

The Impact of High-Level Pension Insurance on Physical and Mental Health Among the Elderly: An Empirical Analysis Based on CHARLS 2018 Data

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Abstract: China's swiftly aging population has considerable health issues, wherein comprehensive pension insurance is crucial for alleviating physical and mental health deterioration among the elderly. This study takes data from the 2018 China Health and Retirement Longitudinal Study (CHARLS), concentrating on persons aged 60 and older, and performs Ordinary Least Squares (OLS) regression to assess the effects of pension insurance tiers. The findings indicate that comprehensive pension insurance markedly enhances both physical and mental well-being, with more pronounced impacts noted among urban dwellers and non-isolated seniors, largely mediated by self-assessed health status. These findings highlight systematic inequalities in benefit allocation. Policymakers must emphasize the expansion of rural coverage, expedite multi-pillar pension changes, and include community-based eldercare services to guarantee sustainable and equitable health results for China's aging demographic.

Keywords: high-level pension insurance, the elderly, physical and mental health, CHARLS

1. Introduction

China is confronting a swiftly escalating aging crisis, with the demographic aged 60 and above anticipated to constitute 25% of the overall population by 2025. Within this demographic, 17% are projected to require long-term care owing to disability, while 20% may encounter depression stemming from social isolation and health issues in 2025. The 2025 Government Work Report clearly promotes the advancement of elderly care services and the "silver economy," with the objective of expanding pension coverage and enhancing healthcare accessible for seniors. Simultaneously, economic pressure is escalating—China's pension expenditures have increased by 12% yearly since 2022, highlighting the necessity for systemic reforms to guarantee sustainable assistance for the aged.

In response to these issues, China implemented the Long-term Care Insurance system in 2017, providing fundamental daily living assistance and medical nursing services for individuals with long-term disabilities. As of the end of 2023, the system comprised more than 8,080 approved service facilities and employed around 303,000 nursing professionals across the country.

By 2023, China's pension insurance system has nearly attained comprehensive national coverage, with 1.07 billion members in basic pension insurance. The system is multi-tiered, consisting of basic pension insurance, enterprise (occupational) pensions, and the personal pension scheme introduced

in 2022. This framework guarantees involvement from the government, businesses, and individuals, addressing varied pension requirements.

Nonetheless, China's pension system encounters increasing obstacles despite attaining nearly universal coverage. The fundamental pension fund, albeit encompassing over 1.07 billion individuals, is experiencing increasing pressure. Official forecasts indicate possible annual deficits of 4.1 trillion yuan by 2029, with reserves of 7 trillion yuan possibly exhausted by 2036. The distribution of these pressures is varied across regions: Guangdong's pension surplus amounted to 1.2 trillion yuan in 2022, attributed to payments from migrant workers, whilst Heilongjiang necessitated 645 billion yuan in central transfers to address deficits. The structural imbalances within the system are similarly alarming. The primary pillar of basic insurance prevails, although company annuities (the second pillar) encompass merely 28 million employees, and personal pensions (the third pillar) have garnered only 19.5 million accounts since its introduction in 2022.

2. Literature review

2.1. Differential effects of pension insurance on urban and rural residents

Significant disparities exist in pension insurance coverage between urban and rural residents. The national pension Gini coefficient is 0.59, with rural areas experiencing even higher inequality at 0.89. To address these issues, scholars recommend raising benefit levels, optimizing management frameworks, and leveraging digital tools for better coordination [1];

Pension insurance plays a more significant role in securing income for urban residents, though benefits for both groups remain low, averaging one-third of the rural minimum living standard [2]. Participation in pension insurance increases household income by approximately 60%, with rural households benefiting from reduced future uncertainties [3]. While in other countries, social security benefits such as pension insurance serve as the primary source of retirees' income [4]. However, the system's redistributive function is debated. Some argue it mitigates income inequality through social and human capital accumulation [5], while others contend some related policies, like raising the retirement age, can increase income inequality among the elderly [6].

In terms of quality of life, urban residents experience more noticeable improvements. Rural residents, despite high retirement concerns, see some alleviation through pension insurance participation [7]. However, rural benefits remain insufficient, as seen in the New Rural Pension Scheme (NRPS), which falls short of meeting basic living needs [8]. Conversely, pension insurance significantly enhances the happiness of rural elderly, with long-term care insurance positively correlating with the well-being of those with agricultural household registration [9].

2.2. Impact of pension insurance systems on the health of older adults

The pension system's impact on elderly health varies across physical and mental dimensions. Higher pension income improves physiological health by enhancing access to medical services and nutritional support [10], particularly in activities of daily living [11]. However, basic pension insurance has limited direct effects on physical health, as sustained health investments and lifestyle changes are required [2].

Mental health benefits are more pronounced through improving financial satisfaction [12]. These effects vary by gender and region: increased social security income significantly improves mental health for elderly women but not men [13]. Long-term care insurance has the most notable positive impact in eastern regions, with weaker effects in central and western areas [14].

2.3. Study methods of pension insurance systems

Pension studies primarily employ empirical analysis (OLS/PSM-DID), case studies, and limited actuarial modeling. For example, OLS regression shows that basic pension insurance reduces risk perception among rural residents [15], while PSM-DID assesses the poverty reduction effects of rural pension insurance [16].

Case studies provide in-depth insights into regional policies. For instance, single-case analysis of China's NRPS reveals its impact on labor supply [17], while comparative case studies contrast China's system with those of Japan and South Korea, suggesting reforms to reduce disparities and optimize public expenditure [18].

Simulation and actuarial methods are less common but offer valuable projections. Static simulations estimate the impact of pension fund adjustments across provinces [19], while actuarial models predict financial pressures and the effects of contribution level changes [20].

3. Current state of the insurance industry in China

3.1. Evolution of insurance policies

China's social insurance system has undergone substantial evolution since the Reform and Opening-up, shifting from a unit-based welfare model for urban employees to a multi-tiered structure encompassing both urban and rural populations. Initial changes restored pension and medical insurance; nonetheless, inequalities remained due to disjointed regional pools and insufficient rural coverage. The 2018 central adjustment mechanism for enterprise employee pensions sought to mitigate regional disparities; nonetheless, financial deficiencies and reliance on fiscal transfers persisted unsolved. In 2019, premium decreases alleviated corporate pressures but jeopardized long-term sustainability due to an aging population. The 2020 dynamic adjustment method for medical insurance increased reimbursements for novel pharmaceuticals; nonetheless, disparities in access to high-value care remained. By 2021, long-term care insurance trial programs tackled aging difficulties; nonetheless, scalability issues and inconsistent regional implementation underscored structural fragmentation. Although these changes emphasized equity and coordination, they faced problems such as intergenerational equity, inadequate rural involvement, and fiscal constraints underscore the need for deeper structural solutions.

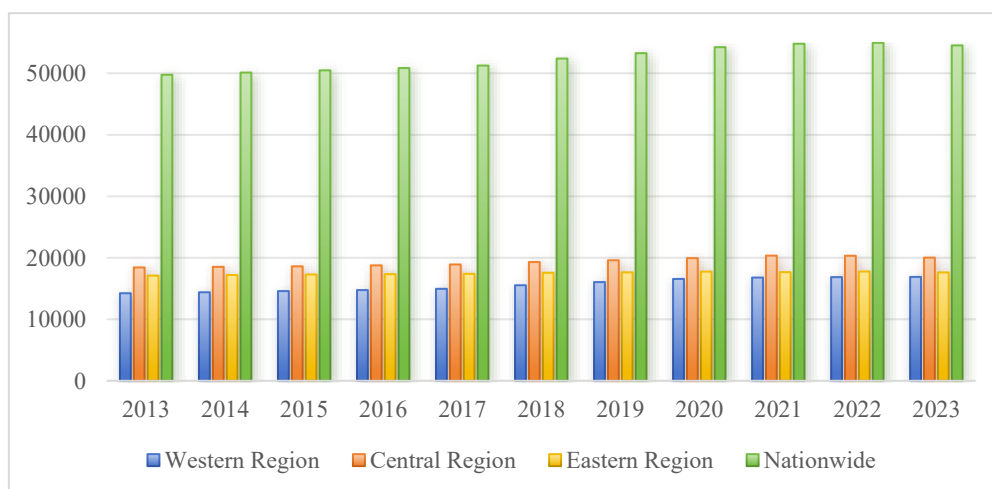


Figure 1: Number of urban and rural residents enrolled in basic pension insurance by region

3.2. Evolution of insurance companies and products

The insurance industry in China has evolved from a state-controlled framework to a more diversified and globalized sector, propelled by digital revolution and market liberalization. Initiatives like as electronic social insurance cards and online platforms have enhanced efficiency; nevertheless, inconsistent digital infrastructure in rural regions restricts accessibility. Back-end pension solutions, including those provided by ICBC and China Life, have diversified possibilities; nonetheless, their uptake is minimal (merely 15% of pension assets in 2023) owing to customer inclination towards conventional savings. Foreign entities such as AIA and Allianz, functioning through joint ventures, possess less than 10% market share, indicating enduring regulatory and competitive obstacles.

Innovative solutions, including China Life's "Huimin Insurance" (which covers 50 million rural inhabitants by 2023) and Ping An's "Long-term Care Insurance" (tested in 30 cities), aim to bridge socioeconomic disparities but encounter sustainability issues. Huimin's low premiums (¥50–200 annually) enhance inclusivity; however, claims ratios surpass 90%, jeopardizing profitability. Ping An's long-term care initiative, albeit catering to 200,000 seniors, is significantly dependent on subsidies, which raises worries regarding its scalability. These initiatives demonstrate advancements in social impact; yet, limitations in profitability and regional inequalities remain, emphasizing the necessity for equitable growth.

4. Research methods and model construction

4.1. Research methods

The Ordinary Least Squares (OLS) method, initially utilised by Carl Friedrich Gauss in 1809 for astronomical computations, has established itself as a fundamental instrument in econometrics. By the mid-20th century, academics such as Lawrence Klein, Clive Granger, and Robert Engle widely employed Ordinary Least Squares (OLS) in economic modelling. Granger and Engle's contributions to time-series analysis, encompassing cointegration theory and the ARCH model, garnered them the 2003 Nobel Prize in Economic Sciences. Currently, Ordinary Least Squares (OLS) is extensively utilised across various fields. For example, intergenerational mobility has been investigated using OLS [21], and the correlation between pension systems and workers' subjective class identity has also been assessed with this methodology [22].

4.2. Hypotheses and application of the method

Pension insurance is essential for wealth distribution throughout an individual's life cycle, easing financial limitations for the elderly and facilitating access to superior nutrition and treatment, therefore enhancing health outcomes [23]. Premium pension insurance offers enhanced financial assistance, resulting in the initial hypothesis.

H1: Participation in premium pension insurance improves the physical and mental well-being of the elderly.

Research demonstrates that elderly individuals in rural areas exhibit elevated levels of somatization, sadness, and anxiety relative to those in urban settings [24]. Moreover, it has been observed that rural old individuals report inferior self-rated health [25]. This establishes the foundation for the second hypothesis.

H2: High-level pension insurance significantly enhances the health of urban elderly individuals.

Isolation intensifies loneliness and adversely affects physical and mental health. Research underscores the dangers of lonely dying among older individuals residing alone, especially those who have experienced spousal loss [5]. High-benefit pension insurance can alleviate these impacts, particularly for non-solitary older individuals, so supporting the third hypothesis.

H3: Advanced pension insurance more effectively improves the well-being of non-lonely seniors.

A multiple linear regression model is developed using ordinary least squares (OLS) to evaluate these hypotheses in benchmark regression analysis. The model independently evaluates physical and mental health, using robustness checks, Propensity Score Matching (PSM) endogeneity tests, heterogeneity analyses, and mediating effect studies to thoroughly investigate the influence of high-level pension insurance on the health of the elderly.

The model is defined as:

$$phy_h_i = \alpha + \beta hi_insur_i + \gamma C_i + \varepsilon_i$$

$$men_h_i = \alpha + \beta hi_insur_i + \gamma C_i + \varepsilon_i$$

Where phy_h_i and men_h_i represent physical and mental health, indicates participation in high-level pension insurance, are control variables, is the random disturbance term, is the intercept, and is the core parameter of interest.

5. Data collection and analysis

5.1. Data collection

The data originate from the 2018 China Health and Retirement Longitudinal Study (CHARLS), a nationally representative survey focused on persons aged 45 and older. The research examines participants aged 60 and above, with dependent variables comprising physical health (evaluated through ADL, IADL, and fundamental activity function) and mental health (measured using the CESD scale). The independent variable is involvement in high-level pension insurance, characterised as enrolment in government/public institution pensions or private pension schemes. Control factors encompass gender, education, living status, residential location, wage income, and family size, with self-rated health serving as a mediating variable.

Table 1: Variables and definition

Variables		Definition	Mean	Standard Error
dependent variables	phy_h	The higher score (), the poorer physical health.	19.5832	15.4443
	men_h	The higher score (10-40), the poorer mental health.	22.5804	10.7409
independent variable	hi_insur	1 for participation and 0 for not.	0.2072	0.4053
control variables	age	The age of interviewers.	69.2615	7.1613
	gender	1 for male and 0 for female.	0.4861	0.4998
	edu	1 for above college and 0 for lower.	0.0147	0.1204
	alone	1 for the solitary and 0 for non-solitary.	0.0546	0.2273
	location	1 for urban and 0 for rural	0.0614	0.2401
	expense	The expense of the family last month.	1711.917	2263.002
	num	The number family numbers living and eating together.	3.0812	1.8645
mediating variable	self_h	Interviewer's assessment of their own health (1-5). The higher score, the worse health.	3.0709	0.9634

5.2. Analysis of empirical results

5.2.1. Benchmark regression results

Table 2 displays the OLS estimates about the influence of high-level pension insurance on the health of the elderly. Columns (1) and (2) indicate the impacts on physical health and mental health, respectively. The coefficients β are negative and statistically significant at the 1% level, signifying that engagement in high-level pension insurance markedly enhances older health, particularly affecting physical health more significantly.

Table 2: Benchmark regression results

	(1) phy_h	(2) men_h
hi_insur	-3.409*** (-8.647)	-3.410*** (-12.054)
age	0.700*** (24.638)	0.149*** (7.388)
gender	-4.696*** (-13.828)	-2.679*** (-10.349)
edu	-2.836** (-2.484)	-1.631*** (-3.306)
alone	0.875 (1.450)	-0.326 (-0.662)
location	-0.521 (-0.783)	-0.338 (-0.642)
expense	0.000 (1.262)	0.000 (0.347)
num	0.271*** (2.842)	-0.125* (-1.720)
_cons	-27.232*** (-13.496)	14.896*** (10.507)
N	6643	6643
R2	0.158	0.050

t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2.2. Robustness tests

The study winsorizes the primary variables at the 5th and 95th percentiles to mitigate any outliers. The coefficients for physical and mental health maintain consistent signs and significance both prior to and following winsorization. This validates the strength of the data and the consistency of the model.

5.2.3. Endogeneity test

To address endogeneity issues, Propensity Score Matching (PSM) is utilised through nearest neighbour, radius, and kernel matching techniques. The mean differences between the treatment and control groups are negligible, with standardised bias (%bias) predominantly at low levels, signifying effective sample equilibrium. The t-test results indicate no significant changes in variables between the groups, hence affirming their comparability. Upon adjusting for endogeneity, the regression

outcomes retain significance at the 1% level, indicating that high-level pension insurance consistently exerts a positive influence on the health of the elderly.

5.2.4. Heterogeneity analysis

The study conducts heterogeneity analyses based on residential location and living status.

The sample is initially categorised into urban and rural groups. Table 3 indicates that the influence of high-level pension insurance is substantial for both demographics, however more pronounced among urban elderly, with coefficients significant at the 0.1% level in contrast to the 5% level for rural old. This corroborates Hypothesis 2, indicating that urban inhabitants derive more advantages from comprehensive pension insurance, presumably owing to enhanced access to healthcare and elevated income levels.

The sample is subsequently categorised into solitary and communal dwelling groups. Table 3 indicates that high-level pension insurance substantially enhances both the physical and mental health of non-solitary older individuals. This supports Hypothesis 3, emphasising the significance of social support and companionship in augmenting the health advantages of pension insurance.

Table 3: Heterogeneity analysis

	location				alone			
	urban phy_h	rural phy_h	urban men_h	rural men_h	yes phy_h	no phy_h	yes men_h	no men_h
hi_insur	-3.135* (-2.42)	-3.391*** (-7.08)	-3.447** (-3.29)	-3.344*** (-9.26)	-4.330** (-3.13)	-3.343*** (-7.16)	-3.102** (-2.67)	-3.429*** (-9.73)
control variables	yes	yes	yes	yes	yes	yes	yes	yes
_cons	-48.66*** (-7.75)	-25.65*** (-14.39)	23.90*** (4.72)	14.20*** (10.57)	-11.70 (-1.12)	-27.46*** (-15.70)	17.25 (1.96)	14.85*** (11.25)
N	448	6195	448	6195	358	6285	358	6285

t statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001

5.2.5. Mediating effect analysis

The study employs a step-by-step regression method to examine the mediating role of self-rated health.

In the initial regression analysis, columns (1) and (2) indicate that engagement in high-level pension insurance significantly impacts both physical and mental health in the elderly, with all coefficients demonstrating statistical significance. In the second model, column (3) indicates that high-level pension insurance substantially enhances self-rated health, with the coefficient for the independent variable staying statistically significant. In the third regression, columns (4) and (5) demonstrate that both comprehensive pension insurance and self-assessed health considerably influence the physical and mental well-being of the elderly. The results substantiate that self-rated health serves as a mediator, partially elucidating the beneficial impacts of pension insurance on the health of the elderly.

Table 4: Mediating effect

	(1) phy_h	(2) men_h	(3) self_h	(4) phy_h	(5) men_h
hi_insur	-3.409*** (-8.647)	-3.410*** (-12.054)	-0.196*** (-6.673)	-2.771*** (-7.211)	-3.108*** (-11.020)
self_h				3.252*** (19.127)	1.537*** (11.029)
control variables	yes	yes	yes	yes	yes
_cons	-27.232*** (-13.496)	14.896*** (10.507)	2.831*** (25.844)	-36.436*** (-18.143)	10.545*** (7.234)
N	6643	6643	6643	6643	6643
R2	0.158	0.050	0.015	0.200	0.069

t statistics in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01

6. Conclusion and suggestions

6.1. Conclusion

This study shows that increased participation in pension insurance significantly enhances the physical and mental health of elderly adults in China. Heterogeneity analyses indicate significant differences in outcomes among demographic groups: urban inhabitants have greater health improvements than their rural counterparts, perhaps due to better healthcare facilities and higher disposable incomes. Moreover, non-solitary elderly adults have greater benefits, underscoring the essential function of social support systems in influencing health outcomes. Mediation analysis reveals that self-rated health serves as a significant conduit, contributing 20.0% and 6.9% to the total impacts on physical and mental health, respectively.

6.2. Policy recommendations

To ensure sustainable and equitable pension systems, comprehensive reforms should focus on expanding coverage, diversifying funding sources, and integrating elderly care services. Key priorities include bridging urban-rural disparities through fiscal transfers and digital administration, while accelerating multi-pillar development via tax incentives and financial literacy programs.

Four concrete measures are proposed: First, diversify the pension architecture by expanding enterprise annuities (second pillar) and voluntary personal pensions (third pillar) through employer matching and tax benefits. Secondly, amalgamate pension and long-term care systems through community-based pilot initiatives that consolidate disbursements with nursing services. Third, execute proactive fiscal measures, encompassing incremental retirement age modifications and risk-optimized investment approaches, to mitigate anticipated fund exhaustion. Fourth, institutionalize evidence-based policymaking through real-time actuarial modeling to dynamically modify system parameters.

References

- [1] Chen, Q., Zhang, X., & Hao, Y. (2024). The impact of basic pension insurance for urban and rural residents on the health and inequality of the elderly population. *Population Journal*, 46(6), 77–94.
- [2] Cai, W., Li, B., & Fei, Y. (2024). The impact of pension insurance system convergence on workers' participation behavior. *Economic Perspectives*, 2024(2), 88–106.
- [3] Yang, J., Deng, D., & Wu, H. (2018). The family income effect of China's urban and rural residents' pension insurance system—A counterfactual estimation based on propensity score matching (PSM). *Journal of Agrotechnical Economics*, 2018(10), 84–95.

- [4] Dushi, I., Iams, H. M., & Trenkamp, B. (2017). The importance of social security benefits to the income of the aged population. *Social Security Bulletin*, 77(2), 1 - 12.
- [5] Song, J., & Gao, C. (2023). Basic pension insurance system and income inequality among residents: Impact and mechanism analysis—From the perspective of individual relative deprivation. *Journal of Southwest Minzu University (Humanities and Social Science Edition)*, 2023(2), 153–164.
- [6] Etgeton, S. (2018). The effect of pension reforms on old - age income inequality. *Labour Economics*, 53, 146 - 161.
- [7] Xu, Q., Zhang, K., & Zhou, Y. (2023). Traditional security, pension insurance, and rural residents' concerns about old-age support. *Zhejiang Social Sciences*, 2023(8), 80–89.
- [8] Chen, T., Wang, K., Lan, B., Mo, L., Peng, W., & Song, L. (2021). Analysis of urban-rural heterogeneity in the health status of the elderly—Based on 2015 CHARLS tracking survey data. *Rural Economy and Science-Technology*, 32(21), 265–270.
- [9] Zhu, X., Gu, N., Chen, Q., & Gao, L. (2024). The impact of long-term care insurance on the subjective well-being of the elderly—An empirical analysis based on CHARLS panel data. *Chinese Health Service Management*, 41(3), 264–268.
- [10] Chen, T., Wang, K., Lan, B., Mo, L., Peng, W., & Song, L. (2021). Analysis of urban-rural heterogeneity in the health status of the elderly—Based on 2015 CHARLS tracking survey data. *Rural Economy and Science-Technology*, 32(21), 265–270.
- [11] Huang, Q., & Fang, S. (2022). The impact of the pension insurance system on the health of the elderly: Evidence from Chinese urban residents. *On Economic Problems*, 2022(8), 29–38.
- [12] Pak, T. Y. (2021). What are the effects of expanding social pension on health? Evidence from the Basic Pension in South Korea. *The Journal of the Economics of Ageing*, 18, 100287.
- [13] Lei, X., Bai, C., Hong, J., & Liu, H. (2022). Long-term care insurance and the well-being of older adults and their families: Evidence from China. *Social Science & Medicine*, 296, 114745.
- [14] Zhang, L., Wei, Q., Liu, H., Ma, Y., Zhao, B., Li, S., & Chen, S. (2024). The impact of long-term care insurance on the physical and mental health of the elderly in China. *Medicine and Society*, 37(8), 72–77.
- [15] Pu, X., Wang, Y., & Zhao, H. (2022). Basic pension insurance, interpersonal consumption, and rural residents' risk perception—A comparative analysis from the perspective of formal and informal institutions. *Comparative Economic & Social Systems*, 2022(1), 105–117.
- [16] Liu, Q., & Liu, S. (2019). The poverty reduction effect of rural basic pension insurance—An empirical analysis based on PSM-DID. *Population and Development*, 25(3), 38–46.
- [17] Qin, C., & Guo, J. (2021). Analysis of China's New Rural Society Pension System. *Journal of Quantitative & Technical Economics*, 38(5), 52 - 71.
- [18] Lu, M., & Feng, M. (2008). Reforming the Welfare System in the People's Republic of China. *Asian Development Review*, 25(1&2), 58 - 80.
- [19] Wei, S., Xiang, J., & Ma, G. (2018). The Estimation and Potential Impact of the Central Adjustment Fund for Basic Endowment Insurance. *Tax and Economic Research*, 23(6), 1 - 5.
- [20] Zhang, X., & Fang, Q. (2017). Research on the appropriate contribution base of pension insurance for China's urban low-income groups. *The Journal of Quantitative & Technical Economics*, 34(9), 122–139.
- [21] Chetty, R., & Hendren, N. (2018). The impacts of neighborhoods on intergenerational mobility II: County-level estimates. *The Quarterly Journal of Economics*, 133(3), 1163-1228.
- [22] Shang, X., & Lei, H. (2024). The subjective social stratification effect of the basic pension security system—An analysis based on CLDS2018 data. *Sociological Review of China*, 2024(5), 234–256.
- [23] Chen, Y., Zhao, L., Fan, Y., & Xie, B. (2021). Does the New Rural Pension Scheme improve residents' livelihoods? Empirical evidence from Northwestern China. *PLoS ONE*, 16(4), e0250130. <https://doi.org/10.1371/journal.pone.0250130>.
- [24] She, X., & Wu, J. (2014). Comparison of mental health status between urban and rural elderly. *China Journal of Health Psychology*, 22(2), 237–239.
- [25] Shang, X., & Lei, H. (2024). The subjective social stratification effect of the basic pension security system—An analysis based on CLDS2018 data. *Sociological Review of China*, 2024(5), 234–256.