

Urban–rural disparities in healthcare financing: An analysis under China’s unified residents’ health insurance scheme

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**Urban–rural disparities in healthcare financing: An analysis under China’s unified residents’
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Abstract

Background: Few empirical studies have explored disparities in healthcare financing between urban and rural areas after China's integration of health insurance schemes for residents. This study characterizes and compares disparities in healthcare financing distribution between urban and rural areas in China.

Methods: Data were collected from 3918 individuals in 1800 urban households and 2609 individuals in 1200 rural households in 2018. We conducted tests of dominance on concentration curves of healthcare payments between urban and rural areas to compare urban–rural disparities in healthcare financing.

Results: Disparities were found in healthcare financing equity of direct taxes, the Urban–Rural Residents' Basic Medical Insurance (URRBMI), and out-of-pocket payments between urban and rural areas.

Conclusions: Government subsidies on URRBMI need to be increasingly allocated to residents, especially in rural areas, providing sustainable pooled funding and continuation of URRBMI.

Keywords: Urban–rural disparities, Healthcare financing, Equity, Universal health coverage

Background

Introduction

Disparities in healthcare financing between urban and rural areas still exist to a substantial degree in China. Since a new round of healthcare reform was implemented in 2009, China has enhanced access to healthcare services and has improved health outcomes in urban and rural populations. However, as shown in Fig. 1, *per capita* health expenditure in urban areas was more

than double that in rural areas from 2009 to 2016 [1]. One study based on two rounds of a household survey in Gansu province in 2002 and 2007 showed that public health insurance and out-of-pocket (OOP) payments were more equitable in healthcare financing in urban areas than in rural areas [2]. Some researchers also found that patients with tuberculosis or chronic diseases in rural areas in China had lower reimbursements and were more likely to incur catastrophic health expenses than those in urban areas [3, 4].

<Insert Figure 1 near here>

There have been few empirical studies exploring disparities in the distribution of healthcare financing between urban and rural areas in China. Previous studies on healthcare financing have often focused at the international level, comparing equity of total and each healthcare financing across countries and territories in the whole population [5-7]. The World Health Organization (WHO) appealed to all member states to ‘plan the transition to universal coverage of their citizens’ in its 2005 World Health Assembly [8]. Universal health coverage (UHC) emerged in this context, and has been identified as a priority for international and national development since then. Although some strategies were concluded from previous studies at the international and national level [9, 10], antecedent international experience may not simply be adapted in the present healthcare financing system in urban and rural areas in China, and may not be sufficient to address new opportunities and challenges in deepening UHC.

Exploring disparities in healthcare financing distribution between urban and rural areas under China’s unified residents’ health insurance scheme may provide some reference for other countries

in integrating multiple health insurance schemes. China introduced the Urban–Rural Residents’ Basic Medical Insurance (URRBMI) scheme, a unified health insurance scheme for residents in urban and rural areas. This scheme has one funding pool, one benefit package and reimbursement rate, and one basic medical insurance list [11]. This study can provide evidence on disparities in healthcare financing across the urban–rural line in China. In addition, many other countries, such as Brazil, Ghana, Vietnam, Indonesia, and Peru, also committed to integrating multiple funding pools between different populations in a move toward UHC [10, 12, 13].

Therefore, it is significant to study disparities in healthcare financing distribution between urban and rural areas in China. This study characterizes and compares urban–rural disparities in healthcare financing distribution after the introduction of URRBMI. The comparison highlights gaps between urban and rural areas in China’s current healthcare financing mechanisms and helps estimate the effect of the URRBMI policy on healthcare financing systems. This study may help other countries forecast problems that may arise in the integration of urban and rural areas.

Disparities in China’s healthcare financing between urban and rural areas

To cover basic healthcare services and provide a broader coverage of the entire population, China’s government took steps to realign its healthcare financing system between urban and rural areas. The main characteristics of China’s social health insurance system in urban and rural areas are illustrated in Fig. 2.

<Insert Figure 2 near here>

Employers and their employees (retirees included) in formal sectors in urban areas are obliged to enroll in the Urban Employee Basic Medical Insurance (UEBMI) scheme [14]. Until 2016, the Urban Residents' Basic Medical Insurance (URBMI) scheme was developed to target all urban residents not covered by UEBMI, such as the unemployed, children, students, and elderly people without pensions [15]. The New Rural Cooperative Medical Scheme (NRCMS) was implemented to cover the population in rural areas [16]. Since 2016, the urban and rural population in informal sectors have been insured under URRBMI [11].

In urban areas, UEBMI uses both personal accounts and pooling funds and has multiple financing sources. Contributions to UEBMI are made by both the employee and the employer, at a rate of at least 2% and 6% of the employee's income, respectively. In contrast, URBMI was funded by government subsidy (70%) and individual premium (30%) [17]. In rural areas, individuals, collectives, and both central and local governments were responsible for the funding of NRCMS. The current URRBMI is funded by government subsidy as well as individual premiums. URBMI, NRCMS, and URRBMI all operate with an individual flat-rate contribution regardless of income level, unlike UEBMI.

In urban areas, UEBMI and URBMI had comprehensive service coverage including outpatient services and inpatient services, but the benefit package in URBMI was still limited and its reimbursement cap was lower than that of the UEBMI [18]. In contrast, in rural areas, general outpatient services were almost entirely excluded at the initiation of NRCMS and only catastrophic medical treatments, mainly inpatient services, were covered [19]. Although more outpatient services were gradually added to the list with increases in financing, a gap in the benefit package between the urban and rural population remained. The subsequent URRBMI in part

bridges the gap, with one benefit package and reimbursement rate across urban and rural residents.

UEBMI and URBMI were organized by prefecture-level cities in urban areas, while NRCMS was organized at the county level in rural areas. The introduction of URRBMI means that social health insurance in rural areas is now organized by prefecture-level cities, enhancing its ability to offer mutual aid.

Methods

Data sources

Data were taken from a household survey conducted in 2018 in Heilongjiang province, located in the northeastern China. A multi-stage stratified random sampling procedure was used. In 2018, the survey involved five randomly selected cities or counties. Five communities or towns were then randomly selected in each city or county, and two neighborhoods or villages were selected from each community or town. Sixty households were selected in each neighborhood or village. Each member of the selected family was interviewed by trained data collectors. Overall, data were collected from 3918 individuals in 1800 urban households and 2609 individuals in 1200 rural households in 2018.

Data were analyzed at the household level. The survey obtained comprehensive information about household socioeconomic and demographic characteristics, including household expenditure, urban–rural classification, gender, age, education attainment, marital status, and health insurance coverage of household members. Expenditure on household goods and unexpected expenditure were also recorded. Household expenditure was primarily concerned with monthly expenditure on food, water, clothing, traffic, housing, electricity, fuel, communication, education, entertainment, travel, health care, and other items.

Per capita household expenditure adjusted by adult equivalence (AE) was used to measure living standards [20]. Concerning healthcare payments, information was obtained from two sources: one was the abovementioned survey, and the other was local statistical yearbooks, which were mainly related to taxes and copayments for social health insurance schemes. Specifically, indirect taxes mainly consisted of alcohol tax, cigarette tax, amusement tax, gas and electricity tax, excise on eating, drinking, and lodging, and other consumption taxes. These indirect taxes were approximated by applying specific tax rates to the corresponding expenditures. Direct taxes predominantly included personal income tax. Personal income tax was imposed on employees, calculated as a proportion of their salaries, and applied to a progressive rate. Because no taxes are earmarked for health in China, indirect and direct taxes were allocated on a *pro rata* basis using information from the Chinese National Health Accounts. With regard to social health insurance schemes, the UEBMI financing contribution was calculated by applying contribution rates to the earnings of covered workers, while the financing contributions of URRBMI and private health insurance (PHI) schemes were calculated as the sum of the premiums paid. Information regarding these premiums was obtained from the interviewees during the household survey. The questions relating to OOP payments included information regarding expenditure on prescriptions and outpatient care by individuals during the 2 weeks preceding the household interview and expenditure on inpatient care by individuals during the preceding 12 months.

Living standards measures

The crux of this study was to measure the distribution of burden of healthcare finance across different socioeconomic groups in urban and rural areas. Therefore, the key question concerns how to better scale living standards. Expenditures were aggregated at the household level for

measuring living standards. The number of household members was calculated by an equivalence scale index to estimate per adult equivalent household consumption. The equivalence scale index was defined as follows:

$$AE = (A + \alpha K)^\beta,$$

where A is the number of adults in the household, K is the number of children (aged 0–14), α is the cost of children, and β is the degree of economies of scale [21]. The values of α and β were assumed to be 0.5 and 0.75, respectively [22]. The population was ranked by ability to pay (ATP) and grouped into quintiles. In this study, ATP was defined as the monetary payments made to obtain goods or services. Equivalent household expenditure was calculated using the equivalence scale index. Then, ATP was approximated by equivalent household expenditure.

Progressivity analysis

The progressivity of healthcare financing was assessed by portraying how the cumulative proportion of healthcare payments changes with ATP distribution. Similarly, household healthcare payments were adjusted for household size and composition to obtain AE estimates. The direct approach for progressivity analysis is to calculate the Kakwani index (KI), which is the difference between the concentration index (CI) of healthcare payments and the Gini coefficient. This index is computed as follows:

$$\pi_k = C - G,$$

where C is the CI for healthcare payments and G is the Gini coefficient for the ATP measure. A positive KI indicates that the healthcare financing system is progressive, while a negative KI indicates that it is regressive [23, 24]. Proportional financing, whereby KI is theoretically zero, corresponds to a situation where the concentration curve of healthcare payments and the Lorenz

curve are located together. In some cases, KI may be zero when the two curves cross each other [25].

Ordinary least squares regression and dominance tests

To compute the CI and the Gini coefficient, ordinary least squares (OLS) regression of the healthcare payment variables and ATP was adopted as follows:

$$2\sigma^2 \left(\frac{Y_i}{\varphi} \right) = \alpha + \beta X_i + \varepsilon,$$

where Y_i is the healthcare payment or ATP of household i , φ is the mean healthcare payment or ATP, X_i is the household fractional rank based on the ATP distribution, and σ^2 is its variance.

The OLS value of β is an estimate of the CI or the Gini coefficient, depending on the variables used in the regression [26].

Seeing that KI is obtained by subtracting the Gini coefficient from the CI, its value can be computed using a regression of the following form [21]:

$$2\sigma^2 \left(\frac{s_i}{\sigma} - \frac{t_i}{\tau} \right) = \alpha + \rho X_i + \varepsilon,$$

where s_i is the healthcare payment of household i , σ is an estimate of its mean, t_i is the ATP variable, τ is an estimate of its mean, X_i is the household fractional rank based on the ATP distribution, and σ^2 is its variance. The OLS value of ρ is an estimate of the KI.

The outcome of previous interest is disparities in healthcare financing between urban and rural areas. Thus, we conducted tests of dominance on concentration curves of healthcare payments between urban and rural areas in 2018 to determine whether one concentration curve in urban areas is dominated by (i.e., lies below) the concentration curve in rural areas. The results enable the disparity of the healthcare financing mechanisms between urban and rural areas to be evaluated. If one concentration curve in urban areas dominates the concentration curve in rural

areas, it indicates that the healthcare payments in urban areas became more advantageous for the wealthy than rural areas. In the reverse situation, it indicates that the healthcare payments in urban areas became more advantageous for the poor than rural areas.

Results

The analytical sample comprised 3918 urban and 2709 rural people. Significant statistical differences were observed in the distribution of age, education, marital status, and health insurance between urban and rural areas. Urban people had better education, but were less likely to be married or participate in any health insurance scheme than rural individuals. Table 1 presents characteristics of our study sample in urban and rural areas.

<Insert Table 1 near here>

Healthcare financing distribution between urban and rural areas

Tables 2 and 3 present the income quintile distributions of *per capita* household expenditure and each healthcare financing form in urban and rural areas in 2018. Healthcare financing progressivity is clarified by means of the financing distribution, CIs, and KIs.

<Insert Table 2 near here>

<Insert Table 3 near here>

In urban areas, values of the CIs for other healthcare financing sources apart from URRBMI were statistically significantly positive, which is similar to rural areas. The value of CI for

URRBMI in urban areas was statistically significantly negative, while the value of CI for URRBMI in rural areas was negative, but not statistically significantly.

With respect to indirect taxes, the value of KI in urban areas was positive, but not statistically significant; thus, the hypothesis of proportionality cannot be excluded. In contrast, the value of KI for indirect taxes in rural areas was statistically significantly positive.

Direct taxes in both urban and rural areas were progressive, with KIs being statistically significantly positive, where the concentration curves of direct taxes lie below the Lorenz curves in urban and rural areas.

In urban areas, the value of KI for UEBMI was statistically significantly positive, implying that UEBMI was progressive. This is consistent with the fact that the concentration curve of UEBMI primarily lies below the Lorenz curve in urban areas.

Concerning URRBMI, the KIs in urban and rural areas were statistically significantly negative, demonstrating that they were regressive. Meanwhile, PHI in urban areas was negative but not statistically significant; thus, the hypothesis of proportionality cannot be excluded. This is similar to the situation in rural areas.

With regards to OOP payments, the value of KI in urban areas was negative, but not statistically significant; thus, the hypothesis of proportionality cannot be excluded. In contrast, OOP payments were regressive in rural areas, with a statistically significantly negative KI.

Generally, the value of the overall KI in urban areas was negative, albeit not statistically significant; thus, the hypothesis of proportionality cannot be excluded for the healthcare financing system in urban areas. In contrast, the healthcare financing system in rural areas was regressive, as the overall KI was statistically significantly negative, which is slightly different from that in urban

areas.

The concentration curves of each healthcare financing system and Lorenz curves for urban and rural areas are plotted in Fig. 3 and Fig. 4.

<Insert Figure 3 near here>

<Insert Figure 4 near here>

Dominance tests analysis between urban areas and rural areas

It can be seen from Table 4 that the concentration curve of direct taxes in urban areas dominated that in rural areas. This implies that the poor contributed a smaller proportion of their ATP to direct taxes in rural areas, compared with urban areas. The concentration curves of URRBMI and OOP payments in urban areas were dominated by those in rural areas, indicating that the poor in rural areas contributed a larger share of their ATP to URRBMI and OOP payments than those in urban areas. Indirect taxes and PHI displayed nondominance between urban and rural areas, indicating that nondominance between the concentration curves in urban and rural areas cannot be rejected for indirect taxes and PHI in 2018. Concentration curves for the total of all healthcare financing sources between urban and rural areas did not show any dominance in 2018.

<Insert Table 4 near here>

Discussion

This study characterizes the disparities in China's healthcare financing distribution between

urban and rural areas after the introduction of URRBMI as a move toward UHC. The results of this study delineated equity with regard to total healthcare financing varying between urban and rural areas. Total healthcare financing was near proportional in urban areas, whilst it was marginally regressive in rural areas.

This study found that indirect taxes in urban areas were near proportional, whilst indirect taxes in rural areas were slightly progressive. One possible explanation might be that the Chinese government gave economic assistance to low income groups, especially to farmers who were directly granted subsidies [27, 28]. Thus, the poor paid a smaller proportion relative to their ATP in the form of indirect taxes. Meanwhile, an increasing number of rural residents moved to urban areas for greater job opportunities in the cities [29]. This resulted in these wealthy rural people diversifying their sources of income [30]. They also consumed more goods and services, on which indirect taxes are levied in urban areas. This may explain why the better-off in rural areas contributed a larger proportion of their ATP to indirect taxes.

Direct taxes were found to be both progressive in urban and rural areas. This is attributed to the fact that the predominant direct tax, personal income tax, is largely contributed to by the better-off employed in formal sectors. Another important finding is that, compared with rural areas, direct taxes in urban areas became more advantageous for the wealthy. In total, 38.76% of the employed population in urban areas in Heilongjiang province were employed in formal sectors in 2017 [31].

A possible reason might be that most of the urban population was employed in informal sectors, contributing a smaller proportion of their ATP to direct taxes. Furthermore, annual *per capita* salary in rural areas in Heilongjiang province was 2840.30 RMB (US\$ 420.67) in 2017 [32], which is lower than the personal income tax threshold. This may ease the direct tax burden on the

poor in rural areas.

UEBMI was found to be progressive in the current study. This is borne out by the fact that the insured population were compulsorily requested to pay a fixed proportion of their salaries in premiums, leading to the progressive nature of UEBMI [14].

In contrast to UEBMI, URRBMI was regressive in both urban and rural areas. The financing mechanism of URRBMI is still a flat-rate contribution. Thus, URRBMI may be more regressive with its expanding coverage toward UHC. Under such circumstances, the poor, especially those in rural areas in China, are at a substantial disadvantage. The situation in Palestine, where residents' ATP and their willingness to pay were considered in health insurance schemes, could be used as a reference in this case [33]. Another important finding is that, compared with the situation in urban areas, the poor paid a larger proportion relative to their ATP in the form of URRBMI in rural areas. This finding could be due to the fact that URRBMI, as a merged health insurance scheme, tends to have unified premiums. The new premiums that residents in rural areas pay are higher than the previous NRCMS premiums. Moreover, as mentioned above, most people in urban areas were employed in informal sectors. This may explain why the better-off contributed a larger proportion of their ATP to URRBMI in urban areas.

PHI is playing an increasingly important role in the health insurance system, with the expanding demand for better healthcare services. The original premium income of PHI increased from 57.40 billion RMB (US\$ 8.40 billion) in 2009 to 706.60 billion RMB (US\$ 102.43 billion) in 2019 [34]. This study found that PHI in urban and rural areas were both near proportional. This is not surprising, because the better-off tend to choose PHI to achieve better healthcare services. Moreover, individuals in upper income groups in urban and rural areas were associated with better

health status. Therefore, the better-off can more easily participate in PHI than the poor, benefiting from lower adverse selection [35].

In this study, OOP payments were found to be near proportional in urban areas, but regressive in rural areas. OOP payments are the post-paid health financing mechanism counter to other healthcare payments. Therefore, this finding needs to be cautiously explained. It delineated that the poor contributed a larger proportion of their ATP through OOP payments in rural areas. One possible explanation might be that the poor require more healthcare to promote their health status [36]. Meanwhile, the sustaining subsidies received directly by the poor can increase their utilization of healthcare. However, this may also be borne out by rising healthcare costs on the supply side. Another important finding is that, compared with urban areas, the poor contributed a larger proportion of their ATP to OOP payments in rural areas. The poor in rural areas tend to have more healthcare demands than those in urban areas. The increase in government health investment in URRBMI somewhat improved access to healthcare among poor people in rural areas. Furthermore, the poor in rural areas gained greater benefits due to the emergence of this new scheme [17]. These factors may explain why the poor in rural areas unlocked their demands for healthcare, contributing a larger proportion of their ATP to OOP payments.

Limitations

We note one limitation of this study is that the policy effect of the unified health insurance scheme for residents in urban and rural areas may not yet be evident. There may be a time-lag effect between the introduction of URRBMI and practical performance in urban and rural areas.

Conclusions

The results of this study indicate that total healthcare financing was near proportional in urban areas, but marginally regressive in rural areas. Moreover, urban–rural disparities existed in direct taxes, URRBMI, and OOP payments. Compared with urban areas, the poor in rural areas contributed a larger proportion of their ATP to URRBMI. Thus, residents, especially in rural areas, need further government subsidies in URRBMI, with sustainable pooled funding.

Abbreviation

AE: adult equivalence

ATP: ability to pay

CI: concentration index

KI: Kakwani index

NRCMS: New Rural Cooperative Medical Scheme

OLS: ordinary least squares

OOP: out-of-pocket

PHI: private health insurance

UEBMI: Urban Employee Basic Medical Insurance

UHC: universal health coverage

URBMI: Urban Residents' Basic Medical Insurance

URRBMI: Urban–Rural Residents' Basic Medical Insurance

WHO: World Health Organization

Ethics approval and consent to participate

This study was approved by the Academic Research Ethics Committee of Nanjing Medical University. All procedures were in accordance with the ethical standards of the Helsinki Declaration. Participants provided informed consent prior to data collection.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used in the current study are not publicly available due to the confidential policy but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MC led the study; he designed the study and wrote the manuscript. GZ contributed to the study design and took the lead in writing the manuscript. JX analyzed the data and helped in the writing of the final draft of the manuscript. LS supervised the study, contributed to the study design and wrote the manuscript. All authors read and approved the final manuscript.

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Figure captions

Figure 1 –*Per capita* health expenditure in urban and rural areas in China from 2009 to 2016

Per capita health expenditure (equivalent to the US dollar) in urban and rural areas in China from 2009 to 2016

Figure 2 –Main characteristics of China's social health insurance system in urban and rural areas

Main characteristics of China's social health insurance system (including population coverage, funding pools, benefit package, and financing mechanism) in urban and rural areas

Figure 3 –Concentration curves for health-care payments and Lorenz curves in urban areas

Actual cumulative concentration curves for health-care payments (including indirect and direct taxes, public and private health-insurance schemes, and OOP payments) and Lorenz curves (both with 95% confidence interval) in urban areas

Figure 4 –Concentration curves for health-care payments and Lorenz curves in rural areas

Actual cumulative concentration curves for health-care payments (including indirect and direct taxes, public and private health-insurance schemes, and OOP payments) and Lorenz curves (both with 95% confidence interval) in rural areas

Figures

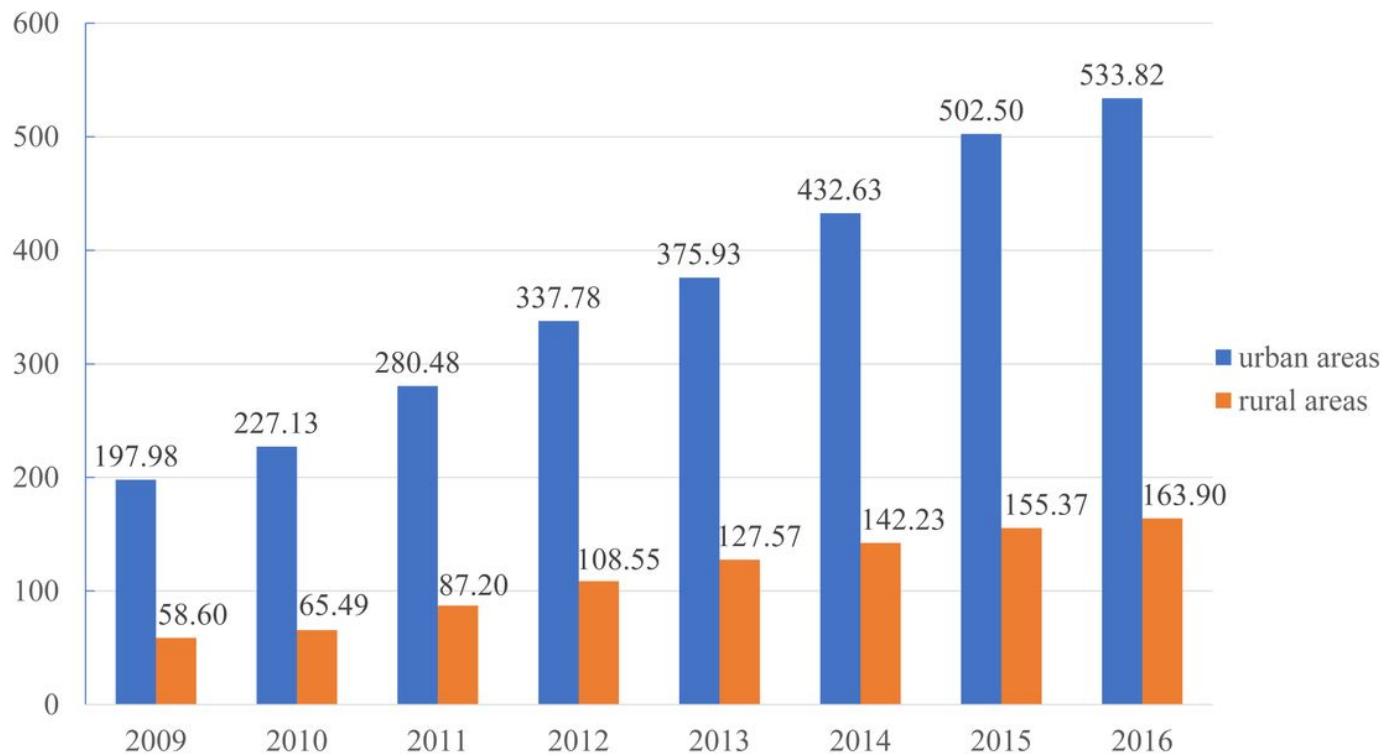


Figure 1

Per capita health expenditure in urban and rural areas in China from 2009 to 2016 Per capita health expenditure (equivalent to the US dollar) in urban and rural areas in China from 2009 to 2016

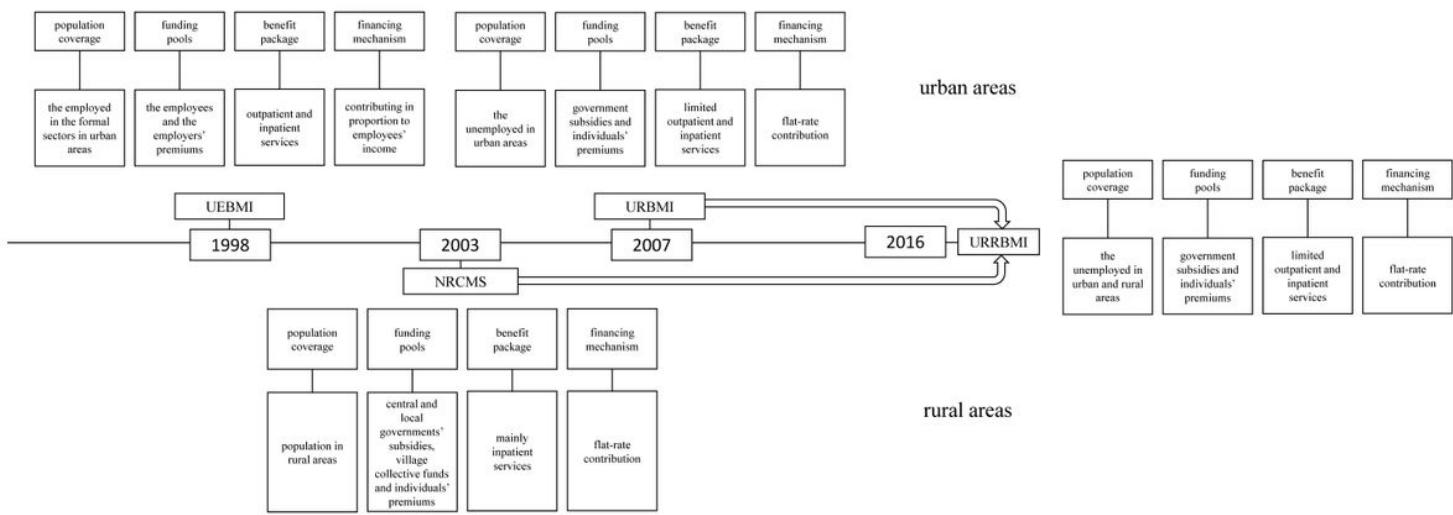


Figure 2

Main characteristics of China's social health insurance system in urban and rural areas Main characteristics of China's social health insurance system (including population coverage, funding pools, benefit package, and financing mechanism) in urban and rural areas

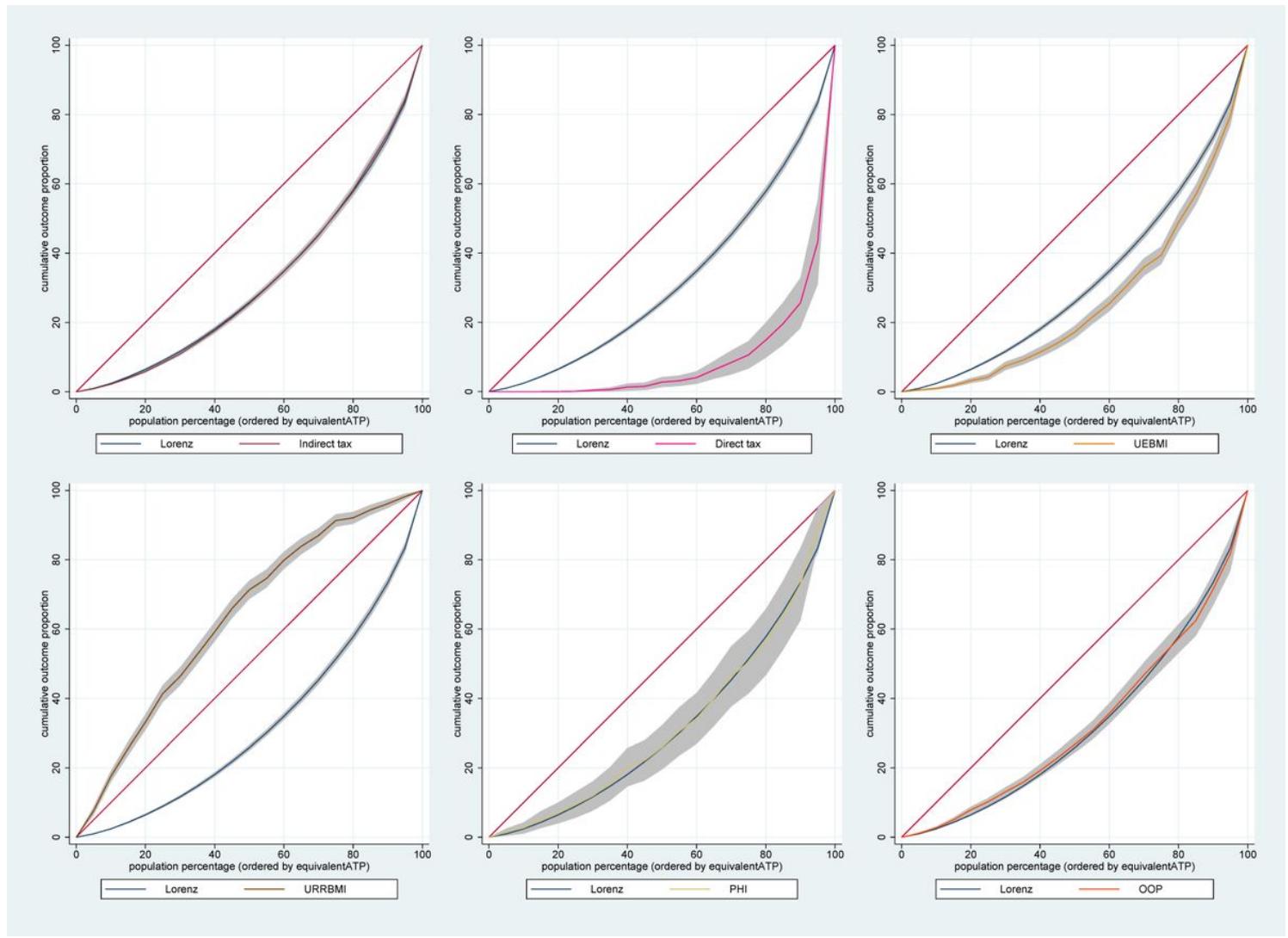


Figure 3

Concentration curves for health-care payments and Lorenz curves in urban areas Actual cumulative concentration curves for health-care payments (including indirect and direct taxes, public and private health-insurance schemes, and OOP payments) and Lorenz curves (both with 95% confidence interval) in urban areas

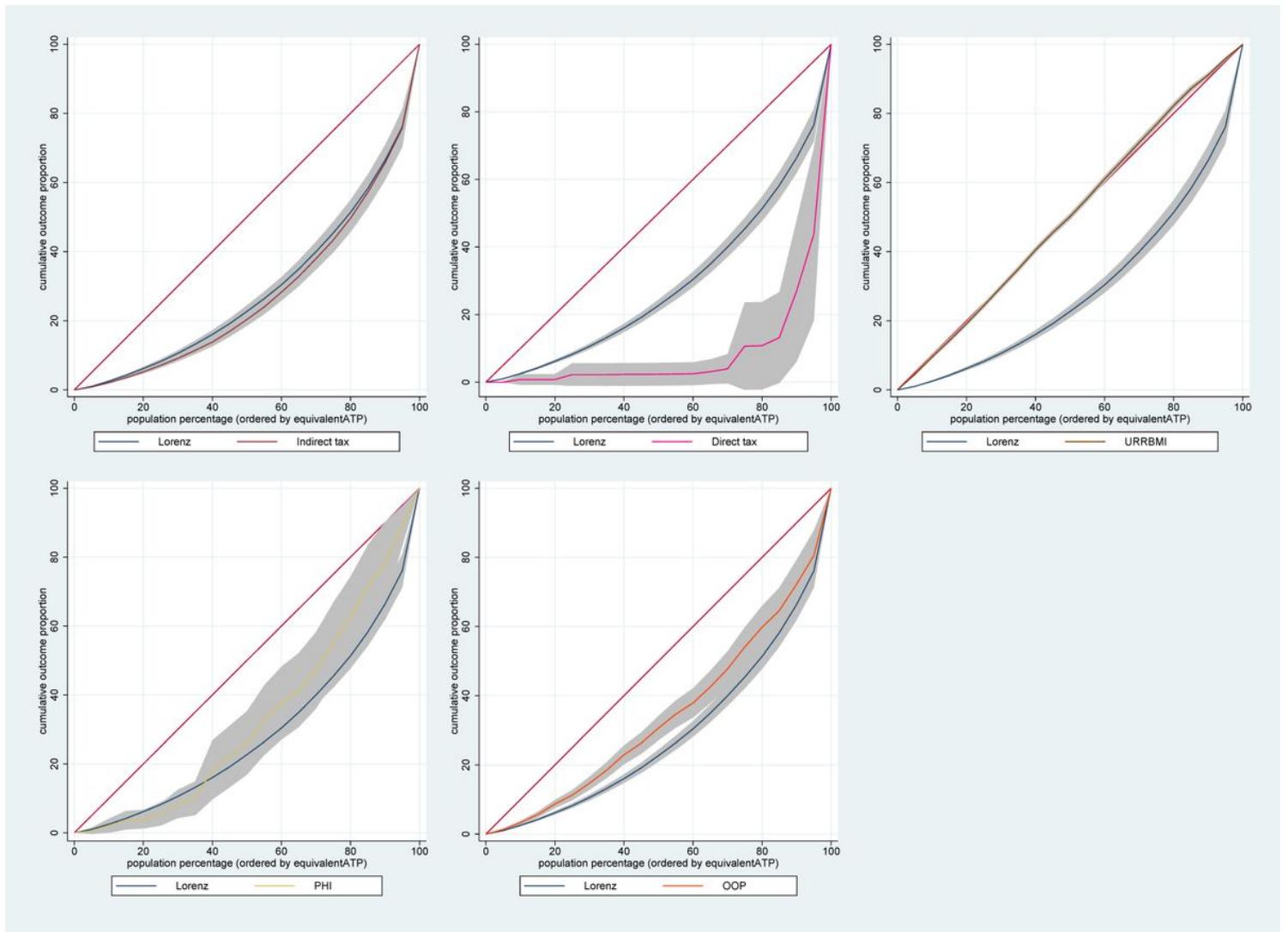


Figure 4

Concentration curves for health-care payments and Lorenz curves in rural areas. Actual cumulative concentration curves for health-care payments (including indirect and direct taxes, public and private health-insurance schemes, and OOP payments) and Lorenz curves (both with 95% confidence interval) in rural areas.