

# Inequality in the health services utilization in rural and urban china

## A horizontal inequality analysis

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### Abstract

**Background:** Inequality in health and health care remains a rather challenging issue in China, existing both in rural and urban area, and between rural and urban. This study used nationally representative data to assess inequality in both rural and urban China separately and to identify socioeconomic factors that may contribute to this inequality.

**Methods:** This study used 2008 National Health Services Survey data. Demographic characteristics, income, health status, medical service utilization, and medical expenses were collected. Horizontal inequality analysis was performed using nonlinear regression method.

**Results:** Positive inequity in outpatient services and inpatient service was evident in both rural and urban area of China. Greater inequity of outpatient service use in urban than that in rural areas was evident (horizontal inequity index [HI]=0.085 vs 0.029). In contrast, rural areas had greater inequity of inpatient service use compared to urban areas (HI=0.21 vs 0.16). The decomposition analysis found that the household income made the greatest pro-rich contribution in both rural and urban China. However, chronic diseases and aging were also important contributors to the inequality in rural area.

**Conclusion:** The inequality in health service in both rural and urban China was mainly attributed to the household income. In addition, chronic disease and aging were associated with inequality in rural population. Those findings provide evidences for policymaker to develop a sustainable social welfare system in China.

**Abbreviations:** CIs = concentration indices, HI = horizontal inequity indexes, NCD = noncommunicable diseases, NCMS = new rural cooperative medical scheme, NHSS = national health services survey.

**Keywords:** concentration index, decomposition analysis, horizontal inequality analysis, inequality, NHSS

## 1. Introduction

Most governments in the world have acknowledged the importance of equality in health and health care, so does the Chinese government. Over the past 4 decades, China has

achieved significant improvement in health care system and health outcomes along with its dramatic economic growth. The life expectancy at birth has reached 74.8 years in 2010 compared to 67.9 years in 1981.<sup>[1]</sup> However, large disparities still exist in

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BG and XX contributed equally to this work.

This study was approved by the ethical committee of the Harbin Medical University, and conducted according to the Helsinki Declaration revised in 2013. All the survey participants gave their written information consent.

The datasets supporting the conclusions of this article are included within the article.

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both health and health service utilization within and between urban and rural residents due to the lower-income, fewer health resources, and less access to health insurance for the rural population. In 2000 to 2004, the mortality rate of children younger than 5 years was 6.4% in poor rural areas, which was more than 5 times higher than that in the most affluent large cities (1%).<sup>[2]</sup> Liu found that rural residents used more physicians than urban residents did (52.0% vs 43.0%,  $P < .001$ ), but used hospitals less (7.6% vs 11.1%,  $P < .001$ ).<sup>[3]</sup>

The urban-focused economic reform that started in 1978 has led to an unbalanced growth of economy between urban and rural areas. The development of infrastructure, including transportation, communication, health care, and education system in urban areas were far ahead of that in rural China. This widened the income gap between urban and rural population that has been existing since 1958. The household registration system under the planned economy divided Chinese citizens into urban and rural household.<sup>[4]</sup> In 2008, annual income per capita for rural residents was RMB ¥6,700.7 (US\$ 1 = ¥6.62), only 40% of that for urban residents (17,067.8 RMB Yuan).<sup>[5]</sup> Meanwhile, the average consumption expenditure in urban areas has reached 11,242.85 RMB Yuan while in rural areas it is 3660.68 RMB Yuan.<sup>[6]</sup> The lower-income makes rural residences experience more financial hardship when seeking for health service than their urban counterparts.

In addition, medical resources are unevenly distributed between urban and rural areas. There were 2.68 doctors per 1000 in urban population compared to 1.26 in rural population in 2008.<sup>[6]</sup> On the other hand, large hospitals only exist in cities. The shortage of health resources is another major cause that rural residents have less access to medical service.

The infrastructures of medical insurance are also different between rural and urban area in China. As a consequence of the economic reform, the rural cooperative medical system, which used to provide Chinese farmers with a needs-based insurance safety net and was predominantly subsidized and organized by peoples' communes, collapsed in most of the rural areas, leaving a large part of Chinese farmers without any insurance. In 1998, only 9.5% of farmers were insured.<sup>[7]</sup> In contrast, urban employee basic medical insurance scheme was completed in 1998 providing health insurance for formal employees, excluding unemployed urban residents and migrant workers.<sup>[8]</sup> In 2003, only 13% of rural people were insured, compared to 22% of urban population.<sup>[9]</sup> The growing urban-rural disparity brought increased public dissatisfaction.<sup>[10]</sup> To ameliorate this inequality, in 2002 Chinese government started to implement new rural cooperative medical scheme (NCMS) for rural residents, and urban resident basic medical insurance scheme for the unemployed, students, children, and the elderly as well in 2007. By 2012, 98.26% rural population was covered by the heavily subsidized and voluntary household-based NCMS. Compared to insurances for urban residents, NCMS has relatively limited financing (248.34 billion RMB vs 553.92 billion RMB in 2012<sup>[11]</sup>), leading to less service coverage, higher deductibles, lower ceilings, and higher coinsurance rates.<sup>[11]</sup>

Recent studies have well documented the difference and inequality of health services in China. For instance, Xie (2009) analyzed data from China Health and Nutrition Survey that covered 9 provinces. They found a larger pro-rich inequality in hospital health service utilization in rural areas than that in urban areas.<sup>[12]</sup> Fu (2014) studied urban-rural disparities in hospitalizations and found an urban-rural disparity in inpatient service

based on multiple survey data.<sup>[13]</sup> However, with limited aggregated data, a large part of them focused either on inequality within a given population<sup>[14–17]</sup> or on a specified service.<sup>[18–22]</sup> A whole picture of inequality of health service utilization in urban and rural area of China, as well as between urban-rural disparity is still in need of great details.

This study aimed to determine the degrees of inequality in health services access within and between rural and urban in China, and to identify the socioeconomic factors that may contribute to such inequalities. We employed concentration index and concentration index decomposition method to quantitatively assess the disparities in health service utilization in rural and urban China using nationally representative survey data. The results will provide evidence to Chinese government to promote the equality of health services utilization among the vulnerable population. To our knowledge, this is the first research focusing on national-evaluation of inequality in both outpatient service and hospital service utilization in rural and urban China.

## 2. Methods

### 2.1. Data

This study used the data from the National Health Services Survey (NHSS) in 2008. The NHSS was one of the most representative health surveys in China, organized by the Ministry of Health. It was conducted every 5 years (in 1993, 1998, 2003, and 2008). The surveys used a questionnaire collecting data including demographic characteristics, income, health status, medical service utilization, and medical expenses of those surveyed.

A 4-stage stratified random sampling strategy was employed to maximize the representation of the social and economic characteristics of the entire population of China. In the first stage, 94 counties/cities were proportionally and randomly selected, representing 5 social economic zones. In the second stage, 5 rural townships in each county and 5 urban districts in each city were chosen at random. In the third stage, 2 villages in each rural township and 2 neighborhoods in each urban district were randomly selected. In the fourth stage, 60 households were randomly selected in each village or neighborhood. A questionnaire survey was administered via face-to-face interviews with household members.

A total of 177,501 questionnaires were completed in the 2008 NHSS, involving 56,456 households across 31 provinces in China. Excluding missing, the sample sizes of the study were 128,753 in rural areas and 45,645 in urban areas.

### 2.2. Measurements

We measured health service utilization with 2 binary indicators: use of outpatient care over a 2 weeks period (yes or no) and use of inpatient care over a 12 months period (yes or no). Data for calculating those indicators were obtained in the survey by asking the respondents 2 questions: "Have you received any treatment during the last 2 weeks?" and "Have you been admitted to hospital during the past year?"

The use of health services was determined not only by the need such as age, sex, self-assessed health, chronic disease, and limitation of daily activities (need variables), but also by other factors such as socioeconomic status (non-need variables). In this study, we considered household income, education, marital status, occupation, health insurance policies, distance to health facilities, and location of residence as non-need variables.

**Table 1**  
**Comparison of major health care outcomes between urban and rural respondents in 2008 (%).**

Variables	Urban (n = 45, 645)	Rural (n = 128, 753)	TOTAL (n = 174, 398)
Two-wk morbidity rate	22.2	17.7	18.9
Morbidity rate	28.3	17.1	20.0
Two-wk visit rate	12.7	15.2	14.5
Hospitalization rate	7.1	6.8	6.8

**2.3. Statistical analysis**

We used concentration index and concentration index decomposition method as described by Xie et al (2014).<sup>[22,23]</sup> We selected 2-week visiting rate and annual hospitalization rate as the primary indices for the utilization of outpatient and inpatient services, respectively. The economic level was measured using living expenditures. The impact factors were classified as either “need variables” or “non-need variables.” A “need variable” was the factor associated with the definition of the health services utilization equality, such as the demographic characteristics,<sup>[24]</sup> health condition, morbidity, and so on. A “non-need variable” referred to the variables which were unrelated to the health services utilization but led to a biased regression coefficient for “need variable” if it is omitted from model. We also used concentration index, horizontal inequity indices, and decomposition analysis to examine the horizontal inequity of health services utilization, and to quantify the contribution of impact factors to the inequality.

In brief, a linear approximation estimation was used to conduct the nonlinear regression analysis on the actual use of services, including need variables and non-need variables as predictors. The need-expected use of services was obtained based on regression coefficients of the fitted model. Next an indirect standardization method was applied to calculate the need-standardized use of services, which was the difference between actual use and expected use, plus the mean of expected use in the study population.

The concentration index was then calculated. This is a common method for health service equality study. It quantifies the degree of equality on the overall utilization of health services that is associated with economic level, ranging between -1 and 1.

The concentration index is 0 when the health services utilization is fair. When the concentration index is positive, it reflects higher utilization of health services tend to rich people (ie, pro-rich). If it is negative, it reflects higher utilization of health services tend to poor people (ie, pro-poor).

Horizontal inequity indices measure the equality of health services utilization. Horizontal equity indicated people who had the same health service need should obtain the same health service utilization.<sup>[23]</sup> Its range and means were as the same as the concentration index.

A decomposition analysis was performed to assess the contribution of various determinants to the inequality.<sup>[25]</sup> The contribution was expressed as proportion of overall inequality.

All analyses were performed with the STATA software version 10.

**3. Results**

**3.1. The current need, demand, and utilization of health services in China**

NHSS in 2008 represented socioeconomic characteristic of rural, urban and all residents in China. Compared to rural residents, urban residents were more likely to be older, in poorer health, have a higher level of education, chronic diseases, and favorable health insurance coverage (data were not shown). Table 1 and Table 2 summarized the current need, demand, and utilization of health services in China. Results in Table 1 showed that 2-week morbidity rate, morbidity rate of chronic diseases of urban residents were about 5% and 10% higher than those in rural areas, respectively. While hospitalization rate of urban was comparable with that of rural, the 2-week visit rate of rural was higher than that of urban.

Since consumption level can directly reflect income level and economic status of residents, we adopted living expenditures as an indicator of economic level. Table 2 compared the proportions of health service utilization across 5 quintiles that divided the households equally based on self-reported living expenditures. In both urban and rural households, the proportion of not seeking service showed a tendency of decline from poorer quintile to richer ones. Of note, the rural households were more likely not to seek the needed medical attention compared to the urban households, regardless which quintile they were in. However, in

**Table 2**  
**Relationship between people’s health service utilization and consumption expenditure in 2008 (%).**

Variables	The consumption expenditure quintiles				
	Quintile I (Poorest)	Quintile II	Quintile III	Quintile IV	Quintile V (Richest)
	9130 25,753	9146 25,766	9116 25,793	9145 25,761	9108 25,680
Sample size: Urban 45,645 Rural 128,753					
Proportion of people did not seek medical attention that they would need over a 2-week period					
Urban	19.3	16.1	17.3	15.1	13.6
Rural	25.7	22.8	22.5	20.6	20.1
Total	23.8	20.8	20.9	18.8	18.1
Proportion of people refused inpatient service advised by doctors					
Urban	31.4	25.9	20.4	17.8	15.0
Rural	25.1	21.1	21.0	18.7	15.5
Total	26.9	22.3	20.8	18.4	15.4

**Table 3**  
**Concentration index and horizontal index in outpatient and inpatient utilization.**

	Outpatient utilization (Rural: N=19,572) (Urban: N=5801)			Inpatient services utilization (Rural: N=8696) (Urban: N=3218)		
	$C_M$	$C_N$	HI	$C_M$	$C_N$	HI
Rural areas	0.032	0.003	0.029	0.186	-0.019	0.209
Urban areas	0.124	0.039	0.085	0.188	0.027	0.164
Nation	0.033	0.016	0.017	0.177	-0.025	0.207

CI was expressed as  $C_M$  for actual use of services;  $C_N$  for need-expected services; HI (horizontal inequity) for need-standardized services. All the parameters were statistically significant ( $P < .05$ ).

terms of inpatient service which was advised by doctors, the refusing rates by richer households were quite similar in rural and urban area.

### 3.2. Distribution of health services

As shown in Table 3, all concentration indices (CIs) were positive except  $C_N$  of inpatient services in rural areas, indicating a pro-poor inequality in need-expected use of inpatient services, that is, patients with lower-income in rural areas had greater needs for inpatient ( $C_N = -0.019$ ) services. When the need for health services was standardized, the horizontal inequity indexes (HI) of outpatient services and inpatient services were positive in both rural and urban areas, and same for entire country as well. In terms of outpatient utilization, rural areas had a smaller HI comparing to urban areas (0.029 vs 0.085), indicating that inequality in outpatient service use was worse in urban area. However, the inequality of inpatient services utilization in rural areas was worse comparing to that in urban areas (HI 0.209 vs 0.164).

### 3.3. Factors contributing to income-related inequalities

Income-related inequalities as measured by CI in outpatient and inpatient services were decomposed to evaluate the contribution of individual determinants, including both need and non-need variables (Table 4). The marginal effect ( $\beta_k$ ) of each variable indicated the association between this variable and use of services. Those with a positive sign demonstrated a positive association with use of services, and vice versa. In addition, the larger the absolute value of a  $\beta_k$  was, the more substantial the association was. The associations between determinants and the outcome were in expected directions. The  $\beta_k$  showed that younger age, activity limitation, having chronic disease, poorer health status, higher income, and public insurance were associated with increased use of services (Table 4). However, those variables were not able to explain the full scale of inequality.

The column next to each  $\beta_k$  in Table 4 presented the proportion of total income-related inequalities contributed by that corresponding determinant. A positive value indicated a contribution in favor of rich, while a negative value indicated a contribution in favor of poor. In fact, the disparities in household income were the major contributor to the inequality in health services among both rural and urban populations. Household income made alarmingly high contributions in favor of the richest people, including 46.8% in urban areas and 95.2% in rural areas for outpatient services, and 78.6% in urban areas and 100.0% in rural areas for inpatient services for the highest quintile of

household income as well. Chronic diseases contributed the second to inequality in outpatient services, as indicated by 42.9% of pro-rich CI for outpatient services in rural areas and 19.7% of pro-rich CI for outpatient services and 8.9% of pro-rich CI for inpatient services in urban areas. For inpatient services in rural areas, older age was the second contributor to the income-related inequalities as indicated by 30.6% for women and 30.8% for men. In contrast, older age was not a considerable source of inequality in urban area.

## 4. Discussion

This is the first study that analyzed the inequality and inequity of outpatient and inpatient utilization in China with stratification by rural and urban areas. The existence of pro-rich inequalities of inpatient service in both rural and urban area was evident by the results from the horizontal inequity analysis.

Table 3 showed that the inequity of outpatient service use in urban areas (HI=0.085) was a bit greater than that in rural areas (HI=0.029). One possible explanation was that the medical insurance system in China was still in the process of development, especially for outpatient services. In China, the major portion of fees for outpatient service came from out of pocket, with 45.3% in the city and 67.0% in the countryside in 2008. Those spending accounted for 1.7% and 2.3% of annual expense per capita, respectively. However, since urban residents have more diverse insurance options that were unavailable in rural area, the inequity within urban residents was more severe in urban than that in rural areas. In addition, township hospitals and village clinics accounted for 82.6% of cases where the diseases were first diagnosed. The outpatient service in rural areas had relatively lower cost as well. Therefore, the results showed that the inequity of outpatient use in the city was a bit larger than that in the countryside. Further, this difference is a manifestation of the inequity in access to health care between rural and urban area.

In contrast, the result suggested that the inequity of inpatient service use in rural areas (HI=0.209) was worse than that in urban areas (HI=0.164). There were 2 possible reasons for this. First, hospitalization costs were very high. The average cost was 8958 Yuan and 3685 Yuan per hospitalization in city and country which accounted for 80.0% and 74.7% of per capita income, respectively. Such expensive hospitalization costs prevented low-income patients staying away from hospitals. Second, there were big gap in medical security between urban and rural areas, such as coverage, funding levels, resource allocation, and effects of policies operation. Health security of NCMS was much weaker than its counterparts in city.<sup>[26]</sup> In city, 44.2% and 89.7% of the surveyed population registered in MIUE and NCMS. The reimbursement ratio of MIUE and NCMS was

**Table 4**  
**Decomposition of income-related inequalities in use of outpatient and inpatient services by need and non-need variables broken-down by urban and rural in China.**

Determinants	Rural				Urban			
	Outpatient services (N = 19,572)		Inpatient services (N = 8696)		Outpatient services (N = 5801)		Inpatient services (N = 3218)	
	Marginal effects ( $\beta_k$ )	Contribution %	Marginal effects ( $\beta_k$ )	Contribution %	Marginal effects ( $\beta_k$ )	Contribution %	Marginal effects ( $\beta_k$ )	Contribution %
Gender and age								
Men								
0–14	0.081	–3.30%	0.029	–0.30%	0.068	–1.30%	0.028	–0.50%
15–24	–0.007	–0.20%	–0.031	–0.20%	–0.016	0.10%	–0.016	0.10%
25–34	–0.006	0.30%	–0.041	0.70%	–0.015	–0.20%	–0.031	–0.30%
35–44	0.013	2.90%	–0.045	–2.60%	–0.017	–0.10%	–0.034	–0.10%
45–54	0.017	2.80%	–0.043	–1.90%	–0.015	0.40%	–0.035	0.90%
55–64	0.023	–2.20%	–0.04	1.00%	–0.012	0.00%	–0.03	0.10%
65–	0.019	–5.70%	–0.039	30.80%	–0.005	–0.20%	–0.027	–1.10%
Women								
0–14	0.053	–5.00%	0.01	–0.20%	0.059	–1.00%	0.028	–0.40%
15–24 (Reference)								
25–34	0.011	0.20%	–0.024	–0.10%	–0.007	–0.30%	–0.01	–0.30%
35–44	0.035	11.70%	–0.044	–3.90%	–0.011	0.10%	–0.032	0.30%
45–54	0.027	5.40%	–0.044	–2.40%	–0.007	0.10%	–0.034	0.60%
55–64	0.021	–2.00%	–0.042	1.10%	–0.003	0.00%	–0.031	–0.30%
65–	0.015	–4.10%	–0.041	30.60%	–0.01	0.00%	–0.03	0.00%
Health status								
Limitation of daily activities								
Yes	0.152	–3.40%	0.041	–1.20%	0.022	0.00%	0.05	0.00%
No (reference)								
Self-perceived health								
Very poor	0.099	0.00%	0.095	0.00%	0.154	0.20%	0.086	0.10%
Poor	0.126	–1.70%	0.063	–0.20%	0.119	0.70%	0.076	0.40%
Fair	0.083	–20.70%	0.041	–2.70%	0.078	–1.30%	0.047	–0.70%
Good	0.034	–9.30%	0.016	–1.10%	0.032	–0.90%	0.013	–0.30%
Excellent (reference)								
Chronic disease								
Yes	0.152	42.90%	0.062	4.70%	0.128	19.70%	0.068	8.90%
No (reference)								
Socioeconomic status								
Education								
No schooling (reference)								
Primary	–0.027	0.90%	–0.01	0.10%	–0.01	6.00%	0.001	–0.30%
Secondary	–0.026	–19.70%	–0.01	–1.90%	–0.01	–1.50%	0	0.00%
Higher	–0.034	–6.10%	–0.006	–0.30%	–0.01	–6.40%	0.002	1.00%
Occupation								
Student	0.042	7.90%	–0.035	–1.70%	0.011	0.10%	–0.029	–0.10%
Unemployed (reference)								
Peasant	0.015	–10.90%	0.001	–0.30%	0.005	–0.60%	–0.008	0.80%
Worker	0.021	1.00%	0.004	0.00%	0.004	–0.10%	–0.007	0.10%
Self-employed	0.003	1.00%	–0.009	–0.80%	0.005	0.40%	–0.015	–1.20%
Manager/technician/clerk	0.005	1.80%	–0.008	–0.80%	0.003	2.30%	–0.012	–6.50%
Other	0.03	0.80%	–0.005	0.00%	0	0.00%	–0.004	0.10%
Marital status								
Single (reference)								
Married	0.017	8.80%	0.05	6.90%	0.016	2.10%	0.047	5.50%
Divorced/widow	0.015	–3.80%	0.063	–4.30%	0.026	–2.30%	0.083	–6.20%
Other	0.05	–0.10%	0.034	0.00%	0.051	0.00%	0.05	0.00%
Household income								
Quintile I (poorest) (reference)								
Quintile II	0.011	–31.50%	0.013	–10.00%	0.008	–6.90%	0.014	–10.60%
Quintile III	0.016	0.10%	0.021	0.00%	0.01	0.00%	0.025	0.00%
Quintile IV	0.014	41.10%	0.034	26.90%	0.018	16.10%	0.031	23.70%
Quintile V (Richest)	0.016	95.20%	0.064	100.00%	0.026	46.80%	0.051	78.60%
Healthcare accessibility								

(continued)



**Table 4**  
(continued).

Determinants	Rural				Urban			
	Outpatient services (N = 19,572)		Inpatient services (N = 8696)		Outpatient services (N = 5801)		Inpatient services (N = 3218)	
	Marginal effects ( $\beta_k$ )	Contribution %	Marginal effects ( $\beta_k$ )	Contribution %	Marginal effects ( $\beta_k$ )	Contribution %	Marginal effects ( $\beta_k$ )	Contribution %
Insurance								
MIUE	-0.009	-2.60%	0.012	0.80%	-0.001	-0.80%	0.01	6.20%
FMC	-0.013	-0.40%	0.03	0.30%	0.002	0.20%	0.016	1.40%
MIUR	-0.012	-0.80%	0.005	0.10%	0.007	-1.40%	0.007	-1.30%
NCMS	-0.002	0.90%	0.01	-1.00%	0.051	-8.40%	0.03	-4.20%
Other insurance	-0.014	-0.70%	0.028	0.40%	-0.004	-0.20%	0.016	0.60%
No insurance (reference)								
Shortest distance to health facilities								
5 km (reference)								
>5 km	-0.009	3.50%	0.001	-0.10%	0.015	-0.20%	0.032	-0.30%
Length of encounter								
30 min (reference)								
>30 min	-0.009	5.30%	0.006	-0.90%	-0.004	0.10%	-0.007	0.10%
Location of residence								
East	-0.002	-2.80%	-0.014	-6.00%	0.015	12.40%	-0.008	-5.70%
Middle	-0.009	-4.60%	-0.001	-0.20%	-0.01	5.40%	-0.001	0.50%
Western (reference)								

63.2% and 26.6%, respectively. For rural residents, economic burden of disease was mainly attributable to the expensive cost of hospitalization as well as the weaker protection of NCMS, especially for the poor. Therefore, inequity of inpatient services for rural residents was more severe than that for urban residents.

The decomposition analysis of inequality of inpatient and outpatient use revealed that household income made the greatest pro-rich contribution. Financial burden was still an important source of health care inequity. This seems to contradict the fact that about 90% of Chinese had health insurance by 2008.<sup>[27]</sup> However, in 2008 the income Gini coefficient in China was 0.48,<sup>[28]</sup> which is above the 0.40 warning level of inequality set by the United Nations. The collective wealth of the top 10% of affluent Chinese families was 65 times of those 10% from the lower end in 2008.<sup>[29]</sup> Additionally, the Chinese government could not develop a comprehensive social welfare system to accommodate the fast growing economy. The current operation of social medical insurance system failed to reduce the disparity between urban and rural residents, as well as gap between the rich and poor.<sup>[30]</sup> Therefore common individuals and families are financially vulnerable to serious diseases.

The second critical factor to inequality in health service use was attributable to chronic diseases. In 2003, the cost of chronic noncommunicable diseases (NCD) in China accounted for 7.31% of GDP and 71.5% of the financial burden for all disease.<sup>[31]</sup> This burden was expected to keep increase.<sup>[32]</sup> By 2008, about 270 million patients have been diagnosed NCD.<sup>[27]</sup> Many studies have showed that NCD is strongly associated with medical impoverishment<sup>[33]</sup> and deteriorated the inadequate health care service among people with lower economic status.<sup>[34–36]</sup> Usually, people with NCD were not eligible for affordable medical insurance,<sup>[37,38]</sup> and poor households were more likely to have NCD.<sup>[39]</sup> As a consequence, NCD patients have to pay expensive medical bills out of pocket so that they were stuck in poverty.<sup>[40,41]</sup> Therefore, the long-term need for

health care was an important source of health inequity for NCD patients.

For rural populations, older age (especially people over the age of 65) was the second most important contributor to the inequalities of inpatient service as indicated by 30.8% and 30.6% for the male and female elderly, respectively. There were 2 probable reasons for this. First, the rural elderly were more likely to have no ability to pay. In rural area 53.2% of the elderly's income mainly came from their children. In addition, 49.5% of the rural elderly lived in low-income household that prevented them from using expensive hospitalization services. Second, the rural elderly usually had to pay most of their own hospital costs due to the weak protection of NCMS. This result is consistent with a recent report that income was the strongest predictor of late-life health.<sup>[42]</sup>

This study was strengthened using national representative survey data. The finding of this study added details in terms of health disparity in current China. However, there were some limitations too. This was a cross-sectional analysis only using 2008 data. A longitudinal analysis with most recently updated data would be warranted to understand the evolution of health disparity in China.

## 5. Conclusions

In summary, we found pro-rich inequality existing in both rural and urban area of China. However, the contents of inequality differed between rural and urban area. The inequality in outpatient service was more severe compared to that in rural area. On the other hand, rural area had greater inequality in inpatient service. Household income made the greatest contribution to pro-rich inequality in both area. Chronic disease also played a critical role. In rural area, aging was the second most important risk factor to the inequality of inpatient service, while it was not a factor in urban area.

## Author contributions

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