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Income-related benefit mobility before and after Urban and Rural Resident Basic Medical Insurance integration: a longitudinal analysis of China

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Abstract

Background To improve equity in medical insurance benefits, the Chinese government integrated the New Rural Cooperative Medical Scheme for rural residents and the Urban Resident Basic Medical Insurance for nonworking urban residents into a unified Urban and Rural Resident Basic Medical Insurance system (URRBMI). This study aims to assess income-related mobility in medical insurance benefits before and after the integration of the two schemes, and to explore its contribution to improving medical insurance equity.

Methods The panel data were obtained from the 2011 and 2018 China Health and Retirement Longitudinal Study, with 9,662 participants. To assess the benefits residents received from medical insurance, four indicators were analyzed for outpatient and inpatient care respectively: benefit rate, benefit probability, compensation fee, and reimbursement probability. The concentration index (CI) was used to measure the income-related inequality of medical insurance benefits. Changes in inequality across the two waves were decomposed into income-related benefit mobility and benefit-related income mobility, which reflect variations in relative benefit changes among individuals with different initial income levels, capturing the effect of integration on benefit inequality.

Results Results indicated a significant increase in all medical insurance benefit measures following integration, except for outpatient care benefit probability and inpatient care reimbursement probability. The CIs shifted from positive in 2011 to negative in 2018 (0.129 vs. −0.052 for the benefit rate, 0.147 vs. −0.044 for the benefit probability, and 0.148 vs. −0.097 for the reimbursement probability, $p < 0.001$). The income-related mobility for inpatient care (benefit rate, benefit probability, and compensation amount) were positive when the average benefit level increased across the two waves. In contrast, no statistically significant difference was observed in outpatient benefit mobility.

Conclusions The findings indicated that income-related inequalities in medical insurance benefits were narrowed due to pro-poor changes in inpatient care equity for inpatient care after integration. This integration has contributed to building a more equitable healthcare system. However, further efforts are needed to expand outpatient benefit coverage in the integrated URRBMI scheme.

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Keywords Income-related benefit mobility, Health equity, Medical insurance integration, China

Background

Health equity stands as a fundamental goal in public health [1, 2]. The World Health Organization (WHO) defined equity as "the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically or geographically." Essentially, health equity meant ensuring that everyone could maximize their health and well-being potential [3].

To improve access to healthcare, many countries provide basic medical insurance, particularly for those most in need [4]. Such insurance served a critical redistributive function, transferring resources not only from healthy to ill individuals, but also from higher to lower-income groups. Therefore, basic medical insurance is a key tool for reducing health disparities and promoting equitable healthcare access [5, 6].

China has made significant progress in achieving nearly universal health coverage. In 1998, the Urban Employee Basic Medical Insurance (UEBMI) was launched nationwide [7], providing health insurance to urban residents who were formally employed. In 2003, China proposed to establish the New Rural Cooperative Medical Scheme (NRCMS) for rural residents. The NRCMS was designed as a voluntary system of mutual assistance through risk pooling [8]. In 2007, China began to pilot the Urban Residents Basic Medical Insurance (URBMI), which covered all urban non-employed residents [9]. By 2013, China had put in place a basic medical insurance network covering the covering 95% of the population, over 1.35 billion residents [10].

Significant disparities existed among the three schemes in terms of pooling levels, financing standards, and security benefits, especially between the URBMI and NRCMS [11, 12]. The NRCMS funds were pooled at the county level, while the URBMI and UEBMI funds were pooled at the municipal (prefecture) level. In 2013, per capita funding varied considerably: 1,561 CNY, 400 CNY, 370.6 CNY respectively [5, 13]. Moreover, the average reimbursement rate of NRCMS was 10% lower than URBMI, with more limited benefit coverage [14]. The proportion of risk-pooling funds for outpatient reimbursement was small, accounting for 30% or less of the total insurance pooling funds for NRCMS [15, 16]. The UEBMI is the most generous among the three basic medical insurance schemes. Between the two residents' insurance schemes, the URBMI was generally more comprehensive than the NRCMS [17, 18]. The insurance fragmentation hindered risk pooling, inadequately protecting underprivileged and sick populations [19, 20]. Previous studies indicated that the Chinese health insurance system faced significant equity concerns, especially regarding healthcare access [21–23].

To improve health benefit equities in the presence of multiple health insurance schemes, integrating medical insurance schemes and cross-subsidizing between different populations were common strategies. Japan and Germany tried a unified cost-sharing policy [24–26]; South Korea and Colombia made efforts to integrate and unify their fragmented health insurance schemes [27, 28]. In China, the government has gradually integrated two residential insurance schemes into a unified system, Urban and Rural Residents Basic Medical Insurance (URRBMI), beginning in 2016 [29]. The URRBMI integration plan focused on bringing the NRCMS benefit package in line with the URBMI, effectively upgrading benefits for previously disadvantaged rural residents and improving their healthcare access. The URRBMI integration encompasses six key aspects: system coverage, fund-raising policy, security benefits, basic medical insurance medication list, designated institution management, and fund management. The integration lowered copayment, increased reimbursement rates, and expanded benefit coverage. The integration was completed by 2018. Table 1 displays a timeline of policy implementation across provinces.

Empirical studies on the introduction of the URRBMI have yielded mixed evidence regarding changes in health service utilization and inequality. Several studies reported that the integration significantly increased outpatient and inpatient care utilization for rural residents [30–32]. Medical reimbursement disparities between urban and rural patients with identical diagnoses have narrowed after the integration [33, 34]. With regard to inequality in healthcare access, studies presented conflicting results. Some reported reduced inequality for the poor: Wang et al. found decreased catastrophic health expenditures among low-income populations under the URRBMI, and Sun et al. found reduced disparities in depression occurrence [18]. In contrast, other studies suggest persistent inequalities: Wang et al. observed that a pro-rich inequality still existed in outpatient care [35].

Existing studies have mainly focused on the inequality in healthcare utilization and health status, rather than on the core of medical insurance integration - benefit equity [36]. For those studying which studied income-related benefit inequality, they have predominantly used cross-sectional data and concentration index (CI) to assess short-term income-related benefit inequality. However, cross-sectional data may overlook critical changes in income distribution or health outcomes over time. Building on Shorrocks' concept of income mobility, Jones et al. developed an index of health-related income mobility

Table 1 Implementation time of medical insurance integration by provinces/municipalities in China

Provinces/municipalities	Implementation time	Provinces/municipalities	Implementation time
Xinjiang	August 2008	Yunnan	October 2016
Tianjin	April 2009	Henan	September 2016
Ningxia	December 2010	Gansu	November 2016
Guangdong	March 2012	Shanxi	November 2016
Chongqing	July 2012	Guangxi	November 2016
Shandong	January 2014	Heilongjiang	December 2016
Zhejiang	December 2014	Anhui	December 2016
Fujian	July 2015	Jilin	December 2016
Shanghai	October 2015	Sichuan	December 2016
Qinghai	April 2016	Guizhou	December 2016
Hebei	May 2016	Jiangsu	December 2016
Hubei	May 2016	Hainan	December 2016
Inner Mongolia	June 2016	Beijing	October 2017
Shaanxi	June 2016	Liaoning	July 2019
Jiangxi	June 2016	Tibet	April 2023
Hunan	July 2016		

The time listed is based on the publication time of the policy document

for assessing changes in longitudinal income-related inequalities [37, 38]. Allanson et al. extended this method by decomposing the CI into two components: income-related health mobility and health-related income mobility [39]. The key measure here is the income-related health mobility, which measured how health changes relate to initial income ranks. Changes in income-related inequality are expected to arise from shifts in both health insurance benefits and income ranks. Instead of linking health with the current income rank, the index uses the initial income level and thus reduced the bias caused by changes in income ranks during the time period, especially the income changes resulting from worse health. To our knowledge, no studies have investigated the effects of URRBMI introduction on healthcare service utilization applying this methodology.

Our study aims to assess income-related inequality in medical insurance benefits before and after the introduction of URRBMI to explore how the integration enhances equity. We will use panel data to decompose changes in benefits and analyze benefit mobility across income ranks. This study will contribute to the understanding of benefit equity of medical insurance integration in China.

Methods

Study design

The study used a before-and-after comparison design to evaluate changes in benefit equity following the implementation of URRBMI. In this study, 2011 is defined as the pre-URRBMI period and 2018 as the post-URRBMI period, since most provinces implemented URBMI between 2011 and 2016 [29, 36].

Data sources and sample selection

Data were obtained from the China Health and Retirement Longitudinal Study (CHARLS), a high-quality survey representing a national sample of Chinese residents aged 45 and older. It is a key data source for researching medical insurance benefits. The survey employed a multistage proportional probability sampling method, selecting participants from 150 counties/districts and 450 villages/resident committees across 28 provinces and autonomous regions. Spouses were automatically included in the interview sample [40]. Launched in 2011, the baseline survey included 17,708 participants. Data were collected through face-to-face computer-assisted interviews using a structured questionnaire. Follow-up surveys were conducted every two or three years, with efforts like revisits to minimize sample attrition. The questionnaire covers basic personal information, family structures and financial support, health status, health service utilization and medical insurance, income, consumption, etc. More details on the CHARLS sampling procedure and questionnaire can be found at charls.charlsdata.com.

Our study focused on residents aged 45 and older. The raw data were processed as shown in Fig. 1. At the provincial level, we excluded three provinces that had already introduced URRBMI before 2011 or after 2018. At the individual level, only those who enrolled in the NRCMS, URBMI, or URRBMI in both waves were retained. Participants with key information missing, such as gender, age, or marital status, were also excluded. Finally, we kept only individuals who were observed in both waves to obtain a balanced panel. The final sample size was 19,324.

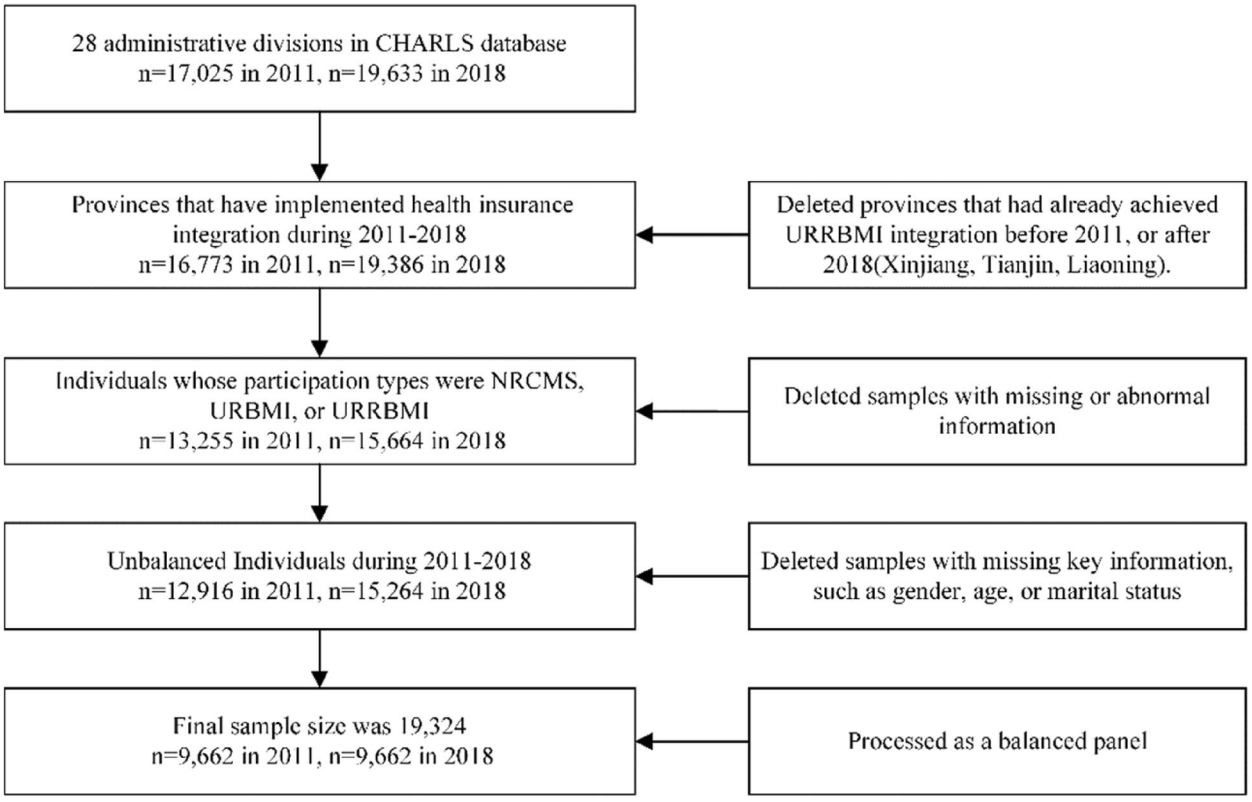

Fig. 1 Flow chart of the sample selection process

Variable specifications

Following the current literature [41, 42], this study measured the medical insurance benefits of outpatient and inpatient care in two dimensions. The first dimension assessed whether any benefits were received using benefit rate and benefit probability. The benefit rate was defined as the proportion of to get benefits for an enrollee if he/she was enrolled in NCMS/URBMI/URRBMI in the past month/year (a continuous variable). Benefit probability indicated whether the enrollee received any outpatient or inpatient services (yes = 1, no = 0). The second dimension evaluated the benefit level using compensation fee and reimbursement probability. The compensation fee represented the reimbursement amount from NRCMS / URBMI / URRBMI for those who received care, with a value of 0 if no visits or reimbursements occurred (also a continuous variable in Chinese yuan (CNY)). Reimbursement probability indicated whether participants were reimbursed for outpatient or inpatient services (yes = 1, no = 0). For inpatient care, the reference period was the past year, while for outpatient care, it was the past month.

Following previous studies, this study controls for two types of basic characteristics [23, 35, 36]. The first type described demographic characteristics, including gender (male = 1, female = 2), age (continuous variable), marital status (married = 1, widowed = 2, divorced or never married = 3), region (eastern = 1, central = 2, western = 3), and location (urban = 1, rural = 0). The second type described socioeconomic status, including educational level (Illiterate = 1, Unfinished elementary school = 2, elementary school = 3, High school = 4, High school or above = 5), self-assessed health (categorized according to a five-point Likert scale, with higher scores characterized as healthier), and commercial health insurance enrollment (yes = 1, no = 0). Particularly, household income status, represented by per capita household consumption expenditure, played a significant role in the study. It was calculated by subtracting household cash health expenditure from self-reported household consumption expenditure and then dividing the result by household size. Previous studies suggest that self-reported consumption expenditures are less prone to misreporting than self-reported income [43]. Additionally, subtracting household health expenditures from total expenditures provides a more accurate measure of consumption capacity in developing countries [44].

Statistical analysis

Descriptive statistics were used to analyze the basic characteristics. Continuous variables were summarized using means and standard deviations (SD). Categorical variables were reported in counts (n) and percentages (%).

Then, the study employed three metrics to evaluate overall inequality in medical insurance benefits:

concentration index, horizontal inequity index, and income-related benefit mobility.

Concentration index

The concentration index (CI) is a commonly used metric for assessing inequality in medical insurance benefits [45]. It is defined as follows:

$$CI = \frac{2}{\sigma} cov\,(h, r) \tag{1}$$

where h is the medical insurance benefit measure, and r represents the fractional rank of household income. The weighted covariance between two variables is computed and divided by σ , the mean of h. The CI ranges from − 1 to 1. The CI provides insights into both the direction and degree of inequality. A positive CI indicates that wealthier individuals benefit more from insurance, while a negative CI indicates that poorer individuals benefit more. The larger the absolute value, the greater the inequality.

Horizontal inequity index

Health inequalities refer to differences in health outcomes or the distribution of health resources among groups, stemming from the social conditions in which individuals are born, grow, live, and age [46, 47]. The horizontal inequality index (HI) was employed to measure the sources of benefit inequality. Wagstaff et al. proposed the horizontal inequity index (HI) to quantify the relationship between medical insurance benefits and income, while controlling for differences in needs across the income distribution [48]. Based on the HI, this study decomposes the factors influencing the CI into three components: need variables, non-need factors, and residual terms. Need variables are represented by age, sex, and self-assessed health, while non-need variables include socioeconomic factors like marital status, education level, region, location, and insurance type. Each factor's contribution is calculated as the product of its influence coefficient on health and the degree of inequality. The HI represents the portion of the CI unexplained by need variables, measuring disparity after accounting for differing needs.

First, the CI can be decomposed as follows:

$$\mathrm{CI} = \sum\nolimits_{\mathrm{j}} \left(\frac{\beta_{\mathrm{j}}^{\mathrm{m}} \bar{x}_{\mathrm{j}}}{\mu} \right) \mathrm{C_j} + \sum\nolimits_{\mathrm{k}} \left(\frac{\gamma_{\mathrm{k}}^{\mathrm{m}} \bar{z}_{\mathrm{k}}}{\mu} \right) \mathrm{C_k} + \frac{\mathrm{GC_u}}{\mu} \tag{2}$$

where $\beta_j^m \bar{x_j} / \mu$ and $\gamma_k^m \bar{z_k} / \mu$ measure the benefit elasticity from the need and non-need variables, respectively. μ is the error term. The HI is defined as follows:

$$HI = C - \sum\nolimits_{j} \left(\frac{\beta_j^m \bar{x_j}}{\mu} \right) C_j \tag{3}$$

In other words, the HI quantifies the portion of CI that is not explained by need variables. This topic is particularly important as policy interventions could help reduce disparities.

Income-related benefit mobility

To understand changes in benefit inequality after the medical insurance integration and its dynamic relationship with socioeconomic characteristics, this study adopts a longitudinal perspective to capture benefit equity trends. Allanson et al. proposed the measure of income-related health mobility on the basis of Jones et al. [38, 39]. They observed that changes in income-related inequality stem from shifts in both medical insurance benefits and income ranks. Measuring changes in medical insurance benefits with income ranks in the initial period can isolate the effect from income ranks shifts due to other reasons, and thus is particularly useful in long-term analysis. This study employs the income-related benefit mobility index to measure differences in relative benefit changes among individuals with varying initial income levels, capturing the effect of integration on benefit inequality.

To obtain income-related benefit mobility, an additional measure CI^{fs} is introduced to link benefit outcomes in 2018 to income ranks in 2011.

$$CI^{fs} = \frac{2}{\overline{h}^f} cov\,(h_{if}, R_{is}) \tag{4}$$

where h_{if} is the medical insurance benefit in 2018; R_{is} is the income rank in 2011; and $\overline{h}^f$ is the average medical insurance benefit in 2018. The change in benefit inequality from 2011 to 2018 can be decomposed as follows:

$$\Delta CI = CI^f - CI^s = (CI^f - CI^{fs}) + (CI^{fs} - CI^s) = M^R - M^H \tag{5}$$

Here, CI^f and CI^s are the *CIs* in periods 2011*(s)* and 2018*(f)*, respectively. $M^H = CI^s - CI^{fs}$ is the income-related benefit mobility index. This measure captures differential changes in medical insurance benefits among individuals with varying initial income levels. A positive M^H means that individuals with lower income enjoy a larger share of benefit gains over the period, and vice versa. This index is the central measure of our study. Additionally, $M^R = CI^f - CI^{fs}$ is the benefit-related income mobility index, which measures changes in income ranks while holding medical insurance benefits constant.

The income-related benefit mobility index can be further decomposed as follows:

$$M^H = CI^s - CI^{fs} = \left(\frac{2}{\overline{h}^s} cov\left(h_{is}, R_{is}\right) - \frac{2}{\overline{h}^f} cov\left(h_{if}, R_{is}\right)\right) = \left(\frac{2}{\overline{h}^s} cov\left(h_{is}, R_{is}\right) - \frac{2}{\overline{\triangle h}} cov\left(h_{if} - h_{is}, R_{is}\right)\right) \quad (6)$$
$$\left(\frac{\overline{\triangle h}}{\overline{h}^f}\right) = \left(CI^s - CI^{\triangle s}\right)\left(\frac{\overline{\triangle h}}{\overline{h}^f}\right) = Pq$$

where $\overline{h}^s$ and $\overline{h}^f$ are the average benefit levels in 2011 and 2018, respectively, and $\overline{\triangle h}$ is the average changes in benefit. $q = \frac{\overline{\triangle h}}{\overline{h}^f}$ is the average rate of benefit change. It can take a positive value, indicating an overall improvement in insurance benefits, or a negative value, suggesting a deterioration. $P = CI^s - CI^{\Delta s}$ is the progressivity index, measuring the progressivity of the benefit change. Its interpretation depends on the sign of q. If the average benefit change q is positive, then undefined $P > 00]] >$ implies that the change is progressive, meaning that poorer individuals benefit more [49]. Conversely, if the average benefit change is negative, $P < 0$ is required for the change to be progressive, meaning that the concentration of benefit losses is greater among wealthier individuals.

All analyses were performed using Stata MP 17.0, with statistical significance set at $p < 0.05$.

Table 2 Baseline characteristics of the study population

Variables	Characteristics (*n* = 9,662)
Age, **years**(Mean ± SD)	57.600 ± 9.023
Gender (n (%))	
Male	4,353 (45.0)
Female	5,309 (55.0)
Marital status (n (%))	
Married	8,731 (90.4)
Widowed	825 (8.5)
Divorce or never married	106 (1.1)
Educational attainment (n (%))	
Illiterate	2,916 (30.2)
Unfinished elementary school	1,887 (19.5)
Elementary school	2,234 (23.1)
Middle school	1,956 (20.2)
High or above	669 (7.0)
Region (n (%))	
Eastern	3,014 (31.2)
Central	3,302 (34.2)
Western	3,346 (34.6)
Location (n (%))	
Rural	6,982 (72.3)
Urban	2,680 (27.7)
Preintegration insurance types (n (%))	
URBMI	382 (4.0)
NRCMS	9,280 (96.0)
Commercial medical insurance (n (%))	
No	9,525 (98.6)
Yes	137 (1.4)
Self-assessed health (Mean ± SD)	3.508 ± 1.009
Household income, **CNY** (Mean ± SD)	6,889.621 ± 23,476.150

Unit of household income: Chinese yuan (CNY)

Results

Descriptive results

Table 2 describes the baseline characteristics of the study population. The average age was 57 years, with 54.95% of respondents being female and over 90% married. Half respondents (50.3%) had received a primary school education or higher. The sample was fairly evenly distributed across three regions of China, with 72.26% residing in rural areas. The per capita household income in 2011 was 6,889.62 CNY. The average self-assessed health score was 3.5, suggesting a moderate health status. Notably, most respondents (96.05%) were covered by the NRCMS prior to integration, while only 1.42% of participants were enrolled in commercial medical insurance.

Figure 2 compares benefit incidence rates between 2011 and 2018. There was a notable increase in medical insurance benefits after the integration, with the exception of the benefit probability for outpatient care and the reimbursement probability for inpatient care. Specifically, the inpatient benefit probability rose from 7.2 to 17.7%, suggesting that a greater proportion of inpatient care was reimbursed by medical insurance. The compensation fee for inpatient care increased from 447.98 CNY to 584.85 CNY. Conversely, both the outpatient benefit probability and the inpatient reimbursement probability significantly decreased ($p < 0.001$).

Effects of URRBMI integration on benefit inequality

Table 3 shows the effect of URRBMI integration on benefit inequality. The CIs shifted from positive in 2011 to negative in 2018 (0.129 to −0.052 for benefit rate, 0.147 to −0.044 for benefit probability, and 0.148 to −0.097 for reimbursement probability, $p < 0.001$). The patterns for outpatient care remained mixed: the CI for outpatient reimbursement probability was negative, while the CI for outpatient compensation fees remained positive. In addition, all these changes are not statistically significant for outpatient care.

Income-related benefit mobility

Table 4 presents the main result: the decomposition of benefit inequality changes into income-related benefit mobility (M^H). The most notable finding is that M^H for inpatient benefit measures was all positive, indicating that income-related benefit mobility favored low-income groups. Additionally, given that the average benefit change was positive, the progressivity index (P) for the

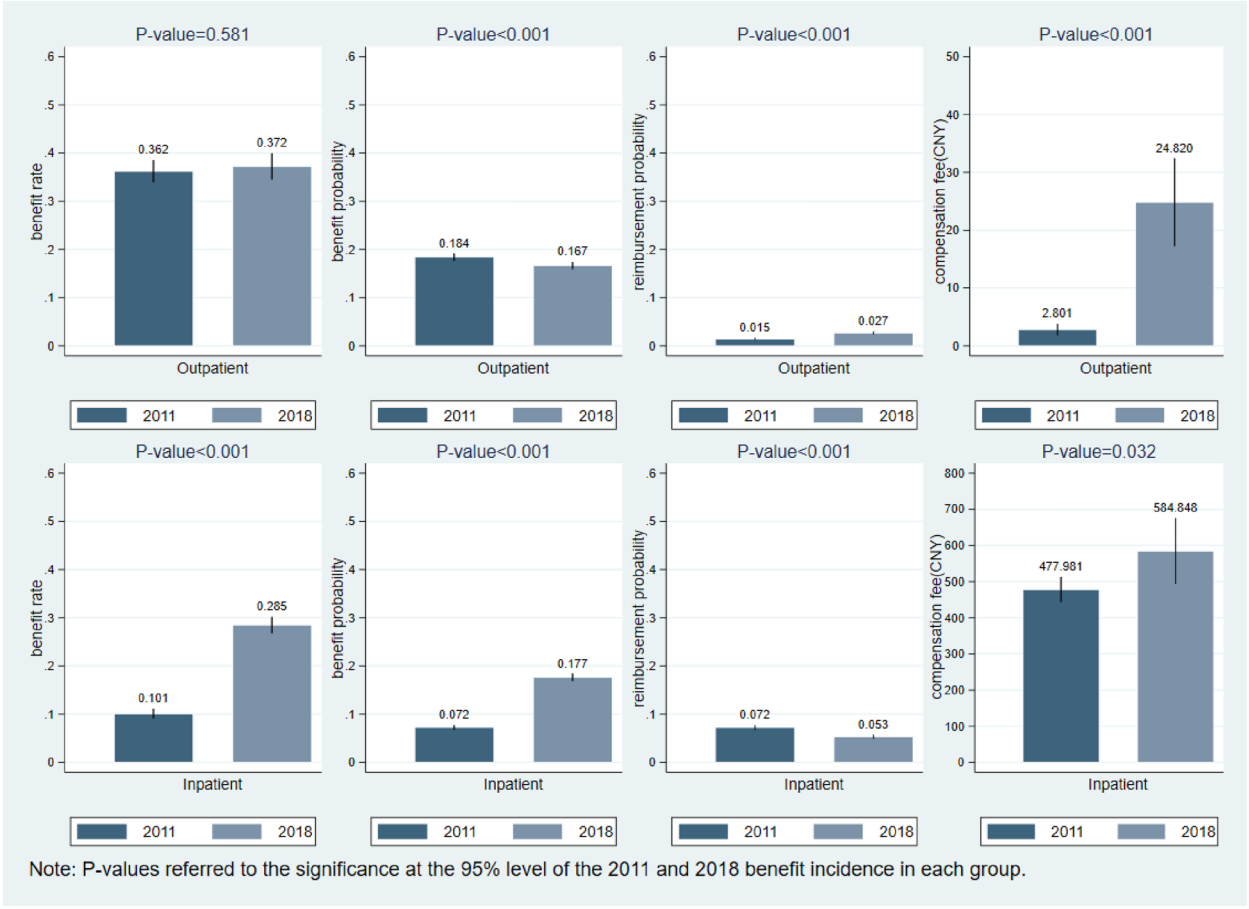

Fig. 2 Benefit incidence for individuals in China

Table 3 Effects of URRBMI integration on benefit inequity

Variables	2011		2018		*F* value	*p*
	CI	Std	CI	Std		
Outpatient						
Outpatient benefit rate	−0.0003	0.019	0.016	0.022	0.301	0.583
Outpatient benefit probability	0.020	0.012	0.015	0.013	0.058	0.810
Outpatient compensation fee	0.040	0.105	0.053	0.090	0.008	0.930
Outpatient reimbursement probability	−0.012	0.048	−0.041	0.035	0.230	0.631
Inpatient						
Inpatient benefit rate	0.129***	0.030	−0.052***	0.018	27.330	0.001
Inpatient benefit probability	0.147***	0.021	−0.044***	0.013	60.745	0.001
Inpatient compensation fee	0.138***	0.021	−0.056	0.046	14.671	0.001
Inpatient reimbursement probability	0.148***	0.021	−0.097***	0.025	56.909	0.001

CI and Std refer to the concentration index and standard deviation of medical insurance benefits, respectively

*, **, and *** correspond to significance levels of 5%, 1%, and 1‰, respectively

benefit rate, benefit probability, and compensation fee was positive (0.204, 0.268, 0.254), indicating URRBMI progressivity. Furthermore, the progressivity index (P) for reimbursement probability was negative (–0.438), suggesting URRBMI progressivity in inpatient care despite a negative average benefit change. Conversely, income-related benefit mobility for outpatient services post-integration was regressive (MH < 0), though not statistically significant.

Table 5 presents the decomposition of HI, accounting for need variables including age, gender, and self-assessed health. The results are consistent with those in Table 3, further supporting the robustness of our main findings.

Table 4 Changes in the concentration index of benefit incidence and its decomposition

Variables	Δh	ΔCI	CI^{fs}	M^R	M^H	*P*	q
Outpatient							
Outpatient benefit rate	0.010	1.236	0.033	−0.018	−0.034	−1.236	0.027
Outpatient benefit probability	−0.050	−0.176	0.040	−0.025	−0.021	0.195	−0.106
Outpatient compensation fee	22.019	0.095	0.089	−0.037	−0.049	−0.055	0.887
Outpatient reimbursement probability	0.290	0.067	0.023	−0.064	−0.035	−0.079	0.450
Inpatient							
Inpatient benefit rate	0.184	−0.075	−0.003	−0.049	0.132	0.204	0.645
Inpatient benefit probability	0.418	−0.122	−0.011	−0.033	0.158	0.268	0.590
Inpatient compensation fee	106.867	−0.116	0.091	−0.148	0.046	0.254	0.183
Inpatient reimbursement probability	−0.150	0.586	−0.008	−0.089	0.156	−0.438	−0.355

Δh, *ΔCI* is the change in benefit level and inequality from 2011–2018, and CI^{fs} is the cross-sectional CI when benefit outcomes in 2018 are ranked by income in 2011. M^R is the benefit-related income mobility index, and M^H is the income-related benefit mobility index. *q* is the average rate of benefit change, and P is the progressivity of the benefit change excluding the change in the average level

Table 5 Changes in the horizontal concentration index of the benefit incidence and its decomposition

Variables	Δh	ΔHI	HI^{fs}	M^R	M^H	*P*	q
Outpatient							
Outpatient benefit rate	0.010	0.137	0.029	−0.118	−0.123	−0.231	0.027
Outpatient benefit probability	−0.050	−0.211	0.036	0.195	−0.156	0.091	−0.106
Outpatient compensation fee	22.019	0.098	0.100	0.223	−0.143	−0.140	0.887
Outpatient reimbursement probability	0.290	0.069	0.052	0.012	−0.292	−0.309	0.450
Inpatient							
Inpatient benefit rate	0.184	−0.047	0.025	0.067	0.217	0.288	0.645
Inpatient benefit probability	0.418	−0.073	0.019	−0.178	0.187	0.279	0.590
Inpatient compensation fee	106.867	−0.047	0.127	0.034	0.071	0.245	0.183
Inpatient reimbursement probability	−0.150	0.570	0.037	−0.243	0.181	−0.352	−0.355

ΔHI and HI^{fs} are changes in the horizontal concentration index accounting for the effects of unavoidable factors, including gender, age, and self-assessed health

Discussion

The study analyzed changes in benefit equality before and after the URRBMI integration, using income-related benefit mobility as the measure. To the best of our knowledge, this is the first study to apply such an index to analyze the URRBMI integration, thereby expanding the understanding of the its effect on benefit equality. Three main findings emerged from the analysis.

First, medical insurance benefits significantly increased following the integration, except for outpatient benefit probability and inpatient reimbursement probability. Our findings align with previous studies [50–52]. On one hand, financial subsidies under the URRBMI have grown substantially over the years and continue to increase. For instance, government subsidies for rural enrollees rose from 282 CNY to 497 CNY post-integration, ensuring access to more comprehensive benefit packages. This increase in subsidies likely reduced the financial burden on enrollees and encouraged greater use of both outpatient and inpatient services. On the other hand, higher compensation levels further incentivized residents to seek medical care. Following the URRBMI's implementation in 2016, the average inpatient care reimbursement probability increased to 75%, marking a 13% rise for NRCMS enrollees and a 9% rise for URBMI enrollees (National Health Statistical Yearbook 2011–2018; National Statistical Bulletin on the Development of Basic Medical Insurance 2018). Higher reimbursement reduced out-of-pocket costs, thereby encouraging greater use of medical services, such as longer hospital stays, increased reimbursement rates, and lower deductibles [53, 54].

Second, benefit inequality in inpatient care decreased after the integration, although no statistical significance changes were observed in outpatient benefit inequality. High out-of-pocket medical expenses have long burdened Chinese residents, with inpatient care costs far exceeding outpatient care costs and constituting the majority of the financial burden [55]. Therefore, the policy prioritized alleviating the financial burden of hospitalization, with the URRBMI focusing on inpatient treatments, complemented by outpatient services for severe diseases. This approach played a vital role in protecting individuals and households from unpredictable and financially disruptive health costs.

Before the integration, the insurance systems of the NRCMS and URBMI were fragmented, with significant disparities in benefits between urban and rural areas and across regions [56, 57]. URBMI participants received greater benefits compared to the NRCMS participants, and higher-income groups benefited more than

lower-income groups [5]. To address these disparities, the URRBMI coordination was elevated to the municipal level, and further consolidations were implemented, such as unifying coverage scope, insurance catalog, contracted hospitals, benefits, financing policies, and fund management (The State Council Information Office of the People's Republic of China 2016). The Chinese government introduced equalized medical insurance reimbursement within coordinated regions, ensuring uniform reimbursement levels for hospitalization costs [58–60]. This policy aimed to achieve greater equality for inpatient care. Additionally, integrated medical insurance reduced barriers for reimbursement at nonlocal hospitals, contributing to greater equality in inpatient benefits.

Compared to inpatient care, changes in outpatient benefits were mixed. While there was no significant improvement in benefit equality, compensation fees and outpatient reimbursement ratios increased significantly. On one hand, the lack of significant difference suggested potential equity in outpatient benefits between 2011 and 2018. On the other hand, inadequate outpatient benefits continued to pose a barrier, a challenge that was not fully captured in the data. Despite the integration, the medical insurance system still prioritizes inpatient treatment over preventive and outpatient services. Although some provinces have launched pilot programs for outpatient care targeting chronic and severe diseases, the number of conditions covered remains limited [61]. At this stage, URRBMI outpatient coverage remained inadequate, leading low-income groups to forgo outpatient services.

The final and most important finding was a pro-poor shift in income-related benefit mobility following the integration of the URRBMI. This shift in benefit distribution was mainly driven by inpatient care, which accounted for the majority of total benefits. Low-income groups benefited more as they were more sensitive to price changes than high-income groups. A study from Ningxia supported this view, noting that government medical insurance subsidies contributed to more equitable inpatient benefits [62]. However, some studies suggested that the URRBMI's impact on inpatient benefits may not be significant [63–65], and other studies even suggested that URRBMI implementation exacerbated a pro-rich change in inequalities of inpatient care [35]. Our results are in clear contrast with these findings. Our evidence also suggests that medical insurance integration may still lead to a pro-poor shift in outpatient care. Wang et al. reported that although the wealthiest groups used more outpatient care under the URRBMI, the difference was not statistically significant [35]. In contrast, Fan et al. reported that, although inequality in outpatient care usage persisted after integration, the extent of this inequality was significantly reduced [66].

Suggestions

Despite significant improvements in inpatient benefit inequality, further efforts are needed to deepen medical insurance integration. The government should enhance the comprehensiveness of insurance benefits by increasing reimbursement rates and improving coverage for major medical conditions. The URRBMI outpatient coverage remains insufficient to meet patients' needs, particularly for vulnerable groups. Expanding outpatient benefits should be a central focus of future reforms. Enhancing outpatient coverage is especially crucial for improving healthcare access for low-income groups which may even reduce reliance on inpatient services use through earlier diagnosis and treatment. This would decrease large medical expenses and improve the efficiency of medical insurance fund use [63]. Additionally, the healthcare reimbursement process should be simplified and streamlined. Future healthcare reforms should prioritize primary care and offer a comprehensive benefit package that includes preventive care and disease management.

The integration of medical insurance has effectively reduced benefit inequalities, contribution to the vision of universal medical insurance in China. The transition from the NRCMS and URBMI to the URRBMI has been an important step in reducing medical insurance fragmentation. Researchers and policymakers are working to bridge the gap between the URRBMI and UEBMI, the two pillars of the current medical insurance system in China. Universal medical insurance remains a promising solution.

Limitations

There were also several limitations in this study. First, recall bias may be an unavoidable issue in the CHARLS data, as key information relied on self-reports of past behaviors or events. Systematic differences in respondents' ability to recall information could introduce bias into the results. Second, there may be limitations in the extrapolation of the results. As the data only covered individuals aged 45 and over, the findings may not be generalizable to the broader population. Further studies are needed to extend the analysis to include all age groups. Third, other policies, such as social assistance and targeted poverty alleviation, may have also contributed to the shift in the distribution of healthcare benefits. Further studies are required to confirm the causal relationship between URRBMI integration and healthcare inequality. Finally, due to COVID-19-related social isolation, CHARLS 2020 data were excluded from the study because they showed significant differences in healthcare utilization compared to historical data.

Conclusions

The study employed an innovative measure- the income-related benefit mobility- to examine the changes in health insurance inequality before and after the URRBMI integration. We find that there was a marked increase in overall medical insurance benefits following the integration, especially for inpatient care. In addition, a noticeable reduction in benefit inequality for inpatient care was observed post-integration. The most important finding was the pro-poor shift in income-related benefit mobility after the integration of the URRBMI. These findings suggest that the benefits of the integration were disproportionately favorable to lower-income groups, promoting greater equity in healthcare access. This integration has made a substantial contribution to the progress toward a more equitable healthcare system in China. However, this study also emphasizes that further efforts are necessary, particularly in expanding outpatient benefit coverage, to address the remaining gaps in healthcare accessibility.

Abbreviations

WHO	World Health Organization
UEBMI	Urban Employee Basic Medical Insurance
URBMI	Urban Resident Basic Medical Insurance
NRCMS	New Rural Cooperative Medical Scheme
URRBMI	Urban and Rural Residents Basic Medical Insurance
CHARLS	China Health and Retirement Longitudinal Study
CNY	Chinese yuan
CI	Concentration index
HI	Horizontal inequity index
M^H	Income-related benefit mobility index
M^H	Benefit-related income mobility index
P	Progressivity index

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Authors' contributions

YX, JM conducted the conception or design of the study. YL Performed data collection. YX, YL analyzed and interpreted the data. YL, JM drafted the manuscript. All authors read and approved the final manuscript and revised it.

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Data availability

Original data can be accessed through China Health and Retirement Longitudinal Study official website (charls.charlsdata.com). The secondary data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval for data collection was obtained at Peking University and updated annually. For all study data involving human participants, the principles outlined in the Declaration of Helsinki are adhered to. Approval for this study was given by the medical ethics committee of Health Science Center of Xi'an Jiaotong University (approval number 2015 – 642). All respondents gave written informed consent prior to data collection.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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