

# The Effect of New Rural Cooperative Medical Scheme on the Socioeconomic Inequality in Inpatient Service Utilization Among the Elderly in China

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**Background and Aim:** Health equity is an important goal of health policy, and the equalization of access to health care plays a vital role in guaranteeing it. The aim of this study was to use the cross-sectional data to explore the effect of New Rural Cooperative Medical Scheme (NRCMS) on the socioeconomic inequality in inpatient service utilization among the elderly in China.

**Methods:** The data of this study were obtained from the 2018 wave of China Family Panel Studies (CFPS), involving 3645 older adults aged 60 and above. Furthermore, concentration index and concentration curve were employed to measure the socioeconomic inequality in inpatient service utilization. Moreover, this study used multiple linear regression model to explore the effect of NRCMS on inpatient service utilization. In addition, this study adopted the decomposition of concentration index to investigate the effect of NRCMS on the socioeconomic inequality of inpatient service utilization.

**Results:** The concentration index of inpatient expense for the older people was 0.0538, and its concentration curve lays below the diagonal. The regression result indicates that NRCMS was significantly associated with higher inpatient expense among the elderly (coefficient = 0.8749,  $p < 0.01$ ). The decomposition result reveals that the contribution rate of NRCMS to concentration index was -2.29%, which indicates that its contribution on reducing pro-rich inequality in inpatient service utilization was limited.

**Conclusion:** This study demonstrates that there was a pro-rich inequality in inpatient service utilization among the elderly. Furthermore, NRCMS was significantly associated with higher inpatient expense. Moreover, NRCMS only played a limited role in reducing pro-rich inequality in inpatient service utilization.

**Keywords:** socioeconomic inequality, inpatient service utilization, elderly, New Rural Cooperative Medical Scheme, China

## Introduction

Health equity is an important goal of health policy, and the equalization of access to health care plays a vital role in guaranteeing it. There exist huge socioeconomic gaps between urban and rural China.<sup>1</sup> Given that per capita income of urban households was three times of that of rural households in 2015,<sup>2</sup> the inequality status in health service utilization is more serious there. Furthermore, older adults in China suffer from serious physical and mental health problems.<sup>3-5</sup> Though China's economy has continued to grow during the recent decades, a large proportion of the rural population did not have access to health service when needed due to financial

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barriers.<sup>6,7</sup> To address this problem, New Rural Cooperative Medical Scheme (NRCMS) was established by the Chinese government in 2003, targeting rural residents with subsidies from central and local governments.<sup>8</sup> In addition, NRCMS is a voluntary scheme, and rural residents take part in it by taking the family as the unit.

The purpose of NRCMS is to prevent households from experiencing catastrophic health expenditure (CHE), improve the utilization of health service, and reduce the socioeconomic inequality in health service utilization.<sup>9</sup> The annual premium per capita has gradually increased from RMB 40 (US\$ 4.88) in 2005 to RMB 400 (US\$ 65.11) in 2014.<sup>10</sup> By the end of 2018, 130.38 million rural residents were covered by NRCMS. In terms of reimbursement policy, NRCMS provides financial protection by bearing a proportion of health expenditures. Moreover, the reimbursement coverage of NRCMS mainly involved serious diseases, and it has a higher reimbursement rate on inpatient service than outpatient service. However, the effect of NRCMS expansion has been offset by the rapid escalation of health expenditures.<sup>11</sup> Furthermore, a study also revealed that NRCMS has not reduced participants' out-of-pocket spending.<sup>12</sup>

Previous studies have explored the effect of health insurance on the socioeconomic inequality in health service utilization. Chen et al found that the effect of NRCMS on promoting equity in health services has not been significant.<sup>13</sup> In contrast, the study of Feng and Liu suggests that NRCMS has a positive contribution in increasing the pro-poor inequality in health-care utilization.<sup>14</sup> Furthermore, a study which is conducted by Zhou et al reveals that health insurance has effectively reduced the income-related inequality in inpatient service utilization for the residents in China.<sup>15</sup> In addition, Zhou et al discovered that Urban Employee Basic Medical Insurance (UEBMI) scheme increased the pro-rich inequity of outpatient utilisation and Urban Resident Basic Medical Insurance (URBMI) scheme increased the pro-poor inequity of outpatient utilisation.<sup>16</sup>

In summary, we observed that fewer empirical studies have explored the impact of NRCMS on the socioeconomic inequality in inpatient service utilization for the elderly. To fulfill this gap, this study aims to explore the effect of NRCMS on the socioeconomic inequality in inpatient service utilization among the elderly in China, using the 2018 wave of China Family Panel Studies data. The results of this study could shed light on future studies

concerning the effect of NRCMS on socioeconomic inequality in inpatient service utilization.

## Methods

### Data Source

The data of this study were obtained from the 2018 wave of China Family Panel Studies (CFPS). CFPS data are freely available at <http://www.issf.pku.edu.cn/cfps/>. CFPS is a nationally representative longitudinal survey of households in China. Furthermore, CFPS is conducted by Institute of Social Science Survey (ISSS) of Peking University, which provides high-quality micro-data for both public policy analysis and academic research. Moreover, CFPS sampled approximately 57,000 individuals from 15,000 households in 25 provinces of China by using a multistage probability-proportional-to-size (PPS) sampling technique. In addition, the first wave of CFPS was conducted in 2008, and the 2018 wave of CFPS is the latest wave of data available at the time of this study. The data in the CFPS are not de-identified. This data is ideal for this study because it collects rich information concerning inpatient service utilization, health insurance, social demographic characteristics, income, health status, and so on. After removing cases with missing information, 3645 older adults aged 60 and above were included in this study.

## Variables

### Dependent Variable

Given the fact that inpatient expense can comprehensively reflect inpatient service utilization, this study used it to measure inpatient service utilization. If inpatient expense is zero, we will add 1 to it and then take the logarithm. If inpatient expense is more than zero, we will take the logarithm directly.

### Independent Variable

Given that this study focused on the effect of NRCMS on socioeconomic inequality in inpatient service utilization among the elderly, the independent variable is NRCMS, which is a dummy variable, indicating whether or not the older adult is covered by NRCMS.

### Control Variables

Considering the fact that Anderson health service utilization model is a well-validated theoretical framework and has been widely used to investigate the influencing factors of health service utilization (including outpatient service

utilization, inpatient service utilization, etc.),<sup>17–19</sup> this study employed it to determine control variables. Taking into account both societal and individual determinants via systematic analysis,<sup>20</sup> Anderson health service utilization model indicates that predisposing factors, enabling factors, and need factors significantly influence the utilization of health service.<sup>21</sup> Predisposing factors are social demographic characteristics of the individual that exist prior to their health condition, which can increase their need for health service, such as age, race, gender, marital status, and educational level. In addition, enabling factors facilitate health service utilization, such as the access to health insurance and income. Furthermore, need factors are the most immediate cause of health service utilization and can reflect the actual need for health service,<sup>22</sup> such as health status.

In this study, the predisposing factors include age, gender, marital status, and educational level. Furthermore, the enabling factor includes household income per capita. Moreover, the need factors include self-assessed health and chronic disease.

In addition, this study conducted a Variance Inflation Factor (VIF) test to test whether there exists serious multicollinearity in this study. The test shows that the mean VIF value is 1.26, and the VIF values of independent variable and control variables are far lower than the critical value of 10, indicating that there is no serious multicollinearity across the regression model.

## Statistical Analyses

Since concentration index and concentration curve are useful tools used for assessing the degree of socioeconomic inequality in health service utilization, this study employed them to measure the socioeconomic inequality in inpatient service utilization. The concentration index is defined as twice the area between the concentration curve and the diagonal. The concentration index ranges from  $-1$  to  $+1$ .<sup>23–26</sup> The concentration curve plots the cumulative proportion of inpatient service utilization on the y-axis against the cumulative proportion of the sample on the x-axis, ranked by household income per capita from the poorest to the richest.<sup>27</sup> When the concentration index takes a positive value, the concentration curve lies below the diagonal, which indicates that inpatient service utilization is more concentrated among the higher-income older people, and vice versa.<sup>28–30</sup> When the concentration index takes the value of zero, the concentration curve coincides with the diagonal, which

indicates that there is no socioeconomic inequality in inpatient service utilization.<sup>31,32</sup> Furthermore, when the concentration curve farther lies above (or below) the diagonal, the absolute value of concentration index is larger, which indicates a greater degree of socioeconomic inequality in inpatient service utilization.<sup>33</sup> The formula used for calculating concentration index is as follows:

$$C = \frac{2}{\mu} COV(y, r) \quad (1)$$

where  $C$  indicates the concentration index,  $\mu$  denotes the mean of inpatient service utilization indicator,  $y$  represents the inpatient service utilization indicator, and  $r$  is the fractional rank of household income per capita.

Given the fact that inpatient expense is a continuous variable, this study used multiple linear regression model to explore the effect of NRCMS on inpatient service utilization. The multiple linear regression model is as follows:

$$\ln IE = \beta_0 + \beta_1 * NRCMS_i + \beta_2 * CV_i + \varepsilon_i \quad (2)$$

where  $i$  denotes the individual,  $IE$  indicates the inpatient expense,  $CV_i$  stands for the control variables,  $\varepsilon_i$  is the error term.  $\beta_0$  refers to the intercept term,  $\beta_1$  and  $\beta_2$  are the regression coefficients for NRCMS and control variables, respectively.

Considering the fact that decomposition of concentration index can present the contribution of each variable to the concentration index, this study adopted it to investigate the effect of NRCMS on the socioeconomic inequality of inpatient service utilization. The formula used for the decomposition of concentration index is as follows:

$$c = \sum_k (\beta_k \bar{x}_k / \mu) C_k + GC_\varepsilon / \mu \quad (3)$$

where  $C$  is the concentration index,  $\beta_k$  is the coefficient of  $x_k$ ,  $\bar{x}_k$  represents the mean of  $x_k$ ,  $\mu$  stands for the mean of inpatient service utilization,  $C_k$  is the concentration index for  $x_k$ , and  $GC$  denotes the generalized concentration index for  $\varepsilon_i$ .

In this study, STATA SE 15.1 was employed to conduct descriptive statistics, calculate concentration index, draw concentration curve, construct multiple linear regression model, and perform the decomposition of concentration index. All tests were two-sided and a  $p$ -value  $< 0.05$  indicates statistical significance.

## Ethical Considerations

The study received ethical approval from the Ethics Committee of Shanghai Jiao Tong University.

## Results

### Characteristics of the Study Population

Table 1 reports the characteristics of the study population. Most respondents aged less than 70, and 50.15% of them were men. In addition, more than 80% of the respondents were married, and more than half of them were illiterate. Furthermore, the mean of household income per capita was RMB 12,249.40 (US\$ 1,751.67), and over 92% of them were covered by NRCMS. Moreover, approximately 50% of the respondents were healthy, and more than 30% of them had chronic diseases.

### Socioeconomic Inequality in Inpatient Service Utilization

The concentration index of inpatient expense for the older people was 0.0538, indicating that higher-income older people utilized more inpatient services, favoring the rich. Figure 1 displays the concentration curve of inpatient expense. The concentration curve of inpatient expense

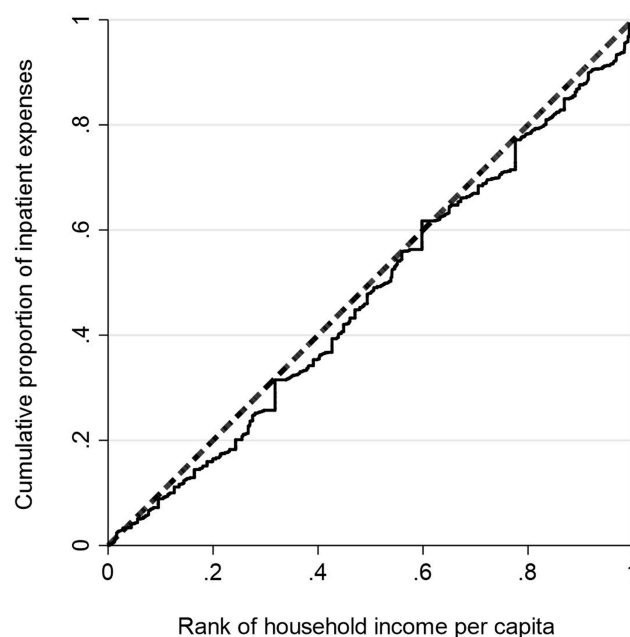


Figure 1 Concentration curve of inpatient expense.

Table 1 Characteristics of the Study Population

Variables	All (N = 3645)
Age	
60–69, n (%)	2440 (66.94)
70–79, n (%)	1037 (28.45)
≥ 80, n (%)	168 (4.61)
Gender	
Women, n (%)	1817 (49.85)
Men, n (%)	1828 (50.15)
Marital status	
Single, divorced or widowed, n (%)	718 (19.70)
Married, n (%)	2927 (80.30)
Educational level	
Illiterate, n (%)	2098 (57.56)
Primary school, n (%)	874 (23.98)
Secondary school and above, n (%)	673 (18.46)
Household income per capita (RMB)	
Mean (SD)	12,249.40 (20,357.19)
NRCMS	
Without NRCMS, n (%)	261 (7.16)
Covered by NRCMS, n (%)	3384 (92.84)
Self-assessed health	
Healthy, n (%)	1831 (50.23)
Unhealthy, n (%)	1814 (49.77)
Chronic diseases	
Have no chronic disease, n (%)	2533 (69.49)
Have chronic diseases, n (%)	1112 (30.51)

lay below the diagonal, which also indicates that higher-income older people utilized more inpatient services. This result is consistent with the value of concentration index.

### The Effect of NRCMS on Inpatient Service Utilization

Table 2 provides the regression results of the effect of NRCMS on inpatient service utilization. The Model 1 indicates that NRCMS was significantly associated with higher inpatient expense among the elderly (coefficient = 0.8749,  $p < 0.01$ ). Specifically speaking, this means that participation in NRCMS was significantly associated with a 139.86% increase in inpatient expense after adjusting for the control variables. In addition, it was also found that being older ( $p < 0.05$ ), unhealthy (coefficient = 1.2659,  $p < 0.01$ ), having chronic diseases (coefficient = 1.7048,  $p < 0.01$ ) were significantly related to more inpatient expenses. Furthermore, we also obtained evidence indicating that gender (coefficient = 0.1015,  $p > 0.05$ ), marital status (coefficient =  $-0.0795$ ,  $p > 0.05$ ), and educational level ( $p > 0.05$ ) were not significantly related to inpatient expense. Moreover, we discovered that household income per capita was not significantly associated with inpatient expense (coefficient =  $-0.0118$ ,  $p > 0.05$ ). The reason may lie in the fact that higher-income older adults have more health knowledge and better health outcome.

Based on Model 1, we added the interaction term between NRCMS and household income per capita to explore the moderating effect. The regression results

**Table 2** Regression Results of the Effect of NRCMS on Inpatient Service Utilization

Variables	Model 1	Model 2
NRCMS		
Without NRCMS	Ref.	Ref.
Covered by NRCMS	0.8749** (0.2239)	2.5277 (−1.7181)
Age		
60–69	Ref.	Ref.
70–79	0.4618** (0.1329)	0.4580** (−0.1329)
≥ 80	0.6421* (0.2878)	0.6289* (−0.2882)
Gender		
Women	Ref.	Ref.
Men	0.1015 (0.1250)	0.0997 (−0.1250)
Marital status		
Single, divorced or widowed	Ref.	Ref.
Married	−0.0795 (0.1528)	−0.0818 (−0.1528)
Educational level		
Illiterate	Ref.	Ref.
Primary school	0.2316 (0.1656)	0.2334 (−0.1656)
Secondary school and above	0.3196 (0.1800)	0.3186 (−0.1800)
Household income per capita	−0.0118 (0.0590)	0.1556 (−0.1824)
Self-assessed health		
Healthy	Ref.	Ref.
Unhealthy	1.2659** (0.1192)	1.2669** (−0.1192)
Chronic diseases		
Have no chronic disease	Ref.	Ref.
Have chronic diseases	1.7048** (0.1285)	1.7016** (−0.1286)
NRCMS * Household income per capita		−0.1865 (−0.1923)
Constant	−0.2724 (0.6304)	−1.7505 (−1.6487)

**Notes:** Ref. indicates the reference group. Standard errors are given in parentheses. \*\* $p < 0.01$ , \* $p < 0.05$ .

were displayed in Model 2, which reveals that the interaction term was not statistically significant (coefficient =  $-0.1865$ ,  $p > 0.05$ ), indicating that household income per capita did not moderate the association between NRCMS and inpatient expense.

## The Effect of NRCMS on Socioeconomic Inequality in Inpatient Service Utilization

Table 3 shows the decomposition results of the effect on NRCMS on socioeconomic inequality in inpatient service utilization. The concentration index value of NRCMS was positive, which indicates that higher-income older people

are more likely to be covered by it. In contrast, the concentration index values of being illiterate, unhealthy, and having chronic diseases were negative, which reveals that lower-income older adults were more likely to be illiterate, unhealthy, and have chronic diseases.

The decomposition result reveals that the contribution rate of NRCMS to concentration index was  $-2.29\%$ , which indicates that its contribution on reducing pro-rich inequality in inpatient service utilization was limited. Furthermore, the decomposition result also indicates that being unhealthy ( $40.81\%$ ) made the biggest contribution to the pro-rich inequality in inpatient service utilization. Moreover, we also observed that ageing 70–79 ( $17.07\%$ ) made a major contribution to the socioeconomic inequality in inpatient service utilization. Except the above, other factors, such as having chronic diseases ( $16.66\%$ ), being illiterate ( $8.97\%$ ), household income per capita ( $7.99\%$ ), and aging 80 and above ( $4.50\%$ ) were also observed to make contributions to the pro-rich inequality in inpatient service utilization.

## Discussion

Using the national representative data from the CFPS that was conducted in 2018, this study explored the effect of NRCMS on socioeconomic inequality in inpatient service utilization among the elderly in China. We observed that there is a pro-rich socioeconomic inequality in inpatient service utilization, which implies that higher-income older adults utilized more inpatient services. The reason may lie in the fact that higher-income older people have higher requirement for health outcome and more fund to buy more higher-quality inpatient services regardless of the health insurance system.<sup>34</sup> This finding is consistent with the finding of Zhou et al<sup>15</sup> who used the data obtained from Chinese National Health Services Surveys (NHSS) and found that there remains a strong pro-rich inequity of inpatient utilization in rural China. However, this finding is not consistent with the finding of Wang et al<sup>35</sup> who employed the 2015 wave of China Health and Retirement Longitudinal Study (CHARLS) data and discovered that there is a pro-poor inequity in inpatient service utilization.

We also obtained evidence indicating that NRCMS was positively associated with inpatient expense among the Chinese older adults. This finding is similar to previous studies,<sup>36–40</sup> and they all found that health insurance increased the inpatient service utilization. However, this finding is different from the finding of Zhang et al<sup>41</sup> who



**Table 3** Decomposition Results of the Effect of NRCMS on Socioeconomic Inequality in Inpatient Service Utilization

Variables	Elasticity	$C_k$	Absolute Contribution to C	Percentage Contribution to C
NRCMS				
Without NRCMS	Ref.			
Covered by NRCMS	0.4181	0.0023	0.0009	-2.29
Age				
60–69	Ref.			
70–79	0.0676	-0.1045	-0.0071	17.07
≥ 80	0.0152	-0.1223	-0.0019	4.50
Gender				
Women	Ref.			
Men	0.0262	-0.0009	-2.3E-05	0.06
Marital status				
Single, divorced or widowed	Ref.			
Married	-0.0329	0.0049	-0.0002	0.39
Educational level				
Illiterate	0.0686	-0.0542	-0.0037	8.97
Primary school	0.0394	0.0523	0.0021	-4.98
Secondary school and above	Ref.			
Household income per capita	-0.0542	0.0611	-0.0033	7.99
Self-assessed health				
Healthy	Ref.			
Unhealthy	0.3243	-0.0521	-0.0169	40.81
Chronic diseases				
Have no chronic disease	Ref.			
Have chronic diseases	0.2677	-0.0258	-0.0069	16.66

**Notes:** Elasticity refers to the degree the concentration index values of independent variables affect the concentration index of dependent variable;  $C_k$  denotes the concentration index of explanatory variable; C stands for the concentration index of independent variable; Ref. indicates the reference group.

observed that NRCMS cannot promote inpatient service utilization for the older people. As mentioned above, NRCMS has a higher reimbursement rate for inpatient service than outpatient service, which significantly stimulated the demand of inpatient service for the older people. This finding also indicates that NRCMS has achieved one of the policy objectives. Furthermore, the regression result also indicates that need factors, such as being unhealthy and having chronic diseases, can lead to more inpatient expenses.

It was also found that NRCMS only played a limited role in reducing pro-rich inequality in inpatient service utilization among the older people in China. The reason lies in the fact that the reimbursement level of NRCMS is relatively lower.<sup>42</sup> In addition, it is worth noting that need factors, including self-assessed health and chronic disease, played major roles in increasing pro-rich inequality in inpatient service utilization.

This study has several important policy implications. Firstly, it is necessary for the government to appropriately

adjust the reimbursement policy of NRCMS, such as increasing the subsidies for the lower-income older inpatients to enhance financial protection, while reducing extra benefits for the higher-income older inpatients. Secondly, the government also needs to improve social security policy and reduce the unequal distribution of income. Thirdly, considering the fact that more than 7% of the respondents in this study were not covered by health insurance, there is a great need for the government to further expand the coverage of NRCMS. Last but not least, lower-income older adults should pay more attention to taking part in physical exercise and periodic physical examination, developing a healthy lifestyle, and strengthening the prevention of chronic diseases.

Considering that inpatient service can objectively reflect the health-care utilization and the rural older adults face significant barriers to health care, it is important to analyze the effect of NRCMS on socioeconomic inequality in inpatient service utilization among them. To the best of

our knowledge, this is the first study to focus on the effect of NRCMS on socioeconomic inequality in inpatient service utilization among the Chinese older adults using the CFPS data. However, it must be acknowledged that this study has several limitations. Firstly, we cannot attain causal relationship due to the cross-sectional design. Secondly, self-assessed health used in this study suffered from the respondents' health consciousness level.<sup>15</sup> Some respondents may overrate or underrate their actual health status due to the different health consciousness levels, which may lead to overestimation or underestimation of their health status. Thirdly, given the fact that the data used in this study were self-reported, recall bias may exist in this study.

## Conclusions

In conclusion, this study demonstrates that there was a pro-rich inequality in inpatient service utilization among the elderly in China. Furthermore, NRCMS was significantly associated with higher inpatient expense. Moreover, NRCMS only played a limited role in reducing pro-rich inequality in inpatient service utilization. It is suggested that some policy strategies, such as increasing the subsidies for the lower-income older adults covered by NRCMS, reducing the unequal distribution of income, and expanding the coverage of NRCMS, are required to alleviate inequitable distribution of inpatient service utilization.

## Abbreviations

NRCMS, New Rural Cooperative Medical Scheme; CFPS, China Family Panel Studies; VIF, Variance Inflation Factor.

## Ethical Statement

This study did not require an ethics committee approval regarding compliance with animal/human ethics guidelines.

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## Disclosure

The authors report no conflicts of interest in this work.

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