Does the integration of urban and rural health insurance influence the functional limitations of the middle-aged and elderly in rural China?

Haijun Hao, Yeong Hun Yeo [*]

Department of Social Welfare, Jeonbuk National University, South Korea

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ABSTRACT

In January 2016, the Chinese government integrated the two systems of urban resident basic medical insurance and new rural cooperative medical system to establish a unified Urban and Rural Resident Medical Insurance. The integration of medical insurance is purported to enhance access for the rural population; however, a dearth of literature exists regarding its effect on functional impairment among middle-aged and elderly residing in rural areas. This study aims to evaluate the impact of urban-rural health insurance integration on functional limitation among middle-aged and elderly individuals in rural China. A longitudinal survey was conducted among 7855 middle-aged and elderly individuals in rural China. Using a nonequivalent control group pretest-posttest design, we exploit these policy changes to evaluate their impact on middle-aged and elderly individuals' functional limitation. The results showed that the integration of urban and rural health insurance systems was significantly associated with reduced functional limitation (Odds ratio .742; 95%CI 0.603, 0.914) among middle-aged and elderly individuals in rural China. Our findings also indicate that prevalent behaviors such as tobacco use, and alcohol consumption may exacerbate functional limitation among middle-aged and elderly individuals. These findings suggest that the integration of urban and rural health insurance systems can have a positive impact on the functional limitation of middle-aged and elderly individuals in rural China and could be an important factor in improving the health and well-being of middle-aged and elderly individuals in rural areas.

1. Introduction

Social health insurance is widely recognized as playing a crucial role in facilitating universal health coverage in low and middle-income countries (Gertler, 1998; Giedion et al., 2013; Palmer, 2014; Wagstaff, Lindelow, et al., 2009). In 2005, the World Health Organization (WHO) established a resolution committing to the pursuit of universal health coverage, encompassing three key dimensions: population coverage, service coverage, and cost coverage (World Health Organization, 2005, p. 58). In an effort to attain this objective, various low and middle-income countries, such as China, Philippines, India, and Mexico, had initiated reforms of their health insurance systems (Acharya et al., 2013; Galárraga et al., 2010; Lagomarsino et al., 2012; Spaan et al., 2012).

China's rapid urbanization in recent decades has led to significant disparities in access to healthcare between urban and rural areas (Gong et at.,2012). The urban population has generally had greater access to healthcare resources and services, while the rural population has often faced barriers to accessing care (Ma & Oshio, 2020; Meng et al., 2015;

Yip et al., 2019). Prior to 2016, social health insurance in China was characterized by a clear divide between rural and urban areas, with the new rural cooperative medical system (NRCMS) serving as the primary form of medical insurance for rural residents, the urban employee basic medical insurance (UEBMI) and the urban resident basic medical insurance (URBMI) for urban residents and employees (Liu et al., 2017). However, a clear differentiation can be observed in the literature regarding the coverage and reimbursement rates of the three types of insurance.

The NRCMS was first proposed by the Chinese government in 2002 and has been implemented nationwide since 2003, providing a useful reference for the promotion of the NRCMS in China through the summation of experiences in pilot areas (Dib et al., 2008; You & Kobayashi, 2009). In 2005, 122 million farmers received NRCMS reimbursement subsidies. In response to the World Health Organization's initiative of universal health coverage, the NRCMS has been rapidly promoted in rural China since 2005(Wang, 2007; Meng & Xu, 2014). By the end of 2009, approximately 94% of the rural population was covered by the NRCMS (Shi & Zhang, 2013). This system has several key features: first,

the responsibility for financing is shared, with funds coming from individual contributions, collective support, and government funding. The current government subsidy per capita for the NRCMS is 550 yuan per year, which is an increase of 30 yuan from 2020(National Medical Security Administration of China, 2023). Second, the principle of voluntary participation is applied, meaning that there is no compulsory participation. Third, the major diseases are mainly coordinated, primarily to protect participants from large medical expenses or hospitalization costs. Fourth, the coordination is generally low, with most counties implementing the county medical system at the county (city) level (Lei & Lin, 2009; Yip & Hsiao, 2009).

The UEBMI system was first introduced as a pilot program in the Two Rivers region of China in 1994, prior to its official implementation in 1998. In compliance with the mandate, UEBMI is mandatory for all urban employees and retirees in China. In 2016, the system had provided coverage to a total of 295 million individuals (Huang & Gan, 2017). The premium for UEBMI is determined as 8% of an individual's salary, which is divided between the employer (6%) and the employee (2%) and is paid monthly. Retirees are not required to pay premiums, with the cost being borne by the employees instead (Su et al., 2019; Yan et al., 2022). The funds for UEBMI are composed of both pooled funds and personal accounts. Personal payments and 30% of the employer's payment for UEBMI are deposited into personal accounts, used for outpatient expenses, while the remaining payments are directed towards a pooled fund, which is used for inpatient reimbursements (Liu et al., 2023).

The URBMI is a healthcare insurance system primarily designed for urban residents who are minors (including children and adolescents, primary and secondary school students) not covered by urban employee medical insurance and non-working individuals (including university students) in urban areas (Liu & Zhao, 2014; Wagstaff, Yip, et al., 2009). This insurance system offers a low level of protection and primarily covers inpatient and outpatient major medical needs for the insured. The financing for this insurance is shared by family contributions and local government subsidies. The urban residents' medical insurance system is characterized by its local government led nature, with a focus on mutual assistance and non-profit principles. It offers coverage to a wide range of individuals, including children and teenagers to the elderly, and the financing responsibility is shared between family contributions and local government subsidies (Chen et al., 2014). The local government also subsidizes the family's contribution for both outpatient and inpatient services and provides free insurance for disabled individuals unable to work, low-income individuals, and elderly individuals over the age of 60 in low-income families, with the cost being fully subsidized by the local government. This insurance system is also convenient for insured individuals as they only need to pay the personal portion of medical expenses, with the remainder being reimbursed by the medical insurance fund, eliminating the need for individuals to pay upfront and seek reimbursement later (Pan et al., 2016). Empirical evidence from 2013 suggests that the reimbursement rates for the UEBMI, URBMI, and NRCMS were approximately 85%, 60%, and 50%, respectively (Lin et al., 2017; Su et al., 2019; Zhu et al., 2017). These findings indicate that the compensation levels for URBMI and NRCMS were significantly lower in comparison to those of UEBMI. According to estimates, by 2018, a total of 1.35 billion individuals had participated in these three programs, representing a substantial proportion of China's population, approximately 95% (Yang et al., 2018).

The NRCMS and the URBMI programs are two major voluntary healthcare insurance systems that provide essential medical coverage to nearly all residents of China. However, it is important to note that these two programs operate independently and are strictly divided based on Hukou system (Chen et al., 2022). While rural residents are only able to choose whether to participate in the NRCMS, urban residents are restricted to participate in the URBMI. Despite the NRCMS and the URBMI comprehensive coverage, there remain significant disparities in healthcare provision due to the inadequate level of pooling in healthcare

funds, resulting in disparities in access to healthcare services between urban and rural residents as well as across different regions of the country. In line with customary patterns observed in major reforms in China, the implementation of integrations displays heterogeneity across provinces and even subnational geographic units, such as municipalities and counties. Notably, several provinces have embarked on pilot initiatives aimed at testing and operationalizing integration processes before 2016(Yang et al., 2022). The government released the "Opinions on Integrating the Urban and Rural Resident Basic Medical Insurance System" in 2016 to reduce the disparities and address health inequality between urban and rural residents in China, which outlined the policy to merge the NRCMS with the URBMI into a single URRMI system (referred to as the integration of urban and rural resident medical insurance). Over time, provinces throughout the country have integrated the New Rural Cooperative Medical Scheme into the Urban and Rural Resident Medical Insurance system. In terms of reimbursement rates, the URRMI has a reimbursement rate of 85%, significantly higher than the 50% of the NRCMS.

Previous research on the role of this system reform in mitigating health inequality and medical expenditure among urban and rural residents and have found that the integration of urban and rural resident medical insurance has alleviated the unequal opportunities for medical service utilization and health levels between urban and rural residents (Li et al., 2019; Mao et al., 2018; Ren et al., 2022; Sun et al., 2021; Wang et al., 2020). Xu et al. (2018) decomposed the differences in the utilization of medical services between urban and rural areas in the urban and rural resident medical insurance integration area and found that the differences in descriptive statistics may have underestimated the unfairness of the utilization of medical services between urban and rural areas. The implementation of the integration of urban and rural resident medical insurance had been found to improve self-rated health among residents, with a greater impact on rural residents compared to urban residents (Fu et al., 2021) and facilitate the free flow of rural labor (Chen et al., 2017; Li & Dou, 2022; Xue & Li, 2022). Research in rural areas in China had also found that the poor are more likely to benefit from the integration of medical insurance policies (Meng et al., 2015). Furthermore, a recent study employed a staggered difference-in-differences approach to investigate the impact of whether a province had implemented an integration policy on health of middle-aged and elderly rural adults. The integration was found to be significantly associated with better self-rated health and reduced depressive symptoms among middle-aged and elderly rural adults (Ye & Wang, 2023).

However, there is limited evidence on the impact of these policies on the functional limitation of middle-aged and elderly individuals in rural areas.

Functional limitation is defined as the inability to perform activities of daily living due to physical or mental impairments (Heflin et al., 2019). It is a common problem among middle-aged and elderly individuals and has been linked to increased morbidity and mortality (Okun et al., 2010). Functional limitation is regarded as an important indicator that reflects the duality of life and health status among Chinese middle-aged and elderly (Hu et al., 2022). In rural China, functional limitation is often compounded by a lack of access to healthcare resources and services, leading to a higher burden of disability among this population (Zimmer et al., 2010). Therefore, understanding the impact of urban-rural health insurance integration on functional limitation among middle-aged and elderly individuals in rural China is important for improving the health and well-being of this population.

By adopting nonequivalent control group pretest-posttest design, this study aims to evaluate the impact of urban-rural health insurance integration on functional limitation among middle-aged and older adults in rural China. In this study, a difference-in-differences (DID) approach was employed using the China Health and Retirement Longitudinal Study (CHARLS) dataset, which comprises of a sample of rural middle-aged and older adults who were 45 years of age or older. The inclusion of control variables, such as frequency of alcohol consumption,

smoking status, and monthly hospital visits, was utilized in the analysis to address potential endogeneity concerns. By examining the relationship between medical insurance policy integration and functional limitations, this study aims to contribute to the understanding of the influence of urban-rural health insurance integration on the prevalence of functional impairment among rural middle-aged and elderly, providing useful insights for policy and practice to improve access to healthcare and reduce functional limitation among this population.

2. Methods

2.1. Data source

The present study utilizes data obtained from the 2015 baseline survey and the 2018 tracking survey of the CHARLS. CHARLS is a nationally representative data that aims to collect high-quality microdata representing families and individuals aged 45 years and older in China in order to facilitate interdisciplinary research on the aging Chinese population. The CHARLS questionnaire includes a comprehensive set of information on demographic backgrounds, family structure and financial support, health status and functioning, healthcare and insurance, work, retirement and pension, income, expenditures and assets, and housing characteristics. The questionnaire design is informed by international best practices, drawing upon studies such as the Health and Retirement Study, the English Longitudinal Study of Aging, and the Survey of Health, Aging and Retirement in Europe (Zhao et al., 2020, pp. 5–6).

CHARLS study utilizes a multi-stage sampling design, with probability proportionate to size sampling methods applied in the county/district and village sampling stages. Furthermore, CHARLS pioneered the use of electronic drawing software (CHARLS-GIS) technology and utilized the map method to create village-level sampling frames. In this study, we removed the samples with missing values, a total of 7855 observations were extracted from the CHARLS database. The selected sample participated in both the 2015 and the 2018 survey. Following selection, the remaining 7855 observations were separated into the URRMI group (treatment group) and NRCMS group (control group) as illustrated in Table 1.

2.2. Sample description

Table 2 presents demographic information on the study sample, including variables such as age, gender, education level, marital status, personal income, smoking, drinking, and number of hospital visits per month. Comparison of the experimental and control groups showed no statistically significant differences in these demographic characteristics, indicating a sufficient level of comparability between the two groups.

2.3. Research model

In this study, we utilize a logistic nonequivalent control group pretest-posttest design regression model to evaluate the impact of the integration of medical insurance for urban and rural residents on prevalence of functional limitations among middle-aged and elderly individuals residing in rural areas, taking into account the temporal variation in the implementation of the medical insurance system for urban and rural residents. The underlying principle of the DID model is

Table 1
The allocation of treatment group and control group.

	2015	2018	N
Control group	NRCMS	NRCMS	6767
Treatment group	NRCMS	URRMI	1088

Note: the new rural cooperative medical system (NRCMS); the Urban and Rural Resident Medical Insurance (URRMI).

Table 2
Demographic description of the experimental group and the control group in 2015 and 2018.

	2015		2018	
	Control group	Treatment group	Control group	Treatment group
	N/Mean (SD/%)	N/Mean (SD/%)	N/Mean(SD/%)	N/Mean (SD/%)
Age	59.72 (9.22)	59.93(9.34)	62.72 (9.10)	62.93(9.34)
Gender				
Male	3181(47.01)	515(47.33)	3185(47.07)	516(47.43)
Education level	2.92(1.70)	2.94(1.70)	2.99(1.71)	3.00(1.71)
Marital status				
Married	5638(83.32)	904(83.09)	5400(79.80)	876(80.51)
Divorced and other	1129(16.68)	184(16.91)	1367(20.20)	212(19.49)
Income(¥)	2826.24 (8911.63)	3929.02 (10941.77)	3179.92 (9756.00)	4525.08 (12874.61)
Smoking				
No	3790 (56.01)	621 (57.08)	3839 (56.73)	624(57.35)
Yes	2977(43.9 9)	467(42.92)	2928(43.27)	464(42.65)
Drinking				
No	3691 (54.54)	609(55.97)	3645(53.86)	598(54.96)
Yes	3076 (45.46)	479(44.03)	3122 (46.14)	490 (45.04)
Hospital visits	0.42 (1.32)	0.42 (1.42)	.361 (1.22)	.373 (1.24)

to establish a treatment group comprising of individuals who have undergone the integration policy of medical insurance for urban and rural residents and a control group consisting of individuals who have not yet participated in the integration of health insurance policies, in order to discern the differences in functional limitations among middle-aged and elderly individuals residing in rural areas prior to and following the implementation of the policy (Bethmann & Cho, 2022; Boelens et al., 2022). The specific model can be expressed as:

model: $Logit(Pr(y=1| \text{Treat, Period})) = \beta_0 + \beta_1 * \text{Treat} + \beta_2 * \text{Period} + \beta_3 * \text{DID} + \beta_4 * \text{Covariates} + \varepsilon$ (1)

Treat is a dummy variable and it denotes the status of treatment and control groups. The treatment group and control group were defined as follows: rural middle-aged and elderly who participated the NRCMS in 2015, and joined the URRMI in 2018 were designated as the treatment group and defined as 1; samples who joined the NRCMS in both the 2015 and the 2018 survey were designated as the control group and defined as 0. Period is a categorical variable that serves as a dummy indicator for the treatment years. It assigns the value of 0–2015 and the value of 1–2018. DID (Treat * Period) is a dummy variable indicating whether the outcome was observed in the treatment group and it was observed after the intervention (=1), or any other case (=0). The DID methodology is employed, utilizing the interaction of Period and Integrate as the independent variable. Additionally, a vector of individual characteristics, referred to as Covariates, is controlled for in the statistical regressions including age, gender, education level, marital status, personal income, smoking, drinking, and number of hospital visits per month. In our DID analysis, we did not use clustered standard errors due to the individual-level assignment of treatment based on individual participation in the URRMI, rather than provincial-level assignment. Through this DID design, the difference in change between the treatment group and the control group is calculated, providing a means to evaluate the precision of the estimations.

2.4. Description of variables

2.4.1. Dependent variable

In this study, the dependent variable is functional limitations, which refer to reductions in the capacity to engage in activities of daily living (ADLs) or instrumental activities of daily living (IADLs) due to physical,

cognitive, or emotional challenges. Within the CHARLS questionnaire, participants' ADLs were evaluated based on their reported difficulty in performing tasks such as dressing, bathing/showering, eating, getting into or out of bed, using the toilet, and controlling urination and defecation. For each of these six tasks, participants were provided with the following response options: (1) no, I do not have any difficulty; (2) I have difficulty but can still manage; (3) yes, I have difficulty and require assistance; (4) I am unable to perform the task. Consistent with the approach employed by He et al. (2019), we considered participants to have no difficulty with a task only if they chose option (1) "no, I do not have any difficulty." By aggregating responses to these six tasks, we derived a binary variable indicating the presence or absence of at least one ADL limitation among participants. Regarding IADLs, participants were queried about their difficulty in preparing hot meals, shopping for groceries, making phone calls, taking medication, and managing money. Following the same operationalization as ADLs, we constructed a binary variable to indicate the presence or absence of IADL limitations.

Ultimately, ADLs and IADLs were employed as measures of functional limitations in the middle-aged and elderly population. By summarizing the 11 activities encompassed within ADLs and IADLs, we created a binary variable that denoted the presence or absence of at least one functional limitation among the study participants (Tian & Shi, 2022). A binary value of 1 was assigned to indicate the presence of at least one activity-related functional limitation among the participants, while a value of 0 was assigned to indicate the absence of any functional limitations across all activities.

Table 3 presents the prevalence of functional limitations in 2015 and 2018, with a control group consisting of 6767 participants and a treatment group consisting of 1088 participants. The functional limitations were measured and compared between the two groups. In 2015, the control group had 2323 participants (34.3%) with functional limitations, while in 2018, this number increased to 2452 participants (36.2%), representing a difference of 129 individuals. On the other hand, the treatment group had 363 participants (33.4%) with functional limitations in 2015, but this number decreased to 323 participants (29.7%) in 2018, representing a difference of −40 individuals. Overall, the results suggest that the treatment group experienced a slight improvement in functional limitations, while the control group showed a slight increase over time.

2.4.2. Independent variables

In this study, the type of medical insurance (New Cooperative Medical Scheme/Urban and Rural Resident Medical Insurance) that rural middle-aged and elderly individuals participate in is employed as an independent variable. Based on the options for the type of medical insurance provided in the CHARLS questionnaire, sample data from individuals participating in other types of insurance are excluded and only samples from rural middle-aged and elderly individuals participating in the NRCMS and URRMI are retained. Since local governments have gradually begun trials of integrating urban and rural resident medical insurance based on their own circumstances since 2008, a small number of individuals (n= 23) in the sample participated in urban and rural resident medical insurance in 2015. To ensure the accuracy of the experimental group, these samples are excluded from the experimental group. The independent variable is a dichotomous variable, with a value of 0 indicating participation in the NRCMS and a value of 1 indicating participation in URRMI.

Additionally, dummy variables for relevant groups are established (as presented in Table 1). The " Treatment group" and "Control group" are defined as follows: rural middle-aged and elderly individuals who fully participated in both rounds of the follow-up survey and participated in the NRCMS in 2015 and URRMI in 2018 are designated as the " treatment group," with a value of 1; samples that participated in the NRCMS in both 2015 and 2018 are set as the "Control group," with a value of 0. Dummy variable for period is also established, with the year of 2015 defined as 0 and the year of 2018 defined as 1.

2.4.3. Covariates

In this study, several control variables were incorporated in the analysis in order to account for potential confounding factors that may influence the health of rural middle-aged and elderly individuals. These variables were selected in line with established literature in health economics (Mu, R., 2014; Gong et al., 2016) including demographic factors such as age, gender, education level, marital status, and income, as well as health-related behaviors such as smoking and drinking, and healthcare utilization measures such as the number of hospital visits per month. This approach was implemented to ensure the robustness and comprehensiveness of the analysis.

3. Results

Table 4 shows the results of a study investigating the impact of urban-rural integration of residential health insurance on functional limitations among middle-aged and older adults in rural China. Analysis using Model 1 indicates that the integration of health insurance significantly reduced functional limitations in this population, as demonstrated by an odds ratio of 0.742 and a statistically significant p-value (p<0.001). The results of Model 2 indicate that the probability of ADL limitations among middle-aged and elderly people is 0.744 times (Odds ratio 0.744; 95%CI 0.584, 0.948) that of before policy integration, and the probability of IADL limitations is 0.770 times (Odds ratio 0.770; 95% CI 0.616, 0.961) that of before policy integration. In addition, from the perspective of probability change, the integration of the policy had a more pronounced effect on the ADLs ability (Odds ratio 0.744; 95%CI 0.584, 0.948) of middle-aged and older adults, compared to IADLs (Odds ratio 0.770; 95%CI 0.616, 0.961). Furthermore, both education level (odds ratio=.983; 95%CI 0.971, 0.994) and income (odds ratio=.925; 95%CI 0.914, 0.936) were found to significantly decrease functional limitations among middle-aged and older adults.

4. Discussion

The findings of this study demonstrate that the integration of medical insurance within rural and urban areas in China had a substantial impact on functional limitations among middle-aged and older adults residing in rural regions. Specifically, it was determined that the integration of medical insurance had a statistically significant effect on reducing functional limitations among rural residents. Furthermore, the integration of the medical insurance policy was found to have a more pronounced effect on the ADLs ability of middle-aged and older adults as compared to IADLs ability.

The integration of urban and rural medical insurance in the present

Table 3
Prevalence of functional limitations in 2015 and 2018.

	2015 N(%)	2018 N(%)
Functional limitations(N = 7855)	2686(34.19)	2775(35.33)
Control group(N = 6767)	2323 (34.3)	2452 (36.2)
Treatment group(N = 1088)	363(33.4)	323 (29.7)
ADL limitations (N = 7855)	1633(20.79)	1692(21.54)
Dressing	469(5.97)	601(7.65)
Bathing/showering	524(6.68)	728(9.27)
Eating	176(2.24)	224(2.85)
Getting into or out of bed	575(7.32)	662(8.43)
Using the toilet	1098(13.98)	1089(13.86)
Controlling urination and Defecation	342(4.36)	401(5.11)
IADL limitations (N = 7855)		
Preparing hot meals	662(8.43)	953(12.13)
Shopping for groceries	609(7.75)	794(10.11)
Making phone calls	944(12.02)	1004(12.78)
Taking medication	368(4.68)	468(5.96)
Managing money	851(10.83)	1085(13.81)

Table 4

Logistic difference-in-difference regression analyses.

Variables	Functional limitations(Model1)		ADL limitations (Model2)		IADL limitations (Model3)	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Constant	.004***	(.003, .006)	.003***	(.002, .005)	.004***	(.002, .005)
DID	.742***	(.603, .914)	.744**	(.584, .948)	.770**	(.616, .961)
Treat	.980	(.848, 1.133)	.943	(.798, 1.114)	1.028	(.879, 1.201)
Period	.829***	(.743, .925)	1.006	(.887, 1.141)	.856***	(.763, .961)
Gender	2.261***	(2.013,2.540)	1.919***	(1.049,1.058)	2.126***	(1.879, 2.406)
Age	1.064***	(1.060,1.068)	1.054***	(1.684,2.187)	1.062***	1.058, 1.067)
Education level	.983***	(.971, .994)	1.007	(.994, 1.020)	.974***	(.962, .986)
Martial status	.995	(.908, 1.090)	1.004	(.907, 1.111)	.998	(.907, 1.100)
Income	.925***	(.914, .936)	.923***	(.909, .937)	.913***	(.900, .926)
Smoking	1.207***	(1.080,1.349)	1.186***	(1.048,1.343)	1.173***	(1.043, 1.320)
Drinking	1.103**	(1.015,1.198)	1.134***	(1.033,1.245)	1.017	(.931, 1.110)
Hospital visits	1.132***	(1.100,1.165)	1.158***	(1.124,1.192)	1.090***	(1.061,1.119)
Pseudo R^2	.096		.071		.095	
Log likelihood	−9169.995		−7531.195		−8244.764	

Note: ***p<0.001, **p<0.01, *p<0.05.

study was found to have a statistically significant impact on reducing functional limitations among middle-aged and elderly population. Previous research has established that the integration of medical insurance leads to improved healthcare utilization and fairness among the elderly population (Li et al., 2019). Our study is consistent with the findings of Zhou et al. (2022) on China's urban-rural health insurance integration policy, which revealed a significant increase in outpatient and inpatient services utilization among rural insured individuals. Furthermore, the integration policy was found to significantly enhance financial risk protection and self-assessed health status among rural residents, particularly among low-income rural residents. Additional studies have also demonstrated that the integration of urban and rural medical insurance significantly improves outpatient medical efficacy in rural areas and has a substantial impact on inpatient patient outcomes (Ren et al., 2022). Our study further supports these findings and also highlights that the integration of medical insurance policies can lead to an improvement in ADLs and IADLs abilities among the middle-aged and elderly, resulting in a significant reduction in functional limitations.

In this study, it was observed that the integration of medical insurance policies had a more pronounced effect on improving ADLs abilities among the elderly population when compared to IADLs abilities. A previous empirical study by Wang et al. (2014) found that rural residents were the most supportive of medical insurance integration, citing the equalization of healthcare services as the primary rationale. Despite higher rates of inpatient treatment initiation among Chinese rural residents with chronic diseases in 2008 compared to 2003, these individuals were more likely to discontinue treatment due to higher hospital co-payments required within their insurance coverage, as compared to urban residents. The integration of urban and rural medical insurance was found to alleviate economic burdens on rural residents and increase the utilization of primary healthcare resources, such as county and township hospitals (Jian et al., 2010). In general, the integration of urban and rural medical insurance was found to increase reimbursement rates for rural residents and optimize the utilization of county and township medical resources. Moreover, the integration of medical insurance was found to reduce rates of abandoned treatment for chronic diseases among elderly individuals in rural areas. An increase in the treatment rate for chronic diseases can directly improve ADLs abilities among the elderly population (Jian et al., 2010; Liu et al., 2018). Our study supports these findings and further demonstrates that the integration of policies had a more pronounced impact on increasing ADLs abilities among the middle-aged and elderly population.

The integration of policies has been demonstrated to have a range of beneficial impacts on the functional limitations of middle-aged and elderly individuals residing in rural areas. There are three potential mechanisms that may contribute to the reduction in the occurrence rate of functional impairments among middle-aged and elderly individuals in

rural areas of China. Firstly, policy integration has the potential to foster an increased utilization of healthcare services among rural residents. By establishing standardized rural healthcare policies and enhancing the overall quality of healthcare provisions, policy integration effectively addresses diverse barriers hindering healthcare access in these regions. Secondly, the unification of urban and rural medical insurance emerges as another influential factor contributing to the positive effects of policy integration on the health of middle-aged and elderly individuals in rural areas. Through the establishment of uniform reimbursement rates, this integration alleviates the economic burden associated with seeking medical treatment for rural residents, thereby reducing the likelihood that they will forego essential care due to financial constraints. Lastly, the expansion of medical insurance coverage to encompass a wider range of diseases and the inclusion of medications for the treatment of chronic conditions within medical insurance directories play a pivotal role in mitigating the prevalence of chronic diseases among middle-aged and elderly individuals in rural areas. This comprehensive approach enhances their capability to actively engage in activities of daily living, leading to improved functional outcomes.

4.1. Limitations

There are several limitations to this study that should be considered when interpreting the results. First, this study conducts a difference-in-differences analysis of the impact of policy integration using data from the years 2015 and 2018. However, it is acknowledged that the evaluation of policy effects typically necessitates a longer time frame of three years or more. The data from the years 2015 and 2018 may not be sufficient to fully evaluate the medical insurance policy. Therefore, future research should consider utilizing a longer time span to evaluate the long-term effects of the policy more accurately. Second, the study relies on self-reported measures of functional limitation, access to healthcare, and health insurance coverage, which may be subject to bias. Finally, the integration of urban-rural health insurance policies has been implemented gradually, and this research possesses inherent limitations, specifically its inability to examine the effects of policy integration on the demographic that had previously enrolled in the URRMI program before 2016. Future research using the staggered DID method could provide a more detailed examination of the effect of policy integration on functional limitation.

4.2. Future research

It is noteworthy that functional limitations can exert a considerable influence on the quality of life and autonomy of middle-aged and older adults. The findings of this study suggest that the integration of medical insurance may represent an efficacious strategy for ameliorating

functional limitations among this demographic in rural areas of China. Additional research may be conducted to investigate the long-term effects of this policy and to investigate other potential factors that may contribute to functional limitations. This could include an examination of the potential differential effects of the policy on middle-aged and older adults with varying levels of education and income.

The findings of this study offer valuable perspectives on the potential benefits of rural-urban integration of medical insurance for advancing the health and well-being of middle-aged and older adults in rural China. It is crucial to take into account the broader context in which this policy is being implemented. Rural areas of China may encounter distinctive challenges and barriers in terms of access to healthcare and other resources that may affect the policy's effectiveness. Therefore, it would be advantageous to investigate the potential interactions between the integration of medical insurance and other factors that may influence functional limitations, such as access to healthcare facilities and other social and economic determinants of health. Additionally, it would be beneficial to examine the potential long-term impacts of the policy on the overall health and well-being of the population, including the potential for reducing healthcare costs and enhancing overall health outcomes. Ultimately, the policy's success will depend on various factors, and it would require ongoing monitoring and evaluation to ensure that it is meeting its intended goals and addressing the population's needs.

5. Conclusion

This study has determined that the integration of urban and rural health insurance systems in China is significantly associated with a reduction in functional limitation among middle-aged and elderly individuals in rural areas. It has been observed that the integration of the medical insurance policy has a more pronounced effect on the ability to perform activities of ADLs as compared to IADLs among middle-aged and older adults. These findings imply that the integration of urban and rural health insurance systems can have a positive impact on functional limitation of middle-aged and elderly individuals in rural China, which may be an essential factor in enhancing the health and well-being of this demographic. However, it is essential to recognize that the integration of urban and rural health insurance systems may not be the sole factor contributing to functional limitation among middle-aged and elderly individuals in rural China. Other factors such as the availability of healthcare resources and services, cultural and social factors, and individual health behaviors may also play a role in functional limitation. Therefore, further research is necessary to gain a comprehensive understanding of the complex factors that contribute to functional limitation among middle-aged and elderly individuals in rural China.

Ethical statement

Ethical approval for all the CHARLS waves was granted from the Institutional Review Board at Peking University. The IRB approval number for the main household survey, including anthropometrics, is IRB00001052-11015; the IRB approval number for biomarker collection, was IRB00001052-11014.

During the fieldwork, each respondent who agreed to participate in the survey was asked to sign two copies of the informed consent, and one copy was kept in the CHARLS office, which was also scanned and saved in PDF format. Four separate consents were obtained: one for the main fieldwork, one for the non-blood biomarkers and one for the taking of the blood samples, and another for storage of blood for future analyses.

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Contributors

Yeong Hun Yeo: Methodology, Validation, Supervision, Project administration, Funding acquisition, Writing – review & editing.

Haijun Hao: Conceptualization, Software, Validation, Formal analysis, Data curation, Writing – original draft, Writing – review & editing.

Conflict of interest disclosure

The authors report there are no competing interests to declare.

Data availability

Data will be made available on request.

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