%	17.0%
	Primary school	35.5%	35.3%	35.5%
	Junior high school	37.1%	35.6%	37.4%
	Senior high school	8.0%	8.3%	8.0%
	Vocational school	1.4%	1.2%	1.4%
	College and over	0.6%	0.5%	0.7%
	Male	41.8%	45.3%	41.1%
need	Self-reproted health Status			
factors	Very good	13.7%	12.8%	13.9%
	Good	47.4%	45.5%	47.9%
	Fair	31.9%	33.0%	31.7%
	Bad	7.0%	8.7%	6.5%
	Hypertension	5.4%	7.7%	4.9%
	Diabetes	0.6%	0.7%	0.5%
enabling	Household income(Yuan)	1,073	1,661	945
factors	Regions			
	Liaoning	8.7%	10.4%	8.3%
	Heilongjiang	11.2%	9.8%	11.4%
	Jiangsu	9.0%	25.9%	5.6%
	Shandong	9.0%	15.2%	7.7%
	Henan	13.3%	5.6%	14.9%
	Hubei	11.4%	11.4%	11.4%
	Hinan	8.8%	6.0%	9.3%
	Guangxi	14.7%	6.7%	16.2%
	Guzhou	14.1%	9.0%	15.0%
life-style	Smoking	27.0%	27.9%	26.7%
factors	Drinking			
	Not drinking	68.3%	66.1%	68.8%
	less one time monthly	2.4%	2.4%	2.4%
	1~2 times monthly	5.6%	6.6%	5.4%
	1~2 times weekly	8.2%	8.1%	8.2%
	3~4 times weekly	4.3%	4.3%	4.4%
	everyday	10.4%	11.8%	10.0%
	don't know	0.8%	0.7%	0.9%
	Health exsercise	5.1%	4.1%	5.4%
	Drink water inside the home	37.7%	46.1%	36.1%
	Toilet inside the home	16.6%	16.2%	16.6%
	No waste nearby the home	56.7%	66.0%	54.8%
	Samples	14556	2415	12141

Source：Calculated based on CHNS2000,2004,2006.

Table 2

The Determinants of Health Care Service Utilization

		(1) Outpatient+Inpatient		(2)Outpatient		(3) Inpatient		(4)Health examination	
		Coef.	z val.	Coef.	z val.	Coef.	z val.	Coef.	z val.
NCMS		0.099 **	2.19	0.092 **	2.01	0.108	1.03	0.405 ***	3.29
Years(2000y)									
2004y		0.488 ***	10.21	0.490 ***	10.08	0.156	1.27	0.340 **	2.01
2006y		0.413 ***	7.97	0.416 ***	7.90	0.104	0.79	0.468 ***	2.70
predisposing factors	Age category(age30~39)								
	age20~29	0.183 *	1.93	0.117	1.19	0.536 **	2.45	-0.171	-0.64
	age40~49	0.041	0.67	0.040	0.64	0.015	0.08	-0.475 ***	-2.61
	age50~59	0.108 *	1.77	0.107 *	1.75	0.032	0.18	-0.182	-1.16
	age60~69	0.196 ***	3.08	0.175 ***	2.72	0.231	1.28	-0.264	-1.50
	age70~79	0.299 ***	4.14	0.281 ***	3.84	0.248	1.26	-0.398 *	-1.79
	age 70 and over	0.411 ***	5.01	0.416 ***	5.03	0.039	0.17	0.012	0.06
	Education category(no education)								
	Primary school	0.074	1.56	0.075	1.56	-0.002	-0.02	-0.026	-0.18
	Junior high school	0.093 *	1.70	0.089 *	1.61	0.057	0.42	-0.271	-1.57
	Senior high school and over	0.097	1.35	0.119 *	1.63	-0.252	-1.16	0.005	0.02
	Male	-0.134 ***	-3.46	-0.134 ***	-3.39	-0.042	-0.43	0.048	0.41
need factors	Self-reproted health Status(very good)								
	Good	0.094	1.57	0.076	1.26	0.341	1.47	-0.298 **	-2.16
	Fair	0.569 ***	9.37	0.552 ***	9.03	0.549 **	2.36	-0.225	-1.53
	Bad	1.257 ***	17.75	1.158 ***	16.22	1.223 ***	5.13	-0.118	-0.60
	Hypertension	0.359 ***	6.84	0.323 ***	6.06	0.336 ***	3.14	0.217	1.34
	Diabetes	0.326 **	2.24	0.246 *	1.67	0.353	1.47	-0.001	0.00
enabling factors	Household income(Yuan)	1.100E-05 *	1.63	1.030E-05	1.53	3.620E-06	0.21	1.560E-05	1.08
	Regions(Jiangsu)								
	Liaoning	-0.236 **	-2.42	-0.249 ***	-2.58	-0.004	-0.02	-0.222	-0.70
	Heilongjiang	-0.270 ***	-2.83	-0.286 ***	-3.03	0.084	0.43	-0.047	-0.17
	Shandong	-0.197 *	-1.94	-0.219 ***	-2.19	0.103	0.54	0.137	0.48
	Henan	0.155 *	1.69	0.137	1.52	0.175	0.98	-0.249	-0.79
	Hubei	0.078	0.85	0.050	0.56	0.237	1.37	0.477 *	1.86
	Hinan	-0.032	-0.32	-0.046	-0.48	0.150	0.78	0.421	1.56
	Guangxi	0.029	0.31	-0.001	-0.01	0.177	0.95	0.332	1.23
	Guzhou	-0.099	-1.04	-0.116	-1.24	0.106	0.56	-0.888 *	-1.95
life-style factors	Smoking	-0.011	-0.27	0.006	0.13	-0.157	-1.38	-0.086	-0.68
	Drinking(No drinking)								
	less 2 times monthly	0.123 **	2.07	0.134 ***	2.24	-0.159	-0.82	0.045	0.26
	1~2 times weekly	0.097	1.59	0.093	1.52	0.041	0.25	0.207	1.28
	3~4 times weekly	0.182 **	2.35	0.167 ***	2.13	0.162	0.80	-0.442	-1.23
	everyday	-0.112 *	-1.85	-0.115 *	-1.88	-0.006	-0.03	-0.075	-0.42
	don't know	-0.052	-0.27	-0.071	-0.36	-0.005	-0.01	-4.871	0.00
	Health exsecise	0.036	0.47	0.054	0.70	-0.080	-0.36	0.395 **	2.19
	Drink water inside the home	0.002	0.06	0.005	0.13	-0.002	-0.02	0.037	0.30
	Toilet inside the home	-0.125 **	-2.46	-0.134 ***	-2.61	0.112	0.98	0.077	0.61
	No waste nearby the home	-0.015	-0.43	-0.024	-0.68	0.103	1.17	-0.015	-0.13
constant		-2.241 ***	-19.86	-2.222 ***	-19.72	-3.515 ***	-10.90	-3.039 ***	-9.25
Number of obs .		14886		14886		14886		14886	
Number of groups		531		531		531		531	
Log likelihood		-4268.851		-4133.230		-518.035		-473.751	
Wald chi2(37)		1146.770		1016.050		156.790		79.550	
Likelihood-ratio test of rho=0									
chibar2(01)		72.550		61.280		22.250		50.050	
Prob >= chibar2		0.000		0.000		0.000		0.000	

Source：Calculated based on CHNS2000,2004,2006.

Notes：*,**,*** express statistical significant levels are 10%,5%,1%.

Table 3

The Impact of NCMS on Health Care Service Utilization (Total samples)-Estimations (1) and (2)

		Estimation(1): Outpatient+Inpatient				Estimation(2): Outpatient			
		DID(2000vs.2004)		DID(2000vs.2006)		DID(2000vs.2004)		DID(2000vs.2006)	
		Coef.	z val.	Coef.	z val.	Coef.	z val.	Coef.	z val.
Treatment		0.042 **	2.42	0.003	0.32	0.038 **	2.25	0.006	0.56
Year		0.058 ***	8.35	0.053 ***	6.15	0.055 ***	8.10	0.051 ***	6.15
DID		-0.007	-0.41	0.019	1.45	-0.004	-0.23	0.016	1.26
predisposing factors	Age category(age30~39)								
	age20~29	0.011	0.69	0.018	1.08	-0.002	-0.15	0.008	0.53
	age40~49	0.004	0.42	0.001	0.06	0.004	0.36	-0.002	-0.14
	age50~59	0.003	0.31	0.002	0.20	0.002	0.19	-4.302E-04	-0.04
	age60~69	0.032 ***	2.66	0.016	1.27	0.027 **	2.30	0.010	0.83
	age70~79	0.041 ***	2.74	0.037 **	2.41	0.034 **	2.38	0.031 **	2.16
	age 70 and over	0.048 ***	2.67	0.068 ***	3.57	0.053 ***	3.00	0.063 ***	3.46
	Education category(no education)								
	Primary school	0.013	1.39	0.002	0.26	0.016 *	1.83	0.000	0.00
	Junior high school	0.020 **	1.98	0.003	0.32	0.023 **	2.27	0.001	0.08
	Senior high school and over	0.010	0.71	0.002	0.13	0.016	1.17	0.002	0.12
	Male	-0.016 **	-2.38	-0.019 ***	-2.92	-0.015 **	-2.33	-0.019 ***	-2.95
need factors	Self-reproted health Status(very good)								
	Good	0.010	0.93	0.004	0.37	0.006 ***	0.60	0.001	0.10
	Fair	0.073 ***	6.12	0.062 ***	4.93	0.067 ***	5.84	0.056 ***	4.68
	Bad	0.253 ***	11.26	0.225 ***	10.09	0.224 ***	10.47	0.183 ***	8.82
	Hypertension	0.030 ***	2.56	0.058 ***	4.84	0.026 **	2.29	0.044 ***	3.88
	Diabetes	0.016	0.54	0.054 *	1.65	0.003	0.11	0.049	1.57
enabling factors	Household income(Yuan)	3.160E-06 **	2.20	3.240E-07	0.23	3.070E-06 **	2.23	3.160E-07	0.23
	Regions(Jiangsu)								
	Liaoning	-0.022	-1.53	-0.035 ***	-2.80	-0.017	-1.24	-0.033 ***	-2.78
	Heilongjiang	-0.037 ***	-2.95	-0.027 **	-2.16	-0.035 ***	-2.87	-0.026 **	-2.19
	Shandong	-0.017	-1.30	-0.029 **	-2.29	-0.015	-1.12	-0.027 **	-2.24
	Henan	0.034 **	2.13	0.028 *	1.95	0.031 **	2.01	0.027 **	1.96
	Hubei	0.020	1.32	0.001	0.07	0.020	1.38	0.001	0.09
	Hinan	-0.008	-0.56	0.007	0.49	-0.010	-0.78	0.006	0.45
	Guangxi	0.006	0.41	0.040 ***	2.57	0.005	0.32	0.038 **	2.49
	Guzhou	-0.022	-1.54	-0.006	-0.43	-0.019	-1.35	-0.010	-0.68
life-style factors	Smoking	0.005	0.70	-0.010	-1.34	0.006	0.86	-0.009	-1.27
	Drinking(No drinking)								
	less 2 times monthly	-0.005	-0.46	0.036 ***	2.91	-0.003	-0.30	0.038 ***	3.12
	1~2 times weekly	0.010	0.88	0.018	1.46	0.008	0.76	0.017	1.48
	3~4 times weekly	0.004	0.31	0.029 *	1.76	0.008	0.57	0.028 *	1.73
	everyday	-0.022 **	-2.23	-0.005	-0.45	-0.021 **	-2.21	-0.002	-0.21
	don't know	-0.029	-0.87	0.007	0.20	-0.024	-0.74	0.002	0.05
	Health exsecise	-0.004	-0.31	0.013	0.99	-0.003	-0.21	0.012	0.92
	Drink water inside the home	0.009	1.35	0.008	1.21	0.007	1.02	0.008	1.18
	Toilet inside the home	-0.008	-0.93	-0.026 ***	-3.26	-0.008	-0.92	-0.027 ***	-3.55
	No waste nearby the home	0.002	0.34	0.009	1.38	0.001	0.21	0.006	1.01
Number of obs .		7813		7753		7813		7753	
Log likelihood		-2069.397		-2090.289		-1990.674		-2000.472	
LR chi2(37)		1146.770		630.870		500.350		555.760	
Pseudo R2		0.117		0.131		0.112		0.122	
Prob >= chibar2		0.000		0.000		0.000		0.000	

Source : Calculated based on CHNS2000,2004,2006.

Notes : 1.*,**,*** express significant levels are 10%,5%,1%.

2. Estimated results(dF/dx) are shown in Table3.

3. Calculated by DID methods.

Table 4

The Impact of NCMS on Health Care Service Utilization (Total samples)-Estimations (3) and (4)

		Estimation(3) : Inpatient				Estimation(4) : Health examination			
		DID(2000vs.2004)		DID(2000vs.2006)		DID(2000vs.2004)		DID(2000vs.2006)	
		Coef.	z val.	Coef.	z val.	Coef.	z val.	Coef.	z val.
Treatment		0.002	0.71	-0.002	-0.71	-0.001	-0.40	-0.004	-1.36
Year		0.002 *	1.75	0.001	0.68	0.001	0.89	0.002	1.23
DID		-0.002	-0.84	0.002	0.68	0.007	1.25	0.017 ***	2.68
predisposing factors	Age category(age30~39)								
	age20~29	0.016 **	2.53	0.014 **	2.07	-0.001	-0.83	-0.001	-0.68
	age40~49	0.001	0.22	0.003	0.88	-0.003	-2.14	-0.002	-1.25
	age50~59	0.001	0.61	0.003	0.99	-0.001	-0.46	-0.002	-1.57
	age60~69	0.005	1.50	0.007	1.60	-0.002	-1.73	-0.001	-1.03
	age70~79	0.005	1.36	0.006	1.25	-0.001	-0.93	-0.002	-1.33
	age 70 and over	-0.002	-0.81	0.004	0.79	3.020E-04	0.13	-2.150E-06	0.00
	Education category(no education)								
	Primary school	-0.002	-1.30	0.002	0.80	0.001	0.61	-0.001	-0.54
	Junior high school	-0.001	-0.54	0.002	0.85	0.001	0.58	-0.003 *	-1.93
	Senior high school and over	-0.002	-1.31	1.714E-04	0.06	0.004	1.13	-0.001	-0.47
	Male	-0.001	-0.60	-1.860E-04	-0.14	0.001	1.21	4.454E-04	0.40
need factors	Self-reproted health Status(very good)								
	Good	0.004	1.42	0.004	1.19	-0.001	-0.64	-0.004 ***	-2.85
	Fair	0.008 **	1.78	0.008 *	1.62	1.373E-04	0.09	-0.003 **	-2.17
	Bad	0.041 ***	3.12	0.058 ***	3.69	0.001	0.43	-0.002	-1.14
	Hypertension	0.002	1.25	0.008 ***	3.03	-0.001	-0.45	0.001	0.63
	Diabetes	0.007	1.24	3.950E-04	0.09	0.002	0.21	0.001	0.56
enabling factors	Household income(Yuan)	4.230E-08	0.17	2.780E-08	0.11	5.220E-08	0.22	1.990E-09	0.01
	Regions(Jiangsu)								
	Liaoning	-0.003	-1.47	-0.001	-0.25	-0.001	-0.82	-1.141E-04	-0.04
	Heilongjiang	-0.001	-0.62	-1.703E-04	-0.06		-0.44	4.505E-04	0.17
	Shandong	-0.002	-0.81	-0.001	-0.32	-3.628E-04	-0.19	4.500E-05	0.02
	Henan	0.001	0.44	2.980E-04	0.11	-0.002	-1.30	1.000E-04	0.65
	Hubei	-4.606E-04	-0.22	-1.898E-04	-0.07	-0.001	-0.33	0.006 *	1.66
	Hinan	0.001	0.43	3.630E-04	0.13	4.365E-04	0.24	0.015 ***	2.64
	Guangxi	4.188E-04	0.17	0.001	0.42	-0.001	-0.78	0.006	1.58
	Guzhou	-0.002	-0.91	0.003	0.81	-0.001	-0.87	-0.002	-0.78
life-style factors	Smoking	-0.001	-0.41	-0.001	-0.55	3.560E-05	0.03	-0.002 *	-1.61
	Drinking(No drinking)								
	less 2 times monthly	-0.001	-0.69	-0.001	-0.40	-0.002	-0.70	0.001	0.29
	1~2 times weekly	4.609E-04	0.24	2.458E-04	0.11	-1.419E-04	-0.08	0.005 *	2.20
	3~4 times weekly	1.340E-04	0.12	0.002	0.47	1.230E-04	0.08	-0.001	-0.24
	everyday	-0.001	-0.31	-0.001	-0.69	0.001	0.54	-0.002	-1.18
	don't know	-3.500E-05	-0.22	-4.010E-04	0.12	0.002	0.34	-1.980E-04	-0.89
	Health exsecise	-0.001	-0.27	0.001	0.27	0.003	1.11	0.003	1.35
	Drink water inside the home	0.002	1.40	2.138E-04	0.16	0.001	1.21	-0.001	-0.86
	Toilet inside the home	-1.792E-04	-0.13	0.001	0.78	0.001	0.89	1.200E-04	0.10
	No waste nearby the home	0.001	0.53	0.002	1.19	1.407E-04	0.13	-0.002 *	-1.81
Number of obs .		7813		7753		5534		6362	
Log likelihood		-232.092		-280.203		-137.620		-249.950	
LR chi2(37)		74.720		93.540		41.770		103.590	
Pseudo R2		0.139		0.143		0.132		0.172	
Prob >= chibar2		0.000		0.000		0.094		0.000	

Source : Calculated based on CHNS2000,2004,2006.

Notes : 1.*,**,*** express significant levels are 10%,5%,1%.

2. Estimated results(dF/dx) are shown in Table4.

3. Calculated by DID methods.

Table 5 shows the results by age groups, and the main findings are as follows. First, the DID item in Estimations (1) and (2) are insignificant in both the 16–59 age group and the 60 and over age group. They

indicate that there is no difference in health care service utilization (both outpatient and inpatient) between the NCMS enrollment group and the non-enrollment group. Therefore, it can be said that NCMS did not affect the health care utilization in both the groups.

Second, comparing the 2000 and 2006 samples, the coefficients of the DID items in Estimation (3) are positively significant at a 1% statistical level in the 16–59 age group, but it is insignificant in the 60 and over age group. These results reveal that in the working age group (16–59), there exist a positive effect of NCMS on disease prevention behavior, but in the elderly group (60 and over), NCMS does not affect health care service utilization.

Table 5

The Impact of NCMS on Health Care Service Utilization by Age Groups

	age 60 and over		age16~59	
	marg. Coef.	z val.	marg. Coef.	z val.
	2000年 vs. 2004年			
【Estimation(1): Access to hospital(Outpatient+Inpatient)】				
Treatment	0.013	0.19	0.044 **	2.52
Year	0.102 ***	4.33	0.050 ***	6.96
DID	0.052	0.65	-0.011	-0.69
【Estimation(2): Outpatient】				
Treatment	0.016	0.25	0.037 **	2.20
Year	0.092 ***	4.07	0.048 ***	6.97
DID	0.039	0.53	-0.004	-0.24
【Estimation(3):Health examination】				
Treatment	-3.000E-05	-0.01	-0.001	-0.26
Year	-3.270E-08	-0.22	4.395E-04	0.37
DID	0.763	0.01	0.004	0.88
	2000年 vs. 2006年			
【Estimation(1): Access to hospital(Outpatient+Inpatient)】				
Treatment	0.003	0.10	0.003	0.34
Year	0.094 ***	4.81	0.036 ***	4.15
DID	0.017	0.46	0.021 *	1.62
【Estimation(2): Outpatient】				
Treatment	0.002	0.06	0.006	0.61
Year	0.086 ***	4.59	0.036 ***	4.25
DID	0.017	0.50	0.017	1.34
【Estimation(3):Health examination】				
Treatment	-0.055	-0.01	-0.002	-1.03
Year	0.001 **	2.18	1.232E-04	0.09
DID	0.441	0.01	0.017 ***	2.68

Source：Calculated based on CHNS2000,2004,2006.

Notes：1.*,**,*** express significant level are 10%,5%,1%.

2.Age, education, gender, self-reported health status, hypertension, diabetes, household income, regions, smoking, drinking, drink water status,toilet status, waste status are estimated,but these results aren't shown in Table5.

3. Calculated by DID methods.

Conclusions

In China, NCMS was implemented in 2003 which is expected that this public health insurance policy would improve the inequality of health care service utilization in rural areas. Does NCMS affect health care service utilization? Using the 2000, 2004, and 2006 CHNS longitudinal survey data and econometric methods (random-effect probit regression model and DID methods), this study conducted an empirical analysis to estimate the impact of NCMS. The major conclusions are as follows.

First, predisposing factors, enabling factors, health care need factors, and lifestyle factors affect health care utilization. These results are consistent with Anderson (1995).

Second, results using DID methods indicate that NCMS did not affect health care service utilization (outpatient and inpatient) of individuals when ill, but it might increase the possibility of receiving a health examination. The main reason why NCMS did not affect health care service utilization in 2004 or 2006 is the structure of the system, which requires large contributions from participants. Concretely based on NCMS, patients (mostly inpatient) have to pay the total medical expenditures firstly and then apply to the local government for reimbursement. Patients can receive such reimbursement (less than 50%) only after the local government checks their applications. Inpatients usually must pay more than 50% of the total medical expenditures themselves. In addition, the entire outpatient fees are usually paid by the patients themselves. It is thought that the large proportions of out-of-pocket (more than 50%) in outpatient and inpatient expenditure under NCMS might cause poor effects (or the absence of positive effects) on health care service utilization. However, in the basic health insurance system for workers in urban China, employees only pay 30% of the health care expenditure by themselves when they are in hospital. These differences in public health insurance systems between the rural and urban areas deserve notice. To resolve health care inequality in rural China through the implementation of NCMS, the reimbursement proportions by the government should increase; in other words, the government should pay more for NCMS in rural areas and establish policies to enforce the integration of different public health insurance systems.

Third, NCMS did not affect health care service utilization (outpatient and inpatient) in both the age groups. However, NCMS positively affects disease prevention behavior (visiting the hospital to receive a health examination) in the working age group, but the effect did not appear in the elderly group.

Finally, some research limitations should be pointed out. Although CHNS panel data was used, the impacts of NCMS are estimated in this study. Factors such as time preference, disease status, and the distance from home to the hospital may affect an individual's health care service utilization. Future research should gather additional information for empirical analysis. In addition, the following questions emerge: how does the impact of NCMS change by the policy implementation periods? Is there a short-term or a long-term effect of NCMS? This study estimated the short-term effect (after one year and three years of the NCMS implementation). It is valuable to answer these questions using longer period panel data. All of these questions constitute our research agenda in the future.

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