# RESEARCH

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Association between medical insurance and life satisfaction among middle-aged and older adults in China: the mediating role of depression

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# Abstract

**Background** While studies have reported a positive association between medical insurance and life satisfaction, there is a lack of studies assessing the underlying impact mechanism. The present study aims to investigate the association between Urban and Rural Resident Basic Medical Insurance (URRBMI) and life satisfaction in China, focusing on the mediating role of depression.

**Methods** Using 2018 wave of China Health and Retirement Longitudinal Study, we employed ordered logit regression models to examine the correlation between URRBMI and life satisfaction. Causal mediation analysis was used to analyze the mediating effect of depression on this association.

**Results** URRBMI participation was related to greater life satisfaction (p < 0.01). Depression mediated the correlation between URRBMI and life satisfaction, and the percentage of total effect mediated was 18.20%.

**Discussion** Middle-aged and older adults covered by URRBMI were more likely to have greater life satisfaction than their counterparts because insurance relieved depression.

**Conclusion** Our study highlighted many policy suggestions, such as improving its coverage, establishing a unified information platform, and mobilizing social forces to provide better life services.

**Keywords** Urban and Rural Resident Basic Medical Insurance, Life satisfaction, Depression, Middle-aged and older adults

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## Background

Middle-aged and older adults are those who aged 45 years and older. The metabolism of the middle-aged and older adults has slowed down, their resistance has decreased [1], and their incidence of diseases has increased [2]. The Middle-aged and older adults are the main group of social and economic decision-making [3].

Life satisfaction represents a subjective global assessment of an individual's quality of life [4, 5]. The literature has demonstrated the correlation between life satisfaction and health status [6, 7]. Life satisfaction, and its measurement and determinants, have been a focus of interest among many disciplines, such as economics and psychology [8, 9]. Indeed, improvements in life satisfaction for citizens have been said to be an objective of governments around the world. An essential aspect of ensuring fairness and justice is improving life satisfaction for every citizen. Identifying factors associated with life satisfaction offers opportunities for improvement possibility, thereby enhancing social welfare.

In China, there are inequalities in health between urban and rural residents primarily because the economic development gap yields differences in the availability of health services. Furthermore, based on the household registration system, China implemented New Rural Cooperative Medical Scheme (NRCMS) for rural residents and Urban Resident Basic Medical Insurance (URBMI) for non-working urban residents. These differences have the potential to affect health outcomes. In countries with multiple health insurance schemes, ensuring equity within the healthcare system is a significant concern and is often considered an essential strategy to narrow health status inequalities. In 2016, the Chinese government merged the two previous insurance arrangements (NRCMS and URBMI) to form Urban and Rural Resident Basic Medical Insurance (URRBMI). The aim was to improve fairness in healthcare utilization and health status. URRBMI provides unified insurance for urban and rural residents, resulting in a larger pool of insurance funds and a significant increase in financial protection. Compared with NRCMS, URRBMI offers greater coverage for drugs and provides higher reimbursement rates [10, 11]. Consequently, the benefits of unified insurance are enhanced. The urban and rural residents can choose whether to participate in URRBMI or not. Participating in URRBMI requires some fees. URRBMI can reimburse the outpatient and hospitalization expenses of insured residents, including the expenses of psychotherapy for mental illnesses.

Some studies have assessed the relationship between medical insurance and life satisfaction. Tran et al. found that people with medical insurance were more likely to be more satisfied with life because medical insurance reduced financial uncertainty [12]. A study showed that medical insurance can improve the life satisfaction of older adults [13]. The study by Yin et al. demonstrated that NRCMS can improve the life satisfaction of rural older adults [14]. Chiao et al. found that medical insurance significantly improved life satisfaction [15]. Luo et al. reported that participation in Urban Employee Basic Medical Insurance, NRCMS, and other health insurance schemes has positive effects on life satisfaction [16]. To sum up, a positive association between medical insurance and life satisfaction has been demonstrated. Nonetheless, it is worthwhile noting that the mechanism by which medical insurance affects life satisfaction has not been fully elucidated in previous studies. Examining this matter in-depth can enhance our understanding of the correlation between medical insurance and life satisfaction.

The middle-aged and older adults are faced with more health risks and vulnerable to changes in medical insurance policy, such as the implementation of URRBMI. The present paper aims to investigate the association between URRBMI and life satisfaction using a nationally representative dataset, focusing on analyzing the mediating role of depression. The results could provide some references to promote life satisfaction and help perfect URRBMI.

### **Research hypotheses**

After the implementation of URRBMI, the number of designated medical institutions has increased, and the types of drugs have doubled than before [17]. Consequently, the level of medical insurance benefits enjoyed by urban and rural residents has been improved, which is conducive to reducing the medical burden and improving financial condition [18–20]. In addition, URRBMI can relieve the middle-aged and older adults' worries about future illness, enhance their confidence and security in the future [21], and reduce their anxiety and psychological stress which is caused by medical expenses when they were ill [22, 23]. Based on the above analyses, we put forward the following hypothesis:

**H1** URRBMI participation is significantly related to greater life satisfaction.

As a common mental disorder, depression is associated with an array of symptoms including low mood, anhedonia, and sleep disturbances [24]. Depression has hugely affected the daily lives of people. Many scholars have analyzed the correlation between social factors and depression. Several researches indicate that people who were covered by medical insurance showed lower depressive symptoms when compared with their counterparts [25, 26]. Access to URRBMI can improve rates of depression diagnosis and treatment, which is useful to improve mental health [27–31]. In addition, previous studies reveal that life satisfaction is negatively related to depression [32, 33]. Based on the above analyses, we put forward the following hypothesis:

**H2** Depression mediates the association between URRBMI and life satisfaction.

## Methods

### Data source

The 2018 wave of China Health and Retirement Longitudinal Study (CHARLS) was the data source. The present study tried to exploit 4 waves of CHARLS, but the sample size decreased below 500, which is difficult to reveal the effectiveness of URRBMI. In addition, although the 2020 wave of CHARLS includes URRBMI (named as exeb001\_ s2 in the dataset), it only has 39 values. Therefore, we employed the 2018 wave of CHARLS. The CHARLS is a high-quality longitudinal survey and focuses on investigating health of the middle-aged and older adults who age 45 years and older. The CHARLS covers 28 provinces in China. The CHARLS was used as it contained rich information on the study variables. After eliminating the participants with missing values, 2,198 participants were included in the present paper.

### Variables

#### Dependent variable

Life satisfaction was the dependent variable. In the 2018 wave of the CHARLS, the respondents were asked to report their satisfaction with life as a whole and answered on a five-point Likert scale (1 = not at all satisfied, 2 = not very satisfied, 3 = somewhat satisfied, 4 = very satisfied, 5 = completely satisfied). Higher life satisfaction scores signified higher degrees of life satisfaction. The study by Cheung et al. has shown that single-item life satisfaction was as valid as satisfaction scored with a life scale [34].

### Independent variable

URRBMI was the independent variable. In the 2018 wave of the CHARLS, respondents were asked to report whether they were insured by URRBMI (1=insured, 0 = not insured).

### Covariates

Based on previous studies [12, 13, 15, 35, 36], the present study considered a series of covariates associated with life satisfaction. The covariates included age, gender, marital status, residency area, education status, household income, drinking, sleeping time, and friend interaction.

## Mediating variable

The depressive symptom was a mediating variable. A 10-item Center for Epidemiological Studies Depression Scale (CES–D 10) was adopted to measure depression. This scale was originally developed by Radloff [37]. It is

one of the most common screening tests for depression [38], and many scholars have used it [39–45]. The CES-D is based on responses to ten questions, including eight negatively oriented questions and two positively oriented questions. The total CES-D score ranges between 0 and 30, with a higher CES-D score suggesting a higher degree of depression. In the present study, the Cronbach's alpha of the CES-D scale was 0.80, indicating higher internal reliability.

### Statistical analyses

Because the dependent variable was an ordered categorical variable, the present study employed ordered logit regression models to examine the correlation between URRBMI and life satisfaction. The econometric model was specified as:

$$Life \ satisfaction_{i} = \alpha_{0} + \alpha_{1} * URRBMI + \sum_{j=1}^{n} \alpha_{j} * X_{ji} + \varepsilon_{i}$$

$$(1)$$

Individuals have a choice in insurance coverage, thus, the standard application of ordered logit regression models might be biased because the sample of individuals with insurance may be systematically different than those without insurance. Without adjustment, the equation's (1) estimation may entail potential selection bias that may confound our findings. One method proposed in the literature to address potential selection bias is propensity score matching (PSM), which was put forward by Rosenbaum and Rubin [46]. This method was operationalized in two stages. In the first stage, the propensity score was estimated to evaluate characteristics associated with URRBMI coverage. For the URRBMI coverage independent effect to be ascertained, this propensity score estimation was then used to match individuals with similar characteristics. In the second stage, the URRBMI coverage effect on life satisfaction was estimated using the PSM techniques to adjust for potential selection bias [47, 48].

To examine the mediating effect of depression in the correlation of URRBMI and life satisfaction, the present study adopted causal mediation analysis. Causal mediation analysis, which is based on the counterfactual framework [49], was put forward by Imai et al. [50, 51] Causal mediation analysis uses quasi-Bayesian Monte Carlo approximation and can be employed to address selection bias. Moreover, causal mediation analysis has become popular in social science [52], and has been used in many cross-sectional studies [53–60].

Table 1 Characteristics of the study population

Variable All (N=2,19			
URRBMI			
Not insured, <i>n</i> (%)	399 (18.15)		
Insured, <i>n</i> (%)	1,799 (81.85)		
Age			
45–64, n (%)	1,388 (63.15)		
≥65, n (%)	810 (36.85)		
Gender			
Female, <i>n</i> (%)	1,171 (53.28)		
Male, n (%)	1,027 (46.72)		
Marital status			
Single, divorced, or widowed, n (%)	316 (14.38)		
Married, n (%)	1,882 (85.62)		
Residency area			
Rural areas, n (%)	1,777 (80.85)		
Urban areas, n (%) 421 (19.15)			
Education status			
Illiterate, n (%)	474 (21.57)		
Literate, n (%)	1,724 (78.43)		
Household income (RMB)			
Mean (SD)	26,874.71 (51,803.57)		
Drinking			
No, n (%)	1,435 (65.29)		
Yes, n (%)	763 (34.71)		
Sleeping time (Hour)			
Mean (SD)	6.36 (1.96)		
Friend interaction			
No, n (%)	1,452 (66.06)		
Yes, n (%)	746 (33.94)		

# Results

### Characteristics of the study population

Table 1 displays the characteristics of the study population. More than 80% of the participants were insured by URRBMI. More than 36% of the participants were aged 65 years and older, and about 53% of them were female. Furthermore, approximately 86% of the participants were married.

### Ordered logit regression results

Table 2 shows the ordered logit regression results. The ordered logit regression results from Models 1-4 suggest that URRBMI participation was related to life satisfaction (p < 0.01). Consequently, H1 is supported.

### **Robustness checks**

Two methods were employed to conduct robustness checks. First, we conducted a robustness check using a dummy variable to measure life satisfaction. The five categories of life satisfaction were regrouped into two categories: a dissatisfied group (0 = not at all satisfied or not very satisfied) and a satisfied group (1 = somewhat satisfied, very satisfied, or completely satisfied). We employed a binary logit regression model to analyze the correlation,

URRBMI	0.4212**	0.4225**	0.4323**	0.4274**
	(0.1287)	(0.1268)	(0.1294)	(0.1300)
Age		0.0239**	0.0215**	0.0230**
5		(0.0051)	(0.0050)	(0.0051)
Gender		0.0082	0.0546	-0.0431
		(0.0844)	(0.0843)	(0.0951)
Marital status		0.1406	0.1492	0.1443
		(0.1284)	(0.1274)	(0.1266)
Residency area		0.0567	0.0823	0.0733
		(0.1098)	(0.1075)	(0.1066)
Education status			-0.2664	-0.2768
			(0.1414)	(0.1431)
Household income			0.0140	0.0140
			(0.0165)	(0.0164)
Drinking				0.2168*
				(0.0981)
Sleeping time				0.0515*
				(0.0251)
Friend interaction				0.1059
				(0.0872)
cut1	-3.2052**	-1.6194**	-1.8145**	-1.3575**
	(0.1825)	(0.4067)	(0.4202)	(0.4985)
cut2	-1.7866**	-0.1962	-0.3923	0.0671
	(0.1330)	(0.3967)	(0.4083)	(0.4809)
cut3	0.9760**	2.5942**	2.4046**	2.8743**
	(0.1237)	(0.3987)	(0.4114)	(0.4844)
cut4	3.3294**	4.9615**	4.7786**	5.2539**
	(0.1662)	(0.4228)	(0.4323)	(0.5088)
Number of observations	2,198	2,198	2,198	2,198
Wald chi-squared	10 72**	31 02**	3252**	41.04**

<sup>\*</sup>p < 0.01, <sup>\*</sup>p < 0.05

and Table 3 displays the results. Models 1-4 reveal that URRBMI participation was correlated with the likelihood that individuals would be satisfied with life (p < 0.01).

Second, we also employed the PSM to conduct a robustness check, with results shown in Table 4. The results indicated that URRBMI participation was positively related to life satisfaction (p < 0.01).

## **Results of causal mediation analysis**

The causal mediation analysis results are shown in Table 5 and indicate that the total effect of URRBMI participation on life satisfaction was significant and positive (estimate = 0.1922, 95% CI: 0.1055–0.2781). Furthermore, after introducing depression, the direct effect of URRBMI participation on life satisfaction was still significant (estimate = 0.1571, 95% CI: 0.0787-0.2343). Moreover, the average causal mediation effect of URRBMI participation on life satisfaction through alleviating depression was statistically significant (estimate = 0.1922, 95% CI: 0.1055–0.2781). It can be concluded that depression mediated the correlation between URRBMI participation

(4)

### Table 2 Ordered logit regression results

(1)

(2)

(3)

Variable

 Table 3
 Robustness check by using a dummy variable to measure life satisfaction

0.9167** (0.1605)	0.8890** (0.1615) 0.0276 <sup>**</sup>	0.8354 <sup>**</sup> (0.1663)	0.8245**
(0.1605)	(0.1615) 0.0276 <sup>***</sup>	(0.1663)	(0.1670)
	0.0276**		(0.1079)
	0.027.0	0.0313**	0.0338**
	(0.0080)	(0.0077)	(0.0080)
	0.1827	0.0806	-0.0558
	(0.1477)	(0.1423)	(0.1609)
	0.3647	0.3107	0.2928
	(0.1930)	(0.2013)	(0.2009)
	0.0493	-0.0111	-0.0143
	(0.1748)	(0.1766)	(0.1749)
		0.4233*	0.4202*
		(0.1853)	(0.1847)
		0.0187	0.0200
		(0.0206)	(0.0208)
			0.2302
			(0.1749)
			0.1199**
			(0.0438)
			-0.0404
			(0.1555)
1.4307**	-0.6231	-1.1692*	-2.0499**
(0.1257)	(0.5643)	(0.5656)	(0.6663)
2,198	2,198	2,198	2,198
32.62**	45.46**	56.95**	67.87**
	1.4307** (0.1257) 2,198 32.62**	1.4307** -0.6231 (0.1257) (0.1748) 1.4307** -0.6231 (0.1257) (0.5643) 2,198 2,198 32.62** 45.46**	0.1827       0.0806         (0.1477)       (0.1423)         0.3647       0.3107         (0.1930)       (0.2013)         0.0493       -0.0111         (0.1748)       (0.1766)         0.4233*       (0.1853)         0.0187       (0.206)         1.4307**       -0.6231       -1.1692*         (0.1257)       (0.5643)       (0.5656)         2,198       2,198       2,198         32.62**       45.46**       56.95**

and life satisfaction, and the percentage of total effect mediated was 18.20%. Therefore, H2 is supported.

### Discussion

The present study investigated the correlation between URRBMI and life satisfaction and the underlying mediating mechanism. We found that middle-aged and older adults insured by URRBMI were more likely to have greater life satisfaction than those not insured. This finding was consistent with previous studies [12–15]. Furthermore, the results were robust to various robustness checks.

The present study also used causal mediation analysis to explore the mediating role of depression. Causal

Table 4 PSM estimation results

**М** К-

Ra

Ke

Ne

Table 5	Results of	causal	mediation	anal	ysis
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Effect	Estimate	95% Confidence Interval		
Average causal mediation effect	0.0350	0.0036	0.0668	
Direct effect	0.1571	0.0787	0.2343	
Total effect	0.1922	0.1055	0.2781	
Percentage of total effect mediated	18.20	12.60	33.21	

mediation analysis demonstrated that URRBMI participation improved life satisfaction by relieving depression. This finding could provide an important reference for future studies in this area. Previous studies have shown that medical insurance can reduce the financial burden of health service utilization [61, 62]. The reason was that those insured by URRBMI were more likely to be confident or optimistic about their future financial status and suffer fewer depressive symptoms, leading to greater satisfaction with life.

The present paper highlights some important policy suggestions for improving life satisfaction. First, given the URRBMI participation benefits, their coverage improvement and participation encouragement are essential. People's willingness to participate may be affected by the defined contribution to medical insurance. When NRCMS and URBMI were integrated, individuals were required to pay additional fees to join URRBMI. That increased the financial burden for participants, particularly for the financially disadvantaged. Shifting from a defined contribution scheme to a proportional rate might be an option to balance people's health rights and medical insurance funds' sustainability. Second, one potential solution was to consolidate smaller insurance funds into larger funds to safeguard people's well-being and medical insurance sustainability. The government could consider upgrading the current municipal-level funds to provincial-level funds. Instead of immediately upgrading the insurance fund pool level in underdeveloped areas, it might be beneficial to firstly establish a unified information platform. That approach would enable the smooth flow of information across various fields and promote transparency in the system, which would reduce repeated inspection, enhance the effectiveness of the insurance

ethod	Sample	Treated	Control	ATT	S.E.	T-stat
nearest neighbor matching	Unmatched	3.2996	3.1003	0.1994	0.0433	4.61
	Matched	3.2997	3.1034	0.1963	0.0569	3.45**
adius matching	Unmatched	3.2996	3.1003	0.1994	0.0433	4.61
	Matched	3.2997	3.0940	0.2057	0.0539	3.81**
ernel matching	Unmatched	3.2996	3.1003	0.1994	0.0433	4.61
	Matched	3.2997	3.0916	0.2081	0.0530	3.93**
earest-neighbor matching within the caliper	Unmatched	3.2996	3.1003	0.1994	0.0433	4.61
	Matched	3.2997	3.1033	0.1964	0.0570	3.44**
0.01 * 0.05						

funds, and lower the barrier to future upgradation. Third, the Chinese government has to mobilize social forces to provide better life services. In addition, the government should consider the relationship between medical assistance and medical insurance to ensure that underprivileged people can fully access the advantages of medical insurance.

The present paper had a few limitations. First, given data limitations, we could not explore the correlation between URRBMI coverage duration and life satisfaction. Future studies can consider exploring the correlation of URRBMI coverage duration and life satisfaction when the data are available. Second, the variables used in this population-based study were all self-reports from study participants, which might suffer from potential recall bias.

Despite the limitations, the present paper has two strengths. On the one hand, this is the first study to examine the correlation between URRBMI participation and life satisfaction. On the other hand, the study examined the mediating role of depression in the correlation between URRBMI and life satisfaction.

### Conclusion

This study highlighted that middle-aged and older adults insured by URRBMI were more likely to have greater life satisfaction than those not insured. In addition, URRBMI participation significantly improved life satisfaction by relieving depression. Our study highlighted many policy suggestions, such as improving its coverage, establishing a unified information platform, and mobilizing social forces to provide better life services.

#### Abbreviations

NRCMS	New Rural Cooperative Medical Scheme
URBMI	Urban Resident Basic Medical Insurance
URRBMI	Urban and Rural Resident Basic Medical Insurance
CHARLS	China Health and Retirement Longitudinal Study
CES–D 10	10-item Center for Epidemiological Studies Depression Scale
PSM	Propensity Score Matching

#### Acknowledgements

The authors would like to acknowledge the China Health and Retirement Longitudinal Study (CHARLS) team for providing data.

#### Author contributions

QW: research design. JS: data analysis and paper writing. CPC and YL: paper writing. The authors gave final approval for the version to be published.

#### Funding

This study was supported by Humanities and Social Science Youth Fund of Ministry of Education of China (23YJC630153), China Postdoctoral Science Foundation (2023M731718), Opening Foundation of Key Laboratory (JSHD202427), and Jiangsu Province Capability Improvement Project through Science, Technology and Education (ZDXYS202210), and Project of Fund Supervision Center of Guangxi Medical Security Bureau and Research Center for Health and Socio-economic Development of Guangxi Medical University (2024RWB04).

#### Data availability

The data used in this study were derived from China Health and Retirement Longitudinal Study (CHARLS).

### Declarations

### Ethics approval and consent to participate

The data used in this study is secondary data. The CHARLS has already obtained ethical approval from the research ethics committees of Peking University and informed consent.

### **Consent for publication**

Not applicable.

### **Competing interests**

The authors declare no competing interests.

Received: 4 May 2024 / Accepted: 14 October 2024 Published online: 10 April 2025

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