BMC Public Health

RESEARCH

Open Access

Does the trans-provincial immediate reimbursement reduce health gap between urban and rural floating population? Evidence from China

Jun Tian[1,3], Zuopeng Chen[1], Yu Wang[2*] and Yue Zhu[1,3]

Abstract

Background One of the critical components of public health policy globally is to enhance population health and mitigate health disparities. In 2017, China launched the reform of immediate reimbursement for trans-provincial treatments, aimed at increasing healthcare utilization among the floating population. This study aims to evaluate the impact of this policy reform on the health status of the urban–rural floating population.

Methods This study utilizes individual-level data from the 2017 and 2018 China Migrants Dynamic Survey (CMDS) and administrative hospital data at the city level. The sample includes 47,803 individuals and 66 cities. Treating the direct reimbursement policy as a quasi-natural experiment, we employ a generalized difference-in-differences model for our quantitative analysis. To control for the effects of urban–rural medical insurance integration—to ensure that both urban and rural residents are covered by the same basic medical insurance policy—our analysis of rural health status from 2016 to 2018 is limited to cities that fully implemented this policy integration before January 1, 2017.

Results The policy of immediate reimbursement for trans-provincial treatments has a significant positive impact on the health of the urban–rural floating population. The health benefits of trans-provincial treatments are less pronounced than those of trans-urban treatment, with primary hospitals showing the most notable improvements. Increased household income and consumer spending significantly amplify the health benefits of this policy for the floating population. The effects of the policy are especially pronounced in the female floating population, middle-aged and young adults, individuals with lower levels of education, those desiring long-term residency, and the unmarried groups.

Conclusion This paper presents theoretical evidence that the policy of immediate reimbursement for trans-regional treatments narrows the health disparities of the urban–rural floating population and elucidates the mechanisms of this impact for the first time. These results suggest that in order to achieve health equality between urban and rural residents and equitable access to medical services, China is building a more effective medical security system.

Keywords Immediate reimbursement, Urban–rural floating population, Trans-provincial treatments, Medical insurance policy

*Correspondence:
Yu Wang
yuwang@njmu.edu.cn
Full list of author information is available at the end of the article

Introduction

According to the World Health Organization's definition, health equity means that everyone should have a fair opportunity to attain their full health potential. All countries and regions are committed to reducing health inequities through social policies and welfare programs [1–3]. China has also made it a principal objective of the healthcare system reform to ensure that every citizen has equal access to basic medical services, thereby increasing the financial accessibility of healthcare for the low-income population [4–6]. China has experienced significant urbanization [7, 8], leading to a substantial increase in its floating population, particularly among rural migrant workers [9–13]. By 2020, the number of migrant workers in China had reached an estimated 169.59 million [14]. However, the majority of the rural migrant population does not have access to the same medical services as the local residents in the areas to which they migrate [15]. This disparity often results in migrant workers, who struggle to secure urban employment, being at heightened risk of falling into a "poverty and poor health" vicious cycle [16, 17]. Consequently, accelerating the equalization of basic public medical insurance services for both urban and rural residents and simplifying the reimbursement procedures for cross-regional medical treatment are critical for improving the health outcomes of the rural migrant population [18].

China has currently established a comprehensive basic healthcare security system that currently extends coverage to over 1.3 billion individuals. We believe that this system plays a crucial role in alleviating the healthcare burden for urban and rural residents, enhancing the health status of the populace, and optimizing the utilization of medical resources [19]. However, the principle of "localized management" within China's healthcare insurance system results in unequal access to convenient and affordable medical services for residents. On January 1, 2017, China implemented immediate reimbursement for trans-regional treatments. Previously, individuals were required to first obtain administrative approval from the medical security management department of the insured area. Subsequently, they had to visit designated medical institutions in their current residence to receive treatment and pay all medical expenses upfront. Finally, they needed to return to the medical security management department of the area where they were insured to complete the necessary reimbursement procedures [20, 21].

Since the establishment of the national immediate reimbursement for trans-regional treatments in 2017, there has been a continuous increase in the number of designated medical institutions for trans-provincial offsite medical care, the number of individuals on record, and the volume of immediate reimbursement [22].The implementation of cross-regional immediate reimbursement significantly alleviates the medical burden faced by the rural floating population when they seek healthcare services across different regions. This policy facilitates timely, convenient, and affordable access to medical services for these populations, thereby enhancing the utilization of medical resources among rural migrants. Consequently, it contributes to the overall improvement in the health outcomes of the rural floating population [23, 24]. Currently, the framework for cross-regional immediate reimbursement has expanded from intra-provincial to inter-provincial levels, encompassing both inpatient and outpatient services. This policy now includes all migrant workers and individuals relocating for entrepreneurial or employment opportunities. These reforms have significantly ensured the fundamental right to healthcare for individuals residing away from their primary domicile, thereby enhancing their access to local medical services for both health maintenance and diagnostic treatment [22].

The issue of cross-regional reimbursement has been a topic of extensive discourse in numerous countries globally. Previous studies have shown that the existence of "pro-rich" inequality in the utilization of healthcare services within countries such as the United Kingdom, African nations, India, and European countries [25–31]. In the context of China, research on the immediate reimbursement of treatment across regions remains relatively sparse, and existing studies exhibit inconsistencies. Several scholars have posited that policies facilitating immediate compensation for cross-regional medical treatment mitigate health disparities between less developed and more developed regions. These policies have been shown to enhance the efficiency of diagnostic and treatment processes, improve access to high-quality medical resources, and subsequently reduce the economic burden on patients with relatively lower economic status [25, 32–34]. However, other scholars have contended that immediate reimbursement for cross-regional treatments has significantly altered patients' healthcare-seeking behaviors. High-tier hospitals leverage their superior medical resources to attract a larger patient base, thereby creating a "siphon effect" that exacerbates regional disparities in the distribution of medical resources. Furthermore, the migrant population experiences lower levels of medical reimbursement compared to local residents, which potentially suppresses their utilization of formal medical services [20, 35, 36]. However, beyond the regional disparities in the allocation of medical resources, it is crucial to assess whether ongoing medical reforms can enhance health outcomes for the rural floating population. Investigating this issue is essential for developing

effective strategies to reduce health disparities between urban and rural floating populations in China.

By using two waves of data from the China Migrants Dynamic Survey collected in 2017 and 2018 as well as the administrative data of hospitals, we use a generalized difference-in-differences model to analyze whether immediate reimbursement of medical insurance is more conducive to improving the health status of the rural migrant population, a vulnerable group. The results show that: First, the study's findings indicate that the immediate reimbursement of medical insurance significantly enhances the self-rated health status of the rural floating population and helps reduce the health disparity between urban and rural floating populations. Second, the policy appears to have a more pronounced effect on health promotion for cross-city medical treatment within the same province compared to cross-province medical treatment. The impact of the policy also varies according to the hospital's level. Notably, the strategic deployment of healthcare functions in primary hospitals yields the most substantial health improvements for patients seeking care in different cities within the same province. Third, the impact mechanism analysis reveals that increases in household income and the upgrading of consumption significantly enhance the health status of rural migrant populations. The effective implementation of immediate reimbursement policies, following household income and consumption upgrades, further maximizes health improvement benefits. This effect aligns with the original intent of the immediate reimbursement policy reform, which aims to increase the utilization of medical resources among the floating population. Fourth, the heterogeneous health effects of policies based on varying individual characteristics within the floating population underscore the necessity for policy refinement. This differentiation provides a feasible pathway for the further development and precision of health policies tailored to specific needs.

The contributions of this study are threefold. First, research on the impact of immediate reimbursement settlement policies is relatively limited. Existing studies have primarily focused on the policy implications of direct reimbursements either within provinces or across them. For instance, Yan et al. (2022) suggested that the direct reimbursement settlement policy within provinces significantly reduces catastrophic health expenditures for residents [37]. In contrast, Li et al. (2021) argued that the convenience of cross-provincial direct reimbursement policies in the Yangtze River Delta region has not resulted in a siphoning effect [38]. However, prior research has not framed the comparison of inter-city and inter-provincial direct reimbursements within a unified analytical framework. Our study uniquely integrates the dual impacts of cross-province and cross-city immediate reimbursements into a cohesive research framework, while systematically considering the differential effects of these policies on the tertiary healthcare system. Second, our findings enhance the literature addressing the scarcity of medical resources in low-income and rural areas. Research conducted by Tang et al. (2024), Huo et al. (2023), and Liu et al. (2018) has indicated improvements in various dimensions, including the equity of health insurance rights for urban and rural residents, health disparities, and the accessibility of medical resources, owing to urban–rural health insurance coordination policies [8, 39, 40]. Additionally, Huu and Bui (2024) demonstrated that allocating medical insurance resources to impoverished areas can significantly improve healthcare utilization among the elderly [41]. Despite a wealth of studies focusing on impoverished or rural populations, our research specifically investigates whether immediate reimbursement policies within China's health insurance system enhance the health outcomes of rural migrant populations. By concentrating on individuals enrolled in the New Rural Cooperative Medical Scheme (NRCMS), we enrich the discourse surrounding the effects of cross-regional immediate reimbursement policies on disadvantaged areas and vulnerable groups. Third, this study explores consumption upgrading and income enhancement as dual mechanisms that influence cross-regional immediate reimbursement policies. We propose that the health benefits of these policies are contingent upon the consumption and income levels of the migrant population. Notably, as the income of rural workers who move to urban areas rises, the convenience of health insurance reimbursements increases their inclination to engage in preventive healthcare. Furthermore, we examine individual differences in the health impacts associated with cross-regional immediate medical reimbursements, taking into account six personal characteristics: gender, marital status, age, settlement intention, education level, and health records. Our findings provide substantial theoretical support for the targeted formulation of healthcare policies tailored to diverse populations and offer pathways to advance reforms aimed at achieving equity in medical insurance for urban–rural migrant populations, thereby enhancing the access of rural migrants to urban healthcare services.

Methods

Data Source

This paper uses data from China Migration Dynamics Survey (CMDS) collected in May of 2017 and 2018, using the annual population reports of 31 provinces as the basic sampling frame. The survey is conducted yearly by the National Health Commission using a

probability-proportional-to-size sampling approach, and targets individuals aged 15 and above who have established residence in their current location for over a year. The survey covers various aspects, including demographic information of the floating population and household members, migration patterns and trends, employment and social security, family planning service management, children's mobility and education, psychological well-being, income and expenditure, housing conditions, basic public health services, marriage, and cultural aspects. Additionally, the survey includes specialized studies on social integration and mental health of the floating population, health and family planning services in the areas of origin, and medical and health services for elderly migrants.

From the initial dataset comprising 286,716 entries, to avoid confounding effects of existing urban–rural medical insurance integration policies, we first excluded provinces that had not finalized urban–rural health insurance integration prior to 2017. We retained the data of 11 provinces that had implemented the policies. Furthermore, to investigate the influence of remote healthcare policies on the well-being of the rural floating population, we focused on participants enrolled in public health insurance, including those involved in trans-provincial or trans-urban floating population. Finally, we narrowed the scope of the study sample to 66 cities, comprising a total of 47,803 samples, of which 40,577 indicated that the reason for migration was work.

To evaluate effect for immediate reimbursement for trans-regional treatments, we extracted data on hospitals listed as providing instant reimbursement for inter-provincial inpatients from the Chinese Ministry of Human Resources and Social Security's website in May 2017 and 2018. The objective was to verify if the policy had been adopted in our sample cities prior to the survey. It was observed that immediate reimbursement for trans-regional treatments policy was not universally post-announcement by the central government, with only 48.49% of the 66 hospitals in the sampled cities enacting the policy by May 2017. By the conclusion of May 2018, full implementation was observed across all surveyed cities. We then matched the municipal hospital data with individual-level data based on city and year variables. Finally, we obtained 47,803 samples from 66 cities.

We use the filtered data of the 2017 and 2018 CMDS to analyze the distribution of health status of urban and rural respondents, and the health of the respondents is divided into "Healthy", "Basically healthy", "Unhealthy but not disabled" and "Disabled". "Healthy" refers to someone who occasionally experiences minor health issues, but these do not impact daily life or work. "Basically Healthy" refers to someone who has some health problems that require regular treatment or check-ups but can still perform most daily activities. "Unhealthy but Not Disabled" refers to someone who suffers from significant health issues that affect certain daily activities, but these do not constitute a disability. "Disabled" refers to someone who experiences severe health problems that significantly limit daily life or work capabilities.

Figure 1 indicates that the proportion of healthy individuals in rural areas is 78.97%, which is lower than the 86.66% observed in urban areas. Additionally, the percentages of individuals categorized as "Unhealthy but not disabled" and "Disabled" are higher in rural areas compared to urban areas. It can be seen that there is inequality in the heal status of urban and rural residents.

Variables Definitions

We utilized the responses to the question "Would you say your health is…" as detailed in the CMDS, which offered four choices: "Healthy," "Basically healthy", "Unhealthy but not disabled", and "Disabled" to gauge each participant's health condition.

The core focus of this paper is the implementation of the policy change on immediate reimbursement for trans-regional treatments policy on the rural and urban floating population. Our core explanatory variables are composed of policy indicator variables and grouping indicator variables. To more accurately capture the policy's adoption and impact, we assessed the number of eligible hospitals as policy indicator variable.

We categorize the type of medical insurance purchased as grouping indicator variables, designating the New Rural Cooperative Medical Scheme(NCMS), the insurance for rural residents, as the experimental group. Conversely, "urban employee and resident basic medical insurance" represents the control group. Due to the inconsistency of the implementation time of the urban–rural medical insurance integration in different cities, and the fact that residents may choose to participate in the insurance before the policy, the actual reimbursement ratio after the policy has been consistent with the urban–rural integration, but the name of the insured has not been changed in time. As a result, the data of the control group in this paper includes not only the data type of basic medical insurance for rural and non-working urban residents, but also the data type of urban residents' basic medical insurance before urban–rural medical insurance integration.

On the other hand, the reasons for the specific choice of health insurance type grouping are as follows. Rural migrant workers in urban areas often engage in flexible jobs without formal contracts and are typically covered under the New Rural Cooperative Medical Scheme (NCMS) based on their household registration. Only a small fraction of migrant workers with rural household registration stay in the city for reasons such as attending university. These individuals are more likely to participate in urban medical

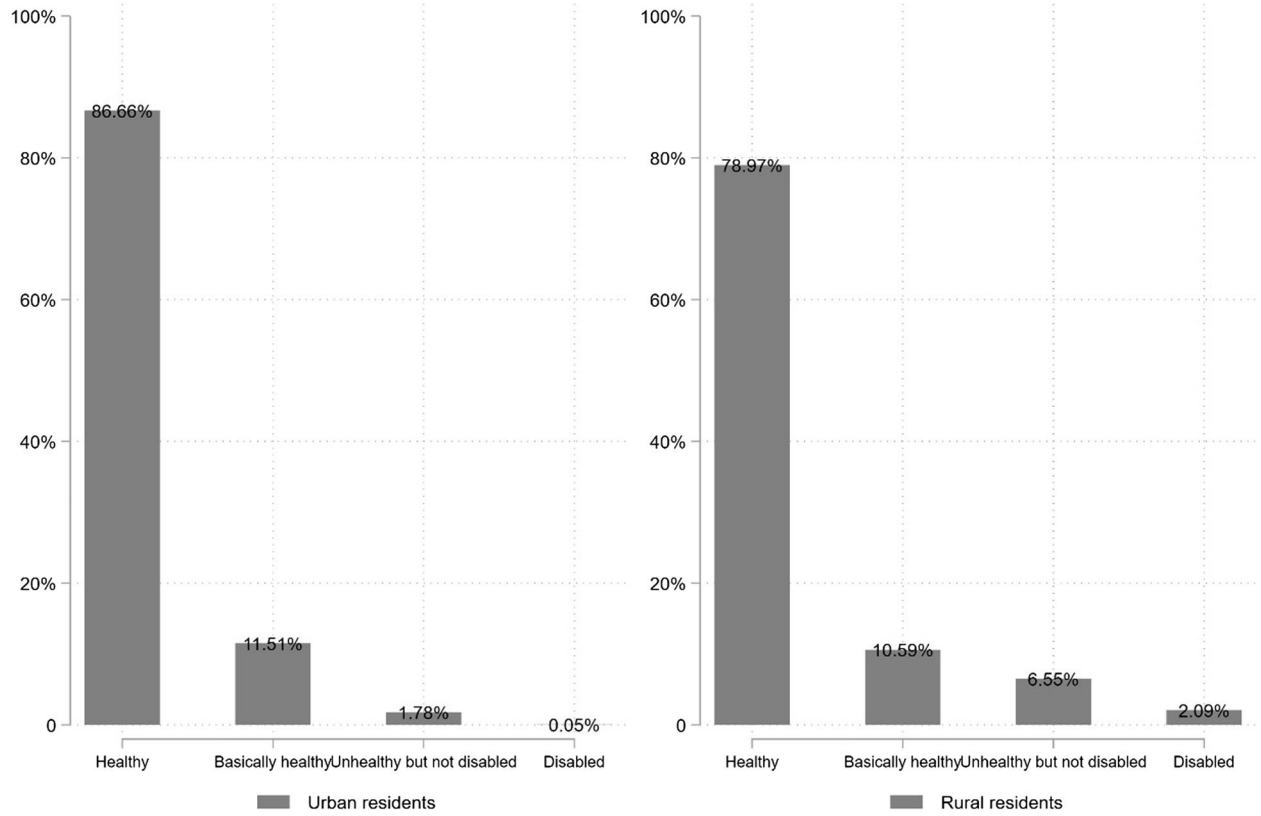

Fig. 1 Health status of urban and rural residents

insurance. Additionally, most inter-city migrants who move for work purposes have stable jobs and are enrolled in urban employee medical insurance, allowing for immediate reimbursement at their current place of residence. As these individuals are enrolled in insurance types, we consider them part of the control group in this study.

Our analysis also controlled for a set of factors that may influenced health statuses [34, 42]. When we conducted the analysis at the individual level, gender, age, marriage status, education level, marital reason, income and expenditure, which were considered potential confounders. Comprehensive definitions and statistical evaluations of all variables are included in Tables 1 and 2.

Model

The reform of immediate reimbursement for trans-regional treatments initiated at the provincial level in our study was implemented by provincial governments. Since the decision to implement this reform is decided by local governments, and the reform is irreversible once it is instituted. Therefore, this policy is an exogenous factor affecting insured individuals. 85% of the samples indicated that the primary reason for migration was work, helping to avoid reverse causality issues. Based on the above analysis, this provides a quasi-experimental research design for our study [38]. Accordingly, starting from the policy of immediate reimbursement for trans-regional treatments, this research takes rural floating population samples as the experimental group and urban insured samples as the control group, the Generalized Difference-in-Differences (DID) method, which can handle data from multiple time periods and multiple treatment groups, enhances analytical flexibility and applicability. Additionally, it better controls for time trends and individual characteristics, thereby reducing potential confounding factors and improving the accuracy of causal inferences. Therefore, this study employs the Generalized DID estimation strategy to assess the impact of the policy on healthcare reform across different regions [45]. The model is formulated as follows:

$$Health_{it} = \alpha + \beta Hospitals_{jt} \times Medicare_{it} + \gamma Hospitals_{it} + \sigma Medicare_{it} + \varphi X_{it} + \tau_t + \varepsilon_{it} \quad (1)$$

Table 1 Variable definition

Variable	Definition
$Health_{it}$	Health status of individual i in year t: "Disabled" = 1, "Unhealthy but not disabled" = 2, "Basically healthy" = 3 and "Healthy" = 4
$Hospitals_{it}$	The number of qualified hospitals in the city of individual i in year t, divided by 100
$Medicare_{it}$	Types of Medicare of individual i in year t: "NCMS" = 1 and "urban employee and residents basic medical insurance" = 0
$Gender_{it}$	Gender of individual i: male = 1 and female = 0
Age_{it}	Age of individual i in year t
$Education_{it}$	The Education level of individual i in year t: "did not attend primary school" = 1, "primary school" = 2, "junior high school" = 3, "high school/technical secondary school" = 4, "college" = 5, "undergraduate" = 6 and "postgraduate" = 7
$Reasons_{it}$	As the frequency of reasons decreases, the value increases. Floating $reasons_{it}$ of individual i in year t: "job" = 1, "business" = 2, "following family members" = 3, "marriage" = 4, "move house" = 5, "find relatives and friends" = 6, "take care of parents" = 7, "take care of children" = 8, "birth" = 9, "retire" = 10 and "else" = 11
$Marriage_{it}$	The marital status of individual i in year t: "married" = 1 and "unmarried" = 2
$Income_{it}$	To mitigate the impact of significant differences between individuals and reduce the magnitude discrepancy with the dependent variable, we use the natural logarithm average monthly household income of individual i in year t [43, 44].In order to exclude the effect of inflation, we use CPI (Consumer Price Index) to obtain real income, the formula is $Income_{it}$ = nominal $income_{it}/CPI_t$
$Expenditure_{it}$	To mitigate the impact of significant differences between individuals and reduce the magnitude discrepancy with the dependent variable, we use the natural logarithm average monthly household expenditure of individual i in year t.In order to exclude the effect of inflation, we use CPI (Consumer Price Index) to obtain real income, the formula is $Expenditure_{it}$ = nominal $expenditure_{it}/CPI_t$

Table 2 Statistical analysis

Variable	Observations	Mean	Standard Error	Min	Max
$Health_{it}$	47,803	3.843	0.420	1	4
$Hospitals_{it}$	47,803	0.434	0.507	0.010	1.840
$Medicare_{it}$	47,803	0.621	0.485	0	1
$Gender_{it}$	47,803	0.511	0.500	0	1
Age_{it}	47,803	36.45	10.50	15	95
$Education_{it}$	47,803	3.475	1.176	1	7
$Reasons_{it}$	47,803	1.720	1.476	1	11
$Marriage_{it}$	47,803	0.836	0.370	0	1
$Income_{it}$	47,722	8.163	0.561	3.878	12.395
$Expenditure_{it}$	47,802	7.462	0.605	1.575	11.049

According to the type of medical insurance purchased, the samples with NCMS are taken as the experimental group, and the samples with urban employee and residents basic medical insurance are taken as the control group ($Medicare_{it}$). Since the immediate reimbursement of provinces and cities is gradually advancing, we use the number of qualified hospitals ($Hospitals_{it}$) to represent the policy effect. The interaction term is used to analyze the difference in the impact of immediate reimbursement on urban and rural samples. β of the interaction item is the key value that this paper focuses on, indicating the impact of implementation immediate reimbursement for trans-regional treatments on health of rural samples, γ indicates the impact of the implementation of immediate reimbursement for trans-regional treatments on health, σ indicates the differences in health differences between urban and rural residents, X_{it} is a vector of control variables.τ_t represent the year fixed effects. ε_{it} is the error term.

Results

Baseline Regression Analysis

Table 3 shows the regression results of the selected samples. The coefficient of the qualified hospital count on the health of trans-provincial samples is 0.032 (Table 3(1)), signifying a 3.2% health improvement for every 100 additional qualified hospitals. This significant upsurge underscores the policy's role in bolstering the health of the floating population. Especially in rural areas, the effect is significant, indicating that the regional gap is narrowed. The regression coefficient of trans-urban samples is 0.048(Table 3(5)), indicating a more substantial health enhancement compared to the regression coefficient of 0.032 for the cross-provincial sample. We divided the qualified hospitals into primary, secondary, and tertiary levels (detailed in Table 3(2)-(4), (6)-(8)). The results show that the increase in the number of qualified hospitals is associated with better health. Especially in secondary and tertiary facilities, the rural sample showed a more significant improvement.

Robustness Analysis

To exclude potential biases from other policies or random factors and to validate the study's accuracy, we applied three robustness tests. First, we performed the DID parallel trend hypothesis test; however, our dataset only spanns two years. Thus, we used pre-policy samples and use model 1 for regression. The resulting non-significant regression (Table 4(1) and (2)) confirms that the

Table 3 Baseline Regression Results

	Trans-provincial treatments				Trans-urban treatments			
	Hospitals	Primary hospitals	Secondary hospitals	Tertiary hospitals	Hospitals	Primary hospitals	Secondary hospitals	Tertiary hospitals
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Hospitals_{it} \times Medicare_{it}$	0.032***	0.055***	0.087***	0.077***	0.048***	0.256**	0.068***	0.087**
	(0.008)	(0.014)	(0.023)	(0.027)	(0.015)	(0.128)	(0.026)	(0.036)
$Hospitals_{it}$	−0.004	−0.015	−0.005	0.002	−0.001	−0.287***	0.009	0.021
	(0.007)	(0.011)	(0.021)	(0.022)	(0.012)	(0.070)	(0.022)	(0.025)
$Medicare_{it}$	−0.004	0.005	−0.003	−0.003	−0.021**	−0.011	−0.016**	−0.018**
	(0.007)	(0.006)	(0.007)	(0.008)	(0.009)	(0.007)	(0.008)	(0.009)
$Gender_{it}$	0.042***	0.042***	0.042***	0.042***	0.030***	0.030***	0.030***	0.030***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Age_{it}	−0.010***	−0.010***	−0.010***	−0.011***	−0.012***	−0.012***	−0.012***	−0.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Education_{it}$	0.018***	0.019***	0.018***	0.018***	0.022***	0.021***	0.022***	0.022***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$Reasons_{it}$	−0.017***	−0.016***	−0.017***	−0.016***	−0.014***	−0.014***	−0.014***	−0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$Marriage_{it}$	0.061***	0.061***	0.061***	0.062***	0.061***	0.059***	0.061***	0.062***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
$Income_{it}$	0.078***	0.078***	0.078***	0.077***	0.128***	0.131***	0.129***	0.128***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
$Expenditure_{it}$	−0.050***	−0.050***	−0.050***	−0.050***	−0.056***	−0.056***	−0.056***	−0.056***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)	(0.008)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.830***	3.827***	3.832***	3.832***	3.515***	3.497***	3.508***	3.514***
	(0.045)	(0.045)	(0.045)	(0.045)	(0.057)	(0.057)	(0.057)	(0.057)
Observations	28,179	28,179	28,179	28,179	19,542	19,542	19,542	19,542
R-squared	0.098	0.098	0.098	0.098	0.147	0.147	0.147	0.147

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The same applies to the following tables

observed health improvements in the selected samples originated from the local policy, satisfying the parallel trend test criteria [46]. Second, we used Propensity Score Matching (PSM) to refine the samples before incorporating them into Eq. (1). The consistent outcomes with previous baseline regressions, shown in Table 4((3)-(6)), reinforce the study's conclusions [34]. Third, considering the immediate reimbursement for trans-provincial treatments, we introduced both province-specific and province-time interaction fixed effects into the model. The results (Table 4(7)-(10)) exhibit significantly positive coefficients for $Hospitals_{it} \times Medicare_{it}$ are significantly positive. The results indicate that regardless of the fixed province effect, or strengthening the control of regional and time factors, the promotion effect of immediate reimbursement for trans-regional treatments on residents' health still exists.

Further Discussion

Mechanism analysis.

We examined the mechanisms of household income and expenditure. Regression analysis presented in Table 5 revealed that these factors significantly bolster the policy's impact, robustly enhancing development within the provincial samples. Immediate reimbursement for trans-regional treatments affects the health of the rural floating population by impacting household income and expenditure. The policy promotes the improvement of health care awareness of floating families with upgraded household income and consumption, and improves the health of residents. The policy enhancs healthcare awareness in floating population through improved income and spending power, thereby bolstering health [47, 48].

Heterogeneity analysis.

Gender heterogeneity.

Table 4 Parallel trend test

	Parallel trend test		PSM-DID (kernel)		PSM-DID (radius)		Province fixed effects		Province × Year	
	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Hospitals_{it} \times Medicare_{it}$	0.098	0.137	0.034***	0.047***	0.032***	0.048***	0.033***	0.027*	0.034***	0.050***
	(0.078)	(0.099)	(0.008)	(0.016)	(0.008)	(0.016)	(0.008)	(0.015)	(0.008)	(0.016)
$Hospitals_{it}$	−0.143**	−0.135*	−0.0085	−0.002	−0.004	−0.001	−0.006	0.015	0.004	−0.017
	(0.068)	(0.074)	(0.007)	(0.013)	(0.007)	(0.013)	(0.008)	(0.014)	(0.012)	(0.014)
$Medicare_{it}$	0.003	−0.026**	−0.005	−0.020**	−0.004	−0.021**	−0.007	−0.014	−0.007	−0.017**
	(0.014)	(0.013)	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.009)
$Gender_{it}$	0.054***	0.038***	0.020***	0.023***	0.042***	0.030***	0.041***	0.034***	0.041***	0.034***
	(0.008)	(0.009)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Age_{it}	−0.012***	−0.015***	0.055***	0.062***	−0.012***	−0.012***	−0.010***	−0.013***	−0.010***	−0.013***
	(0.001)	(0.001)	(0.007)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Education_{it}$	0.026***	0.023***	0.080***	0.132***	0.018***	0.022***	0.017***	0.017***	0.017***	0.017***
	(0.004)	(0.005)	(0.007)	(0.009)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$Reasons_{it}$	−0.016***	−0.006**	−0.052***	−0.058***	−0.017***	−0.014***	−0.018***	−0.010***	−0.018***	−0.010***
	(0.003)	(0.003)	(0.006)	(0.008)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
$Marriage_{it}$	0.070***	0.056***	−0.010***	−0.012***	0.061***	0.061***	0.056***	0.061***	0.056***	0.060***
	(0.012)	(0.013)	(0.000)	(0.000)	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.009)
$Income_{it}$	0.087***	0.158***	0.001	0.001	0.078***	0.128***	0.080***	0.102***	0.079***	0.103***
	(0.011)	(0.014)	(0.000)	(0.001)	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.009)
$Expenditure_{it}$	−0.048***	−0.079***	−0.010***	−0.010***	−0.050***	−0.056***	−0.048***	−0.053***	−0.049***	−0.054***
	(0.009)	(0.012)	(0.002)	(0.002)	(0.006)	(0.008)	(0.006)	(0.008)	(0.006)	(0.008)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Province							Yes	Yes		
Province × Year									Yes	Yes
Constant	3.744**	3.512***	3.907**	3.516***	3.912***	3.481***	3.812***	3.599***	3.828***	3.607***
	(0.081)	(0.102)	(0.043)	(0.077)	(0.051)	(0.060)	(0.051)	(0.062)	(0.050)	(0.067)
Observations	11,829	9,820	28,029	19,416	28,179	19,542	28,179	19,542	28,179	19,542
R-squared	0.114	0.159	0.092	0.145	0.098	0.147	0.101	0.163	0.102	0.165

Notes: In Table 4 ((3)-(4)), we conducted the PSM-DID method. In Panel C, we used a kernel matching at the bandwidth of 0.06. In Table 4 ((5)-(6)), we used a radius matching at the caliper value of 0.1

Table 5 Mechanism analysis of expenditure and income

	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)
$Hospitals_{it} \times Medicare_{it}$	0.396***	0.774***	_	_
$\times Income_{it}$	(0.086)	(0.174)		
$Hospitals_{it} \times Medicare_{it}$	_	_	0.311***	0.514***
$\times Expenditure_{it}$			(0.095)	(0.188)
$Hospitals_{it}$	−0.010	−0.002	0.000	−0.001
	(0.007)	(0.012)	(0.007)	(0.012)
$Medicare_{it}$	−0.009	−0.029***	0.002	−0.016*
	(0.007)	(0.009)	(0.007)	(0.008)
$Gender_{it}$	0.043***	0.033***	0.043***	0.030***
	(0.005)	(0.006)	(0.005)	(0.006)
Age_{it}	−0.011***	−0.013***	−0.010***	−0.012***
	(0.000)	(0.000)	(0.000)	(0.000)
$Education_{it}$	0.021***	0.030***	0.016***	0.021***
	(0.003)	(0.003)	(0.003)	(0.003)
$Reasons_{it}$	−0.018***	−0.014***	−0.018***	−0.015***
	(0.002)	(0.002)	(0.002)	(0.002)
$Marriage_{it}$	0.073***	0.085***	0.050***	0.051***
	(0.007)	(0.009)	(0.007)	(0.009)
$Income_{it}$	−0.008*	0.021***	_	_
	(0.004)	(0.006)		
$Expenditure_{it}$	_	_	0.045***	0.090***
			(0.095)	(0.188)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	4.221***	3.990***	3.711**	3.368***
	(0.044)	(0.071)	(0.044)	(0.058)
Observations	28,179	19,542	28,179	19,542
R-squared	0.092	0.133	0.095	0.144

As shown in columns (1)-(4) of Table 6, the implementation of the policy of immediate reimbursement positively influences both males and females, its impact on females is substantially greater, with trans-provincial and trans-urban differentials at 46% and 103%, respectively. We thus infer a clear gender-based divergence in health outcomes due to policy impacts.

Age heterogeneity.

As shown in columns (1)-(4) of Table 7, the implementation of the policy of immediate reimbursement exerts a pronounced influence on individuals under 60 years old, likely because the policy's effect varies with the age of the floating population. Rural residents floating for non-agricultural work, who typically engage in physical labor, are a major reason for population mobility. Thus, the younger floating labor force, engaged primarily in physical jobs, is more acutely affected by immediate reimbursement policies [49].

Settlement intention heterogeneity.

As shown in columns (1)-(4) of Table 8, the rural floating population intending to settle down is more obviously affected by the policy. In order to maintain a stable physical health for a long time, people who have the willingness to live and work for a long time across provinces or cities are more inclined to pay attention to the changes of policy [50].

Marital status heterogeneity.

As shown in columns (1)-(4) of Table 9, the unmarried floating population, regardless of whether they move across provinces or regions, experiences a greater policy impact. The absence of marital emotional support, which typically aids in stress regulation and imparts positive emotional benefits, significantly affects the health of the unmarried demographic, impacting

Table 6 Heterogeneity analysis of gender category

	Male		Female	
	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)
$Hospitals_{it} \times Medicare_{it}$	0.025**	0.032	0.038***	0.065***
	(0.010)	(0.022)	(0.011)	(0.022)
$Hospitals_{it}$	−0.008	0.008	−0.000	−0.010
	(0.009)	(0.018)	(0.010)	(0.017)
$Medicare_{it}$	−0.003	−0.014	−0.010	−0.028**
	(0.010)	(0.012)	(0.011)	(0.012)
Age_{it}	−0.009***	−0.012***	−0.012***	−0.013***
	(0.000)	(0.001)	(0.001)	(0.001)
$Education_{it}$	0.006*	0.014***	0.027***	0.027***
	(0.003)	(0.004)	(0.004)	(0.004)
$Reasons_{it}$	−0.018***	−0.013***	−0.015***	−0.015***
	(0.004)	(0.004)	(0.003)	(0.003)
$Marriage_{it}$	0.045***	0.072***	0.074***	0.052***
	(0.009)	(0.014)	(0.011)	(0.012)
$Income_{it}$	0.070***	0.123***	0.089***	0.135***
	(0.009)	(0.013)	(0.010)	(0.013)
$Expenditure_{it}$	−0.042***	−0.063***	−0.058***	−0.049***
	(0.007)	(0.011)	(0.009)	(0.011)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	3.890***	3.622***	3.766***	3.372***
	(0.062)	(0.084)	(0.072)	(0.085)
Observations	14,853	9,527	13,326	10,015
R-squared	0.080	0.136	0.117	0.159

their immune response, endocrine balance, and inflammation control [51, 52].

Health education heterogeneity.

As shown in columns (1)-(4) of Table 10, the floating population without a college education or higher is more significantly influenced by the policy. This is because less-educated rural migrant workers tend to be in informal employment, which has a high degree of flexibility and usually participate in the new rural cooperative medical insurance scheme at home, making them more vulnerable to policy changes.

Discussion

The health status of floating population and health inequities have garnered extensive attention worldwide. Scholars generally believe that one of the primary goals of global public health policy development is to narrow health disparities between socioeconomically disadvantaged groups and wealthier populations, and to enhance the accessibility of health care for vulnerable groups. On January 1, 2017, the Chinese government implemented a policy for the immediate reimbursement for trans-provincial treatments. We treated this healthcare policy reform as a quasi-natural experiment, utilizing the 2017 and 2018 CMDS data and hospital management records data, and employed a generalized difference-in-differences model to quantitatively estimate the policy's effects. First, we concluded that compared to the urban floating population who move across provinces, the health status of China's rural floating population has improved. They are now more effectively utilizing hospital services and enjoying an increase in the amount and convenience of medical insurance reimbursements. For the sequence of policy implementation, provinces that have achieved instant reimbursement for medical treatment across different provinces have achieved instant reimbursement in different cities within the province. The health improvement effects for the rural floating population are notably superior for trans-urban medical services compared to cross-provincial services. This effect is more pronounced in primary hospitals, as they provide healthcare functions that more effectively attract the rural floating population

Table 7 Heterogeneity analysis of age category

	Under 60 years old		Over 60 years old	
	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)
$Hospitals_{it} \times Medicare_{it}$	0.026***	0.036**	0.069	0.292
	(0.007)	(0.015)	(0.079)	(0.245)
$Hospitals_{it}$	−0.004	−0.002	−0.050	0.331*
	(0.006)	(0.012)	(0.061)	(0.182)
$Medicare_{it}$	0.015**	0.006	−0.003	−0.023
	(0.007)	(0.008)	(0.082)	(0.093)
$Gender_{it}$	0.019***	0.000	0.102*	0.052
	(0.005)	(0.006)	(0.057)	(0.061)
$Education_{it}$	0.044***	0.048***	0.053*	0.129***
	(0.003)	(0.003)	(0.028)	(0.030)
$Reasons_{it}$	−0.006**	−0.013***	−0.034***	−0.010
	(0.002)	(0.003)	(0.009)	(0.008)
$Marriage_{it}$	−0.035***	−0.036***	0.035	0.083
	(0.006)	(0.008)	(0.076)	(0.079)
$Income_{it}$	0.073***	0.118***	0.250***	0.173***
	(0.007)	(0.009)	(0.051)	(0.049)
$Expenditure_{it}$	−0.041***	−0.057***	−0.181***	−0.047
	(0.006)	(0.008)	(0.054)	(0.050)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	3.397***	3.138***	2.479***	1.811***
	(0.048)	(0.060)	(0.337)	(0.377)
Observations	27,406	18,830	773	712
R-squared	0.028	0.053	0.091	0.121

Notes: Considering the World Health Organization's age categories, we dichotomized our sample at the 60-year threshold

seeking medical services across provinces. The rural floating population tends to prefer secondary and tertiary specialized or comprehensive hospitals when seeking medical services across provinces. Secondly, mechanism analysis indicates that an upgrade in household income or consumer spending can enhance the health improvement effects of the policy. In the heterogeneity analysis of individual characteristics, such as gender difference, marital status, age difference, settlement intention, education level and health record, all lead to the differential effect of policies on health. These results provide nuanced theoretical support for reducing health inequalities. The specific analysis and implications of the obtained results are as follows.

Firstly, a reduction in "pro-rich" inequality among the floating population has been identified, which diverges from the outcomes of prior research [53–55]. The possible reasons are as follows: (1) Prior to the implementation of the immediate reimbursement for trans-regional treatments, individuals were required to personally advance payment for medical expenses when seeking care across provinces or cities. Residents of rural areas may have been unable to access high-quality medical services due to the burden of upfront payments. Following the implementation of immediate reimbursement for trans-regional treatments, the burden of seeking medical treatment for insured individuals has been significantly reduced. It means that the quantity and quality of medical services accessible to residents in rural areas have notably improved, leading to an enhanced level of health. (2) The effect of immediate reimbursement for trans-urban treatments has been more pronounced in primary hospitals, signifying the burgeoning success of the tiered medical service system. This conclusion is consistent with the findings of Gao et al. (2023). The health awareness among rural floating workers within provinces has increased. However, the permanent residences of the rural floating population across provinces are often located far from their registered household locations, resulting in the neglect of healthcare in pursuit of higher work wages.

Table 8 Heterogeneity analysis of settlement intention

	Willingness to settle down		No will to settle down	
	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)
$Hospitals_{it} \times Medicare_{it}$	0.041**	0.062*	0.015	−0.004
	(0.017)	(0.035)	(0.013)	(0.030)
$Hospitals_{it}$	−0.010	0.053***	−0.000	−0.031
	(0.012)	(0.018)	(0.011)	(0.025)
$Medicare_{it}$	−0.034*	−0.050**	0.001	0.021
	(0.020)	(0.020)	(0.012)	(0.019)
$Gender_{it}$	0.044***	0.018*	0.039***	0.034***
	(0.012)	(0.011)	(0.008)	(0.011)
Age_{it}	−0.013***	−0.014***	−0.008***	−0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
$Education_{it}$	0.011*	0.013**	0.012***	0.017***
	(0.006)	(0.005)	(0.004)	(0.006)
$Reasons_{it}$	−0.013***	−0.021***	−0.013***	−0.005
	(0.005)	(0.005)	(0.005)	(0.005)
$Marriage_{it}$	0.081***	0.081***	0.032***	0.022
	(0.023)	(0.021)	(0.010)	(0.017)
$Income_{it}$	0.105***	0.138***	0.049***	0.070***
	(0.017)	(0.016)	(0.011)	(0.019)
$Expenditure_{it}$	−0.076***	−0.053***	−0.039***	−0.044***
	(0.016)	(0.015)	(0.009)	(0.017)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	3.911***	3.474***	3.958***	3.771***
	(0.117)	(0.115)	(0.079)	(0.122)
Observations	4,178	5,195	9,080	4,199
R-squared	0.149	0.200	0.056	0.061

Consequently, the healthcare role of primary hospitals is limited. Furthermore, in China, there is a prevalent belief that hospitalization signals severe illness that can only be adequately treated in high-level hospitals. For this kind of disease, the treatment effect of specialized hospitals and general hospitals are significantly better [56, 57].

Secondly, given the long-standing debate over the equalizing effect of health insurance on healthcare access for urban and rural residents, it is essential to consider the continuous refinement of China's medical reimbursement system in recent years. These improvements in the medical system have more effectively facilitated health enhancements for groups with a lower socio-economic status. In 2016, the urban–rural medical insurance integration schemes were implemented, applying unified standards for premium contributions, drug formularies, designated hospitals, and reimbursement policies for both urban and rural residents. This integration has significantly elevated the level of medical insurance integration for NCMS enrollees, increasing the equity of medical insurance rights for both urban and rural residents [8, 40]. Before the implementation of cross-regional instant reimbursement in China, individuals were required to obtain administrative approval from the medical security administration in their region of participation. Subsequently, they had to seek treatment at a designated medical institution in their current place of residence and pay all medical expenses upfront. Finally, they needed to return to the medical security administration department in their insured area to complete the necessary reimbursement procedures. This process significantly increased the cost and burden of diagnosis and treatment for the transient population. Using cross-regional instant reimbursement as a quasi-natural experiment, we investigate the varying timelines of urban and rural health insurance integration across different provinces and cities. This study focuses on regions that have fully integrated urban and rural health insurance,

Table 9 Heterogeneity analysis of Marital status

	Married		Unmarried	
	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)
$Hospitals_{it} \times Medicare_{it}$	0.031***	0.036**	0.033*	0.095***
	(0.008)	(0.017)	(0.018)	(0.034)
$Hospitals_{it}$	−0.003	0.000	−0.005	−0.001
	(0.007)	(0.014)	(0.015)	(0.025)
$Medicare_{it}$	−0.002	−0.014	−0.008	−0.051**
	(0.008)	(0.009)	(0.014)	(0.020)
$Gender_{it}$	0.042***	0.033***	0.046***	0.017
	(0.005)	(0.007)	(0.010)	(0.013)
Age_{it}	−0.011***	−0.012***	−0.010***	−0.014***
	(0.000)	(0.000)	(0.001)	(0.001)
$Education_{it}$	0.016***	0.020***	0.027***	0.028***
	(0.003)	(0.003)	(0.005)	(0.007)
$Reasons_{it}$	−0.018***	−0.014***	−0.010**	−0.012**
	(0.003)	(0.003)	(0.005)	(0.005)
$Income_{it}$	0.084***	0.134***	0.049***	0.109***
	(0.008)	(0.010)	(0.013)	(0.023)
$Expenditure_{it}$	−0.055***	−0.055***	−0.027***	−0.058***
	(0.007)	(0.009)	(0.010)	(0.018)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	3.887***	3.489***	3.916***	3.842***
	(0.057)	(0.072)	(0.102)	(0.194)
Observations	23,524	16,401	4,655	3,141
R-squared	0.093	0.134	0.126	0.223

examining the health issues related to cross-regional instant reimbursement for immgrations. The purpose is to effectively exclude the health impact of urban–rural medical insurance integration policies on the mobile population, facilitating a more accurate comparison of the health status between rural residents who are on the move and urban residents. In the wake of China's economic reforms and opening up, a large number of the rural floating population have moved to non-agricultural jobs in cities with better economic development. With the introduction of instant reimbursement, the insured individuals to utilize medical treatments and services at uninsured locations. This system delineates the coverage and relevant provisions for the direct settlement of medical expenses incurred by insured individuals in different regions. Specifically, it includes coverage for basic medical insurance drugs, medical service items, and medical consumables. Additionally, the reimbursement scope for medical insurance in the context of cross-regional direct settlement adheres to the regulations established by the location where the medical treatment is received [34]. The implementation of immediate reimbursement has significantly shortened the time required for claims. This reduction in the need for the "pay first, reimburse later" claims process has alleviated the constraints on residents' utilization of high-quality medical resources. This vulnerable group is now able to receive medical services more promptly, helping reduce the actual cost of medical treatment and contributing to an improvement in their health status [35, 58].

Finally, we have discovered that an increase in family income and consumption upgrades can heighten health level among the rural mobile population. Optimizing the health benefits derived from the immediate reimbursement policy following the enhancement of family income and consumption is crucial for achieving the primary goals of the cross-provincial medical treatment reimbursement reform. We propose that with the increase in income among the rural migrant population, the facilitation of medical insurance reimbursement will enhance their focus on health care. This shift is expected to lead to a greater inclination towards preventive care and

Table 10 Heterogeneity analysis of education

	College degree or above		Did not have college degree	
	Trans-provincial treatments	Trans-urban treatments	Trans-provincial treatments	Trans-urban treatments
	(1)	(2)	(3)	(4)
$Hospitals_{it} \times Medicare_{it}$	0.026	−0.050	0.032***	0.038*
	(0.016)	(0.034)	(0.011)	(0.019)
$Hospitals_{it}$	−0.003	−0.022	0.003	0.016
	(0.010)	(0.016)	(0.009)	(0.017)
$Medicare_{it}$	−0.015	0.009	−0.016**	−0.046***
	(0.014)	(0.014)	(0.008)	(0.011)
$Gender_{it}$	0.017*	0.003	0.049***	0.037***
	(0.009)	(0.008)	(0.005)	(0.007)
Age_{it}	−0.009***	−0.007***	−0.011***	−0.014***
	(0.001)	(0.001)	(0.000)	(0.000)
$Reasons_{it}$	−0.004	−0.006*	−0.019***	−0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
$Marriage_{it}$	0.048***	0.033***	0.062***	0.060***
	(0.012)	(0.011)	(0.008)	(0.012)
$Income_{it}$	0.028**	0.028**	0.090***	0.167***
	(0.011)	(0.011)	(0.007)	(0.011)
$Expenditure_{it}$	−0.038***	−0.041***	−0.048***	−0.056***
	(0.010)	(0.010)	(0.006)	(0.010)
Year fixed effects	Yes	Yes	Yes	Yes
Constant	4.222***	4.177***	3.8248***	3.275***
	(0.081)	(0.077)	(0.057)	(0.072)
Observations	4,040	4,990	24,139	14,552
R-squared	0.055	0.033	0.097	0.155

timely treatment of minor ailments. Consequently, the improvement in health outcomes can be observed across both primary and secondary healthcare facilities. In the heterogeneity analysis, (1) we found that the policy has a more significant impact on women, possibly due to their physiological advantages and stronger health consciousness compared to men [35]. In particular, the increasing sense of independence among women has prompted them to pay more attention to their physical and mental health and the impact of changes in health insurance policies. (2) The policy's effect varies with the age of the floating population. Rural residents migrating for non-agricultural work, who typically engage in physical labor, are a major driver of population mobility. Consequently, the immediate reimbursement policy has a more pronounced impact on those under 60 years of age. (3) Rural floating population with a desire to settle are significantly affected. Individuals intending to reside or work across provinces or cities for extended periods, aiming to maintain stable health over the long term, are more inclined to pay attention to the dynamic changes in health insurance. (4) Members of floating population with specialized or undergraduate and higher education levels often secure jobs that match their qualifications and are accompanied by formal labor contracts or positions within institutional frameworks. This group is mostly covered by urban employee medical insurance in their workplace, thus they fall under the local reimbursement category of medical insurance. In contrast, floating workers from rural areas with educational levels below a technical diploma tend to engage in non-agricultural employment characterized by high flexibility and the absence of formal labor contracts. This demographic predominantly secures health insurance in their place of household registration, making them more susceptible to the impact of policies pertaining to immediate reimbursement for trans-regional treatments. (5) The unmarried population is more visibly affected by the policy. The unmarried floating population often lacks emotional support in different places. Deprived of the companionship and care of a spouse and children, they frequently face isolation. This circumstance compels these individuals to pay greater attention

to changes in their own health status, thereby amplifying the visible health benefits yielded by relevant policies.

This paper outlines directions for formulating related policy suggestions across three key aspects. Firstly, our findings indicate an improvement in the health status of the rural floating population and enhanced accessibility to medical resources across various levels of hospitals. Therefore, the medical insurance policy for hospital services should be further refined to include outpatient services, with a particular focus on immediate reimbursement for inter-urban treatments. These should be integrated into a provincial-level medical insurance coordination system.. For rural migrant workers in the city, on the one hand, the scope of medicines covered under the medical insurance sheme should be expanded, especially by increasing the options for chronic and malignant diseases at primary healthcare institutions. On the other hand, On the other hand, considering the fact that non-migrants in EU countries use screening services and specialized care more frequently than migrant populations, China should further provide free regular medical check-ups for migrant populations and establish health records for them, in order to reduce the inequality in access to preventive health services [42]. Particularly in the transformation of cross-province medical treatment, the approach should shift from forced medical treatment to preventive medical care for migrant workers. This shift would better leverage the functions and roles of hospitals at all levels. Additionally, we have observed a significant increase in household health expenditures following income growth. This observation suggests that we should further raise the proportion of immediate reimbursement for trans-regional treatments, thereby reducing the likelihood of impoverishment due to illness among the low-income population. For example, governmental agencies could adopt measures to lower the deductible standards for immediate reimbursement for trans-regional treatments. Specifically for the New Cooperative Medical Scheme (NCMS), it is recommended to increase the outpatient and inpatient reimbursement ratios for immediate reimbursement of trans-regional treatments, ultimately aim to standardize the reimbursement ratios across both the insured's location and the location of medical treatment. Thirdly, we propose leveraging health policies from other developed nations to address the unique health challenges faced by immigrant populations. For instance, in the United Kingdom, immigrant ethnic minorities are integrated into general health programs targeting prevalent health issues within the broader population. This approach facilitates early identification and mitigation of disease risk factors among immigrants. Similarly, Italy adapts its existing health programs to accommodate the linguistic, social, and cultural characteristics of its immigrant populations, thereby addressing barriers to accessing preventive and treatment services [59]. We advocate for a reinforced focus on 'timely medical treatment, early prevention of minor ailments, and proactive insurance coverage'. This strategy is crucial for reducing the prevalence of major diseases among the transient rural population in China, particularly among unmarried individuals, those living alone, retirees, and men with limited health awareness. Fourth, To further enhance the allocation and management of residents'health resources, it is imperative for government departments to streamline administrative procedures and bolster oversight regarding healthcare expenditures, service quality, and reimbursement rates for the floating population. Drawing on Spain's integration of discrimination factors—such as country of origin, citizenship, and healthcare access—into national health surveys, this approach aims to identify and address health disparities among rural migrants [59]. This will ensure the sustainability of the medical insurance fund for the floating population and guarantee that they receive equal medical services.

Limitations

Our research is limited by the availability of data. If more suitable data becomes available in the future, these problems may be better addressed. On the one hand, the CMDS data is only available up to 2018. Since the policy of our research began in 2017, we only used the data from 2017 and 2018 to evaluate the policy's effect, making it difficult to observe its long-term impact. In particular, it is difficult to observe the social effects of China's implementation of the cross-regional direct outpatient settlement policy. On the other hand, the questions regarding the utilization of health care services for the floating population in the questionnaire change slightly every year, which contrains us in selecting data years and indicators of health care service utilization. For example, we want to further explore the urban–rural difference in the use of medical resources by policies, which is not always available in the CMDS database in 2017 and 2018.Third, the research object of CMDS database is the floating population, which makes our control group unable to include the non-floating local residents who enjoy medical insurance for urban workers, so it is difficult to make a comparative analysis of the health of the floating population and local non-floating residents.

Conclusion

This paper has revealed that the policy of immediate reimbursement for trans-regional treatments significantly improves the health status of the rural floating

population. The results indicate that the health benefits for the rural floating population are more significant when obtaining immediate reimbursement for trans-provincial compared to trans-urban treatments. This effect is particularly notable in the provision of healthcare at primary hospitals. Mechanism analysis reveals that family income and consumption upgrades are moderating factors that amplify the effects of immediate reimbursement. Heterogeneity analysis reveals that the impact of immediate reimbursement is notably more pronounced among female floating population, the non-retired cohort, individuals with lower educational attainment, those with a desire for long-term residence, and the unmarried population. These conclusions offer important empirical support for the standardization of basic public medical and health services and for breaking down the barriers to medical insurance between urban and rural areas.

Authors' contributions

Jun Tian contributed to the study conception and design. Jun Tian, Zuopeng Chen wrote the first draft. Zuopeng Chen and Yu Wang conducted the statistical analyses. Jun Tian and Yu Wang contributed to the interpretation of the results.Zhu Yue proofread and modified the text. All authors reviewed, edited, read and approved the manuscript.

Funding

This paper was funded by Philosophy and Social Science Research Foundation for University of Jiangsu Province (2023SJYB0294), Heilongjiang Provincial Philosophy and Social Science Planning Project (23 JLC094, 24JYC020) and Heilongjiang doctoral Dissertation Funding Program (LJYXL2022-095), China Postdoctoral Science Foundation Program (2024MD763977). Heilongjiang Province "Double First-Class" Discipline Collaborative Innovation Achievement Project (LJGXCG2022-060).

Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to the data confidentiality agreement, but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

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.

Competing interests

The authors declare no competing interests.

Author details

[1]School of Economics and Business Administration, Heilongjiang University, Harbin, China. [2]School of Health Policy and Management, Nanjing Medical University, Nanjing, China. [3]Law School, Heilongjiang University, Harbin, China.

Received: 22 May 2024 Accepted: 2 May 2025
Published online: 17 May 2025

References

1. McCartney G, Popham F, McMaster R, et al. Defining health and health inequalities[J]. Public Health. 2019;172:22–30.
2. Reidpath DD, Allotey P. Measuring global health inequity[J]. Int J Equity Health. 2007;6:1–7.
3. Braveman PA, Kumanyika S, Fielding J, et al. Health disparities and health equity: the issue is justice[J]. Am J Public Health. 2011;101(S1):S149–55.
4. Diao L, Liu Y. Inequity under equality: research on the benefits equity of Chinese basic medical insurance[J]. BMC Health Services Research. 2020;20:1–11.
5. Ren Y, Zhou Z, Cao D, et al. Did the integrated urban and rural resident basic medical insurance improve benefit equity in China?[J]. Value in Health. 2022;25(9):1548–58.
6. Liu H, Hu T. Evaluating the long-term care insurance policy from medical expenses and health security equity perspective: evidence from China[J]. Arch Pub Health. 2022;80(1):3.
7. Zhu K, Zhang L, Yuan S, et al. Health financing and integration of urban and rural residents' basic medical insurance systems in China[J]. Int J Equity Health. 2017;16:1–8.
8. Huo J, Hu M, Li S. The impact of urban–rural medical insurance integration on medical impoverishment: evidence from China[J]. Int J Equity Health. 2023;22(1):245.
9. Su D, Chen Y, Gao H, et al. Effect of integrated urban and rural residents medical insurance on the utilisation of medical services by residents in China: a propensity score matching with difference-in-differences regression approach[J]. BMJ Open. 2019;9(2):e026408.
10. Chen M, Canudas-Romo V. Urban–rural lifespan disparities and cause-deleted analysis: evidence from China[J]. BMJ Open. 2022;12(2):e050707.
11. Bairoliya N, Miller R. Social insurance, demographics, and rural-urban migration in China[J]. Reg Sci Urban Econ. 2021;91:103615.
12. Heger I. More than "Peasants without Land": Individualisation and identity formation of landless peasants in the process of China's State-Led Rural Urbanisation[J]. J Curr Chin Aff. 2020;49(3):332–56.
13. Hao P, He S. What is holding farmers back? Endowments and mobility choice of rural citizens in China[J]. J Rural Stud. 2022;89:66–72.
14. Wang X, Chan CKC, Yang L. Economic restructuring and migrant workers' coping strategies in China's Pearl River Delta[J]. Third World Q. 2021;42(4):812–30.
15. Lei X, Lin W. The New Cooperative Medical Scheme in rural China: does more coverage mean more service and better health?[J]. Health econ. 2009;18(S2):S25–46.
16. Wagstaff A, Lindelow M, Jun G, et al. Extending health insurance to the rural population: an impact evaluation of China's new cooperative medical scheme[J]. J health econ. 2009;28(1):1–19.
17. Yip W, Hsiao WC. Non-evidence-based policy: how effective is China's new cooperative medical scheme in reducing medical impoverishment?[J]. Soc sci med. 2009;68(2):201–9.
18. Pan L, Li G, Wan H. Does improving basic public health services promote household consumption of rural migrant workers? Evidence from China[J]. Front Public Health. 2024;11:1308297.
19. Sun J L, Tao R, Wang L, et al. Does social medical insurance achieve a poverty reduction effect in China?[J]. Front Public Health. 2022;9:800852.
20. Wang P, Cheng L, Li Y, et al. Factors and key problems influencing insured's poor perceptions of convenience of basic medical insurance: a mixed methods research of a northern city in China[J]. BMC Public Health. 2023;23(1):1066.
21. Liang C, Zhao Y, Yu C, et al. Hierarchical medical system and local medical performance: A quasi-natural experiment evaluation in Shanghai, China[J]. Front Public Health. 2022;10:904384.
22. Zhou D, Cheng L, Wu H. The impact of public health education on migrant workers' medical service utilization[J]. Int J Environ Res Public Health. 2022;19(23):15879.
23. Fu Y, Lin W, Yang Y, et al. Analysis of diverse factors influencing the health status as well as medical and health service utilization in the floating elderly of China[J]. BMC Health Ser Res. 2021;21(1):438.
24. Chen S, Chen Y, Feng Z, et al. Barriers of effective health insurance coverage for rural-to-urban migrant workers in China: a systematic review and policy gap analysis[J]. BMC Public Health. 2020;20:1–16.
25. Zhang B, Wang H, Zhang H, et al. The influence of cross-regional medical treatment on total medical expenses, medical insurance payments, and out-of-pocket expenses of patients with malignant tumors in Chinese low-income areas[J]. Cost Eff Resour Alloc. 2022;20(1):35.
26. Ge J, Chang F. Implications of EU's Cross-border Healthcare on China's Medical Treatment Beyond pooling regions. China J Pharm Econ. 2019;14(3):120–8.

27. Nana G, Hongbing H, Aolong L. The Effect of Direct Settlement of Medical Insurance for Nonlocal Medical Treatment on Residents' Health[J]. J Financ Econ. 2023;49(06):94–108.
28. Van Doorslaer E, Wagstaff A, Bleichrodt H, et al. Income-related inequalities in health: some international comparisons[J]. J health econ. 1997;16(1):93–112.
29. Castro-Leal F, Dayton J, Demery L. Public spending on health care in Africa: do the poor benefit?[J]. Bull World Health Organ. 2000;78(1):66–74.
30. Channon AA, Andrade MV, Noronha K, et al. Inpatient care of the elderly in Brazil and India: Assessing social inequalities[J]. Soc sci med. 2012;75(12):2394–402.
31. Allin S, Masseria C, Mossialos E. Equity in health care use among older people in the UK: an analysis of panel data[J]. Appl Econ. 2011;43(18):2229–39.
32. Carrieri V, Wübker A. Assessing inequalities in preventive care use in Europe[J]. Health Policy. 2013;113(3):247–57.
33. Song T, Ma R, Zhang X, et al. Analysis of the current status and influencing factors of cross-regional hospitalization services utilization by basic medical insurance participants in China— taking a central province as an example[J]. Front Public Health. 2023;11:1246982.
34. He W. Does the immediate reimbursement of medical insurance reduce the socioeconomic inequality in health among the floating population? Evidence from China[J]. Int J Equity Health. 2023;22(1):96.
35. Zhou M, Zhang L, Liang Y, et al. The effect of trans-provincial immediate reimbursement for healthcare expenses on inequity in the utilization of healthcare services for migrants[J]. Int J Equity Health. 2024;23(1):1–9.
36. Li L, Zhou Q, Yin T, et al. Does the direct settlement policy of trans-provincial outpatient expenses aggravate the siphoning effect? An empirical study on yangtze river delta, China[J]. Int J environ res public health. 2021;18(19):10001.
37. Pan Y, Zhong W, Yin R, et al. Does direct settlement of intra-province medical reimbursements improve financial protection among middle-aged and elderly population in China? Evidence based on CHARLS data[J]. Soc Sci Med. 2022;308:115187.
38. Li L, Liu B. Spatial price differences of medical services: evidence from the Yangtze River Delta in China[J]. BMC Health Serv Res. 2023;23(1):761.
39. Tang Y, Fu R, Noguchi H. Impact of medical insurance integration on reducing urban-rural health disparity: evidence from China[J]. Soc Sci Med. 2024;357:117163.
40. Liu P, Guo W, Liu H, et al. The integration of urban and rural medical insurance to reduce the rural medical burden in China: a case study of a county in Baoji City[J]. BMC Health Serv Res. 2018;18:1–9.
41. Huu KP, Bui T. The healthcare support program and healthcare utilization of older adults in ethnic minority areas in Vietnam[J]. Soc Sci Med. 2024;361:117357.
42. Graetz V, Rechel B, Groot W, et al. Utilization of health care services by migrants in Europe—a systematic literature review[J]. Br med bull. 2017;121(1):5–18.
43. Liu T, Wang J. Bringing city size in understanding the permanent settlement intention of rural–urban migrants in China[J]. Population, Space and Place. 2020;26(4):e2295.
44. Zhou M, Zhang L, Liang Y, et al. The effect of trans-provincial immediate reimbursement for healthcare expenses on inequity in the utilization of healthcare services for migrants[J]. Int J Equity Health. 2024;23(1):49.
45. Moser P, Voena A. Compulsory licensing: Evidence from the trading with the enemy act[J]. Amer Econ Rev. 2012;102(1):396–427.
46. Qian N. Missing women and the price of tea in China: The effect of sex-specific earnings on sex imbalance[J]. Q J econ. 2008;123(3):1251–85.
47. Cavalcanti T, Da Mata D, Toscani F. Winning the oil lottery: The impact of natural resource extraction on growth[J]. J Econ Growth. 2019;24:79–115.
48. Thomson RM, Igelström E, Purba AK, et al. How do income changes impact on mental health and wellbeing for working-age adults? A systematic review and meta-analysis[J]. The Lancet Public Health. 2022;7(6):e515–28.
49. Qin W, Xu L, Wu S, et al. Income, relative deprivation and the self-rated health of older people in urban and rural China[J]. Front public health. 2021;9:658649.
50. Han Y, He Y, Lyu J, et al. Aging in China: perspectives on public health[J]. Glob Health J. 2020;4(1):11–7.
51. Golden SD, Earp JAL. Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions[J]. Health educ behav. 2012;39(3):364–72.
52. Wells JL, Haase CM, Rothwell ES, et al. Positivity resonance in long-term married couples: Multimodal characteristics and consequences for health and longevity[J]. J Pers Soc Psychol. 2022;123(5):983.
53. Robards J, Evandrou M, Falkingham J, et al. Marital status, health and mortality[J]. Maturitas. 2012;73(4):295–9.
54. Carnazza G, Liberati P, Resce G. Income-related inequality in smoking habits: a comparative assessment in the European Union[J]. Health Policy. 2023;128:34–41.
55. Shang XT, Wei ZH. Socio-economic inequalities in health among older adults in China[J]. Public Health. 2023;214:146–52.
56. Dou G, Wang Q, Ying X. Reducing the medical economic burden of health insurance in China: achievements and challenges[J]. Biosci trends. 2018;12(3):215–9.
57. Zhou Y, Wushouer H, Vuillermin D, et al. Medical insurance and healthcare utilization among the middle-aged and elderly in China: evidence from the China health and retirement longitudinal study 2011, 2013 and 2015[J]. BMC health serv res. 2020;20:1–9.
58. Guan M. Should the poor have no medicines to cure? A study on the association between social class and social security among the rural migrant workers in urban China[J]. Int J Equity Health. 2017;16:1–14.
59. Vázquez ML, Terraza-Núñez R, Vargas I, et al. Health policies for migrant populations in three European countries: England; Italy and Spain[J]. Health Policy. 2011;101(1):70–8.

Publisher's Note