

The Impact of the New Rural Social Pension Insurance on the Utilization of Integrated Health and Elderly Care Services among Rural Older Adults: A PSM-DID Analysis Based on CHARLS Data

Hongrui Feng*

School of Pharmaceutical Business, Guangdong Pharmaceutical University, Zhongshan 528458, China

**Corresponding author: Hongrui Feng.*

Abstract

Against the backdrop of accelerated aging in rural China and the promotion of the “integrated healthcare and elderly care” policy, this paper aims to examine the impact of the New Rural Social Pension Insurance (NRLSI) on the use of preventive health services among rural elderly, in order to provide empirical evidence for coordinating pension security and health promotion policies. Using panel data from four waves (2013, 2015, 2018, and 2020) of the China Health and Retirement Longitudinal Study (CHARLS), the integration of urban and rural resident pension schemes in 2014 was treated as a quasi-natural experiment. The Propensity Score Matching-Difference in Differences (PSM-DID) method was employed to identify the causal effect of NRLSI enrollment on the health check-up behavior of rural elderly. Heterogeneity analysis was conducted across economic status and health conditions. Enrollment in the NRLSI significantly increased the probability of rural elderly undergoing health check-ups, with an average effect of approximately 4.6–4.7 percentage points. Heterogeneity analysis revealed that this promoting effect was stronger among high-income groups (about 11.1 percentage points) and more pronounced among elderly with chronic diseases (about 6.1 percentage points), whereas it was not significant among low-income groups and those without chronic diseases. This reflects the existence of a “threshold effect” in health investment, which is moderated by the intensity of individual health needs. The NRLSI not only serves as an income security tool but also effectively encourages rural elderly to adopt preventive health behaviors, although its effects vary across different groups. Future policies should enhance targeting and coordination to better leverage pension insurance in promoting healthy aging.

Keywords

new rural social pension insurance (NRSPI), integrated health and elderly care, health check-up, preventive health behavior, PSM-DID, rural older adults

1. Introduction

With the acceleration of population aging in China, elderly care has become a major challenge in national governance. Notably, the degree of aging in rural areas has continued to deepen in the context of large-scale

out-migration of young and middle-aged laborers, exhibiting more pronounced structural pressures than in urban areas [1]. Under this reality, how to effectively ensure the quality of later life for rural older adults is not only related to family well-being but also constitutes a key component in promoting rural revitalization and maintaining social stability. In recent years, the state has actively advocated the development of an *integrated health and elder care* model, aiming to promote the organic integration of healthcare services and elderly care services. Meanwhile, after years of development, the New Rural Social Pension Insurance (NRSPI) has become an important cornerstone supporting the rural pension security system. How these two major policies are interconnected in practice and whether they can generate synergistic effects constitute a research question of substantial practical significance.

The academic community has conducted extensive discussions on the effects of NRSPI implementation and produced a rich body of findings. A large number of empirical studies indicate that, by providing stable pension income, NRSPI generates significant economic empowerment effects, playing a positive role in improving the basic living standards of insured older adults, alleviating household poverty, and stimulating rural consumption potential. In addition, studies have examined the complex impacts of this system on intra-household resource allocation, labor mobility, and land use patterns. However, existing discussions have largely focused on the economic outcomes and resource allocation effects of the policy, with relatively limited attention given to changes in health behaviors. Specifically, as a long-term income security program, whether NRSPI influences individuals' decisions regarding the utilization of preventive health services—and thereby interacts at the micro level with the policy orientation of integrated health and elder care—remains to be further empirically tested.

Based on the above considerations, this study aims to examine how participation in NRSPI affects the utilization of integrated health and elder care-related services among rural older adults. The utilization of such services is operationalized as the active use of preventive healthcare services, and *regular health checkups* are selected as a specific and observable core indicator. As a key link connecting primary healthcare and health management, health checkups serve as an important observation point for assessing whether older adults shift from “passive treatment” to “active health management.” In terms of methodology, this study employs multiple waves of panel data from the China Health and Retirement Longitudinal Study (CHARLS), treating the 2014 integration of the urban–rural resident pension system as a policy shock. A combined Propensity Score Matching and Difference-in-Differences (PSM-DID) approach is adopted to more accurately identify the causal relationship between pension participation and the utilization of health services. To ensure the robustness of the conclusions, the analysis covers survey data from 2013 to 2020, controls for common time effects across different years through econometric modeling, and incorporates the impact of the COVID-19 pandemic period into robustness checks.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature; Section 3 presents the theoretical framework and research hypotheses; Section 4 describes the data sources, variable construction, and empirical strategy; Section 5 reports and analyzes the empirical results; and the final section concludes with key findings, policy implications, and research limitations.

2. Literature Review

As a core pillar of China's rural social security system, the implementation effects of the New Rural Social Pension Insurance (NRSPI) have attracted sustained attention from scholars across multiple disciplines. This section aims to systematically review the relevant literature. It first summarizes the economic and social effects of NRSPI in terms of multidimensional welfare, then focuses on empirical evidence regarding its health-promoting effects, followed by an evaluation of the concepts and practical challenges of integrated health and elder care in rural contexts. Finally, it synthesizes the literature to clarify the positioning and contribution of this study within the existing academic framework.

2.1 Multidimensional Welfare Effects: Economic Empowerment and Social Restructuring

Existing studies generally confirm that NRSPI generates fundamental economic empowerment effects by providing stable pension income. The most direct manifestations are income increases and poverty alleviation. Research shows that participation significantly increases pension income among older adults [2], with a particularly strong “bottom-up” effect for low-income households, where the basic pension provides

approximately a 14% income guarantee [3]. Furthermore, this effect has extended from income poverty to multidimensional poverty, with evidence indicating that NRSPI effectively reduces the incidence, depth, and intensity of poverty, while improving deprivations in health, education, and other dimensions among older adults [4,5].

Economic empowerment further releases household consumption potential and optimizes consumption structure. Studies find that NRSPI not only increases overall consumption levels but, more importantly, promotes consumption upgrading, with a significantly stronger stimulating effect on developmental and enjoyment-oriented consumption than on subsistence consumption [6]. This reflects that pension income effectively alleviates precautionary savings motives and improves quality of life [7].

At a deeper level, NRSPI has reshaped intra-household resource allocation and decision-making logic, triggering complex processes of social restructuring. In terms of labor supply, it primarily induces “adjustments in labor structure,” prompting older adults to reduce high-intensity agricultural labor and shift toward family caregiving or leisure activities [8,9]. Regarding intergenerational relationships—a core issue—existing studies present a complex picture in which both “crowding-in” and “crowding-out” effects coexist. Some studies find that pension income may substitute for financial support from adult children [10], while others provide evidence that it can encourage greater feedback by enhancing grandparents’ caregiving capacity or functioning as a “shared family fund” [11,12]. In addition, NRSPI facilitates non-agricultural labor migration by alleviating constraints on the younger generation [13], and exerts nuanced and multifaceted influences on land transfer decisions [14,15].

2.2 Health Promotion Effects: From Healthcare Utilization to Health Outcomes

With the deepening of research, scholars have increasingly focused on the impact of the New Rural Social Pension Insurance (NRSPI) on health outcomes and behaviors, revealing its potential in promoting healthy aging. The underlying mechanisms mainly operate through two pathways: improving access to healthcare services, and optimizing conditions for health maintenance by enhancing economic security and reallocating time resources.

At the level of healthcare utilization, pension income directly relaxes budget constraints. Studies show that receiving NRSPI significantly increases the probability that older adults utilize healthcare services, particularly for more costly inpatient services [16]. It often works in synergy with health insurance to jointly mitigate the risk of falling into poverty due to illness [4].

At the level of health outcomes, the scope of research has continued to expand. Beyond physical health, the positive effects of NRSPI on mental and cognitive health have been widely validated. Evidence suggests that by alleviating economic anxiety and reducing heavy labor burdens, NRSPI significantly improves subjective well-being and life satisfaction among older adults [17,18]. Furthermore, some studies innovatively find that participation can delay cognitive decline, with the mechanism operating through increased social participation supported by pension income [19]. From the perspective of system resilience, NRSPI enhances households’ ability to cope with health shocks by promoting health-related consumption [20].

2.3 The Concept of Integrated Health and Elder Care: Challenges in Rural Practice

As a national strategy, integrated health and elder care aims to combine healthcare and elderly care services to provide older adults with integrated and continuous health management and care. Its ideal model encompasses multiple components, including prevention, treatment, rehabilitation, and long-term care, with prevention as the core principle [21].

However, the implementation of this concept in rural areas faces severe challenges. The literature generally identifies four major constraints. First, service provision is fragmented and insufficient: both healthcare and elderly care resources are inherently scarce in rural areas and belong to separate systems, making integration difficult. Second, payment capacity is limited: older adults have relatively low incomes and find it difficult to afford market-based services. Third, health awareness remains weak, with a prevalent preference for treatment over prevention. Fourth, there is a shortage of professional personnel, particularly interdisciplinary talents with expertise in both medical and elder care. As a result, integrated health and elder care in rural areas largely

remains at the pilot stage, and its inclusiveness, accessibility, and sustainability urgently need to be strengthened [22].

2.4 Literature Review Summary and Positioning of This Study

In summary, existing studies have reached an important consensus that NRSPI possesses significant economic empowerment and multidimensional welfare effects, and its positive role in health promotion has been increasingly supported by empirical evidence, laying a solid foundation for subsequent research. From the perspective of research focus and content, most existing studies concentrate on the impact of NRSPI on health *outcomes* (such as disease status and mental health indicators) or the utilization of *treatment-oriented* healthcare services. However, as a long-term income security program, whether and how NRSPI influences older adults' decisions to actively utilize preventive and health management-oriented services remains insufficiently explored. The utilization of preventive health services by older adults is precisely the key behavioral link through which the concept of integrated health and elder care is implemented at the individual level, and it also constitutes an important entry point for promoting healthy aging.

Based on this, this study attempts to explore this research direction by operationalizing “integrated health and elder care service utilization” as observable preventive health behaviors and selecting *regular health checkups* as the core proxy variable. Health checkups serve as an important nexus connecting primary healthcare and health management, and they are also a key component of China's basic public health service system. Their utilization decisions are jointly influenced by economic capacity and risk expectations, making them an appropriate observation point for examining the implementation of the “prevention-first” principle. This study empirically examines the impact of NRSPI participation on the utilization of health checkups among rural older adults and seeks to analyze the underlying mechanisms through which pension income influences health behaviors. In doing so, it aims to provide micro-level empirical evidence at the intersection of pension insurance policy and the practice of integrated health and elder care, thereby offering insights for policy optimization and improvement.

3. Theoretical Framework and Research Hypotheses

3.1 Definition of Core Concepts

3.1.1 New Rural Social Pension Insurance

The research object of this study is the New Rural Social Pension Insurance (NRSPI). This system was piloted in 2009 and was merged in 2014 with the Urban Resident Basic Pension Insurance into the Urban–Rural Resident Basic Pension Insurance. Although the institutional name has changed, its core functions, financing mechanisms, and benefit structures targeting rural residents have been continued and integrated after the reform. Therefore, in academic research—especially empirical analyses based on panel data spanning before and after the integration—the Urban–Rural Resident Basic Pension Insurance (for rural hukou participants) is often regarded as a continuation and development of the NRSPI policy. Following this common practice, the substantive research object of this study remains the rural social pension insurance policy. At the operational level, based on survey data, this study defines older adults with rural hukou who participate in the Urban–Rural Resident Basic Pension Insurance (or its predecessor, NRSPI) as the “treatment group,” thereby constructing the core explanatory variable to capture the effect of this social pension policy.

3.1.2 Utilization of Integrated Health and Elder Care Services

Integrated health and elder care aims to integrate medical and elderly care resources to provide older adults with continuous health and care services [23]. For the purpose of micro-level quantitative analysis, this study operationalizes “utilization of integrated health and elder care services” as the active utilization of integrated services that are prevention-oriented and incorporate health management functions by older adults.

Based on the preventive nature of this concept and data availability, this study selects “whether an individual has undergone a health checkup in the past two years” as the core proxy variable. The rationale is threefold. First, conceptual alignment: health checkups represent a key practice of preventive care and fully align with the “prevention-first” principle of integrated health and elder care. Second, accessibility and universality: health checkups are part of China's basic public health service programs and constitute the most

fundamental and widespread link connecting primary healthcare systems with community- and home-based older adults. Third, measurement reliability: in large-scale social surveys, this behavior has a clear recall period and objective criteria, resulting in high measurement reliability. Although health checkups represent only a basic component of the multi-level integrated health and elder care system, as a universal, accessible, and strongly prevention-oriented behavior, they provide an effective entry point for examining how pension income influences older adults' decisions regarding proactive health management.

3.2 Theoretical Foundations

3.2.1 Health Demand Theory

Health demand theory conceptualizes health as a “durable capital good” that generates utility. Individuals invest in health capital through expenditures such as healthcare services and nutrition, while health capital depreciates over time. Therefore, maintaining or improving health requires continuous investment. This theory suggests that the demand for health investment is constrained by budget limitations. When disposable income increases, individuals are more capable of covering both the direct and indirect costs of health investment, thereby potentially increasing demand for preventive services such as health checkups. As a form of stable non-labor income, pension benefits from NRSPI generate an income effect that directly relaxes the budget constraints of older adults and enhances their ability to invest in health, including preventive health checkups.

3.2.2 Precautionary Saving Theory

Precautionary saving theory posits that risk-averse consumers engage in additional saving to cope with uncertainty regarding future income and expenditures, thereby suppressing current consumption [24]. In rural China, due to the long-standing insufficiency of formal social security, older adults face strong uncertainty and anxiety regarding potential large medical expenditures in the future. This compels them to maintain high levels of precautionary savings and compress non-essential expenditures, including preventive health investments. NRSPI provides a lifelong and predictable cash flow, significantly reducing participants' future economic risks associated with old-age security. According to this theory, such an “expectation stabilization effect” can alleviate economic anxiety among older adults and release consumption and investment willingness that is otherwise suppressed by uncertainty. Specifically, older adults are more likely to allocate resources toward preventive measures that reduce future health risks and avoid potential catastrophic expenditures, such as regular health checkups [19].

Taken together, health demand theory reveals the pathway through which pensions influence behavior by enhancing *payment capacity*, while precautionary saving theory explains how pensions affect behavior by strengthening *investment incentives*. These two perspectives jointly constitute the theoretical foundation for understanding how NRSPI influences preventive health behaviors among older adults.

3.3 Theoretical Framework and Research Hypotheses

Based on the above theories, NRSPI may influence the utilization of integrated health and elder care services (health checkups) among rural older adults through two primary channels: the *income effect* and the *expectation stabilization effect*. From the perspective of health demand theory, pension income directly increases disposable resources, thereby enhancing the ability of older adults to pay for health checkups. From the perspective of precautionary saving theory, the stable expectations brought by pensions reduce fears of future poverty caused by illness, thereby strengthening the motivation to invest in long-term health through preventive measures. The simultaneous enhancement of payment capacity and investment incentives is expected to promote the transformation of potential demand for preventive health services into actual health checkup behavior. Accordingly, the following hypothesis is proposed:

H1: Compared with non-participants, participation in NRSPI significantly increases the probability that rural older adults utilize health checkup services.

Furthermore, the effects of these two mechanisms may vary across different groups, indicating the presence of heterogeneity. On the one hand, the strength of the income effect depends on individuals' initial economic constraints. For older adults with lower per capita household consumption, liquidity constraints are more severe, and preventive health demand is more strongly suppressed by limited economic capacity. Therefore, the marginal income increase brought by pensions has a more pronounced effect on improving their payment

capacity. As a result, the promoting effect of NRSPI on health checkups is expected to be stronger for this group. Accordingly, the following hypothesis is proposed:

H2: The promoting effect of NRSPI on health checkup utilization is more pronounced among individuals with lower levels of per capita household consumption.

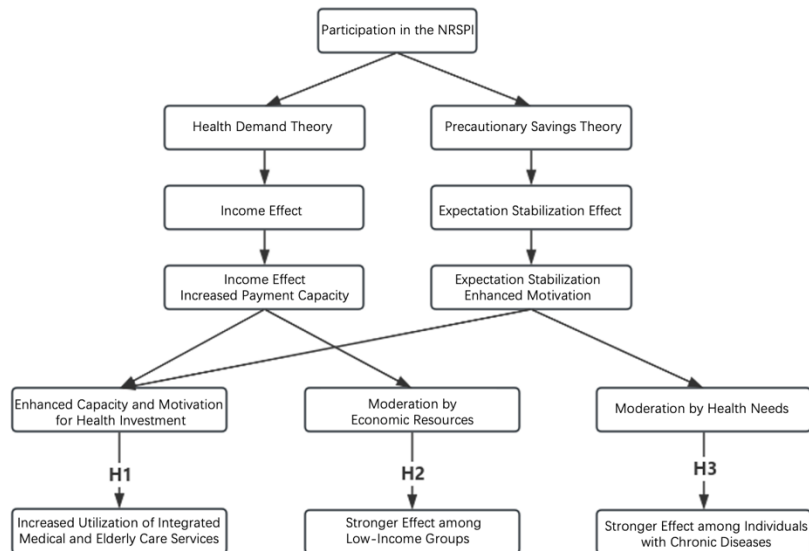
On the other hand, the intensity of individuals' health investment demand may also moderate policy effects. According to health demand theory, individuals with lower health capital (e.g., those with chronic diseases) face higher marginal returns to maintaining health and thus have a stronger inherent demand for health monitoring and management (such as regular checkups). However, this demand is also constrained by economic capacity. Pension income not only provides the financial means to cover related expenses for individuals with chronic conditions, but its expectation stabilization effect may also particularly alleviate their anxiety about potentially high medical costs resulting from disease progression, thereby more effectively translating latent demand into actual behavior. Accordingly, the following hypothesis is proposed:

H3: The promoting effect of NRSPI on health checkup utilization is more pronounced among older adults with chronic diseases.

In summary, the analytical framework of this study integrates the above theoretical logic and hypothesis development, as illustrated in Figure 1. This framework clearly demonstrates that NRSPI participation enhances both payment capacity and investment incentives through the income effect and expectation stabilization effect, thereby influencing the utilization of integrated health and elder care services (health checkups), and highlights the theoretical basis for group heterogeneity.

To clearly present the above theoretical logic and hypothesis development process, this study constructs an analytical framework diagram, as shown in Figure 1:

Figure 1: Theoretical Framework of the Study



4. Research Design

4.1 Data Sources and Sample Selection

This study employs multiple waves of nationally representative panel data from the China Health and Retirement Longitudinal Study (CHARLS) for empirical analysis. CHARLS is a large-scale, high-quality, multidisciplinary longitudinal survey targeting Chinese households and individuals aged 45 and above. Its questionnaire covers rich information on family structure, health status, healthcare utilization, employment and retirement, pensions, income and consumption, assets, and social interactions, providing an ideal data foundation for this study [25].

This study uses four waves of CHARLS data from 2013, 2015, 2018, and 2020 to construct an unbalanced panel dataset [26]. Although the national baseline survey of CHARLS was launched in 2011, the 2011 data are excluded for the following reasons. First, NRSPI was piloted in 2009, and in 2011 it was still in the early stage of policy expansion, with substantial regional heterogeneity and instability in coverage and implementation effects. Using 2011 as the baseline period may lead to bias in identifying the treatment group and estimating policy effects. Second, and more importantly, in 2014 the State Council decided to merge the New Rural Pension Scheme and the Urban Resident Pension Scheme into a unified Urban–Rural Resident Basic Pension Insurance system. This institutional integration provides an ideal quasi-natural experiment for evaluating the policy effects of NRSPI. Therefore, this study defines 2013 as the pre-policy period and 2015, 2018, and 2020 as the post-policy *period*, allowing for clearer identification of the impact of pension system integration.

In terms of sample processing, the following steps are implemented:

(1) Hukou selection: Only respondents with agricultural hukou are retained to focus on rural older adults.

(2) Age restriction: The sample is restricted to individuals aged 50–70. The lower bound of 50 is chosen because individuals in this age group are approaching or entering the pension-receiving stage and exhibit increased concern for health. The upper bound of 70 aims to ensure comparability across life stages while avoiding substantial behavioral changes due to severe physical decline among the oldest-old, and to maintain sufficient sample size.

(3) Data cleaning: Observations with missing values in key variables (e.g., health checkups, participation status, age, gender, household consumption) are excluded to ensure the completeness of the empirical analysis.

To address the potential impact of COVID-19 on the 2020 data, year fixed effects are included in the model, and robustness checks are conducted by incorporating a dummy variable indicating the 2020 survey to test the potential influence of the pandemic shock.

After the above processing, a total of 14,441 observations are retained for empirical analysis.

4.2 Variable Definitions

To clearly define the variables used in this study and specify their measurement and coding, the dependent variable, key explanatory variable, grouping variable, time variable, and control variables are described as follows. Detailed definitions are presented in Table 1.

(1) Dependent variable: A binary variable indicating the utilization of integrated health and elder care services, measured as whether the respondent has undergone a health checkup in the past two years.

(2) Key explanatory variable: To identify the causal policy effect, this study constructs the core interaction term in the DID model, which captures whether an individual is exposed to the policy intervention resulting from the integration of the pension system.

(3) Grouping and time variables: A treatment group indicator (reflecting whether an individual belongs to the policy-affected group) and a policy time indicator (reflecting whether the observation falls in the post-policy period) are defined to construct the DID model.

(4) Control variables: These include individual characteristics (age, gender, education, marital status), health status (self-rated health, chronic diseases), household economic resources (log of per capita consumption), other social security (health insurance), and family structure (number of children), in order to control for other factors that may influence health checkup behavior.

Table 1: Variable Definitions

Variable Type	Variable Name	Definition and Measurement
Dependent Variable	Health checkup in the past two years	1 = received a health checkup in the past two years; 0 = otherwise
Key Explanatory Variable	Policy interaction term	Core DID variable: equals 1 for individuals in the treatment group during the post-policy period; 0 otherwise
Grouping Variable	Participation in NRSPI	1 = participated in NRSPI in the 2013 baseline; 0 = otherwise
Time Variable	Post-policy period	0 = 2013; 1 = 2015, 2018, 2020

Variable Type	Variable Name	Definition and Measurement
Control Variables	Age	Respondent's age
	Gender	Male = 1; Female = 0
	Education level	1 = below primary school; 2 = primary school; 3 = middle school; 4 = high school and above
	Marital status	Married = 1; otherwise = 0
	Self-rated health	Scale 1–5 (1 = very poor, 5 = very good)
	Number of chronic diseases	Total number of diagnosed chronic conditions
	Household per capita consumption	Log of total household consumption divided by household size
	Health insurance coverage	1 = has any health insurance; 0 = otherwise
	Number of living children	Number of surviving children of the respondent

4.3 Empirical Model Specification

To identify as cleanly as possible the causal effect of NRSPI participation on health checkup behavior among older adults, this study adopts a combined approach of Propensity Score Matching (PSM) and Difference-in-Differences (DID).

4.3.1 Propensity Score Matching

Before constructing the DID model, Propensity Score Matching (PSM) is first employed to mitigate sample selection bias arising from systematic differences in observable characteristics between the treatment group (participants) and the control group (non-participants). The specific steps are as follows:

(1) Estimation of propensity scores: Using baseline data from 2013, a Logit model is estimated with participation status as the dependent variable. Observable covariates—including age, gender, years of education, marital status, self-rated health, number of chronic diseases, log of household per capita consumption, health insurance coverage, and number of living children—are included to estimate each individual's probability of participating in NRSPI (i.e., the propensity score).

(2) Sample matching: Kernel matching is applied. Based on the estimated propensity scores, each treated individual is matched with all control individuals, with weights assigned according to the proximity of propensity scores, thereby constructing a counterfactual control group with a distribution of characteristics similar to that of the treatment group.

(3) Matching quality assessment: After matching, balance is assessed by examining whether the mean differences in covariates between the treatment group and the matched control group are significantly reduced, and whether the standardized bias decreases substantially. In addition, only observations within the common support region are retained to ensure that subsequent analyses are conducted on individuals with overlapping characteristics.

4.3.2 Difference-in-Differences Model

Based on the matched sample, a two-way fixed effects panel model is constructed to perform DID estimation. The baseline model is specified as follows:

$$Y_{it} = \beta_0 + \beta_1 Treat_i \times Post_t + \beta_2 X_{ict} + \varphi_i + \gamma_t + \varepsilon_{it} \quad (1)$$

Where t denotes year and i denotes individual. The dependent variable Y_{it} is a binary indicator of whether the individual underwent a health checkup in period t . $Treat_i \times Post_t$ represents the interaction term between the treatment group indicator (whether individual i participates in NRSPI) and the post-policy period indicator, which is the key variable of interest in this study. The coefficient β_1 is the core estimate, capturing the average difference in changes in the probability of health checkups between the treatment and control groups before and after policy implementation—that is, the “net effect” of NRSPI participation. X_{it} is a vector of time-varying control variables, including age, gender, education level, marital status, self-rated health, number of chronic diseases, household per capita consumption, health insurance coverage, and number of

living children. φ_i and γ_t denote individual fixed effects and year fixed effects, respectively, which control for time-invariant individual heterogeneity and common time shocks affecting all individuals. These controls are crucial for satisfying the parallel trends assumption of DID and for eliminating confounding from common shocks. ε_{it} is the error term.

5. Empirical Results and Analysis

5.1 Descriptive Statistics

Table 2 presents the descriptive statistics of the full sample. The final sample consists of 14,441 observations. From the sample characteristics, 36.5% of rural older adults underwent health checkups in the past two years, indicating substantial room for improvement in the utilization of preventive healthcare services. In terms of pension participation, 71.4% of older adults were enrolled in NRSPI in the 2013 baseline, forming the treatment group in this study. The average age of the sample is 60.6 years, with males accounting for 48.5%. The average education level is 1.83 (between “below primary school” and “primary school”), and 84.9% of the respondents are married. In terms of health, the mean self-rated health score is 3.01 (indicating a “fair” level), and individuals have an average of 1.92 chronic diseases. Regarding economic status, the mean log of household per capita consumption is 8.84, health insurance coverage is as high as 96.0%, and the average number of living children is 2.63.

Table 2: Descriptive Statistics of the Full Sample

Variable	Mean	Std. Dev.	Min	Max
Health checkup in past two years	0.365	0.481	0.000	1.000
Participation in NRSPI	0.714	0.452	0.000	1.000
Age	60.591	5.482	50.000	70.000
Gender	0.485	0.500	0.000	1.000
Education level	1.831	1.002	1.000	4.000
Married	0.849	0.358	0.000	1.000
Self-rated health	3.010	0.985	1.000	5.000
Number of chronic diseases	1.921	1.707	0.000	13.000
Log of household per capita consumption	8.836	0.867	4.864	12.614
Health insurance coverage	0.960	0.196	0.000	1.000
Number of living children	2.631	1.198	0.000	10.000
Observations	14441			

Table 3 further compares the pre-policy differences between the treatment and control groups in 2013. The results show that the treatment group had a significantly higher health checkup rate than the control group by 3.4 percentage points ($p = 0.017$), suggesting that participants may inherently have stronger health awareness. In addition, significant differences exist between the two groups across multiple characteristics: the treatment group is younger, has higher education levels, better self-rated health, and fewer chronic diseases. Notably, the treatment group has a significantly lower health insurance coverage rate than the control group by 4.1 percentage points, which may reflect a substitution relationship between NRSPI and health insurance. These systematic differences indicate that direct comparisons between the treatment and control groups may lead to selection bias. Therefore, this study employs PSM to construct a comparable sample to address this issue.

Table 3: Mean Differences Between Treatment and Control Groups in 2013

Variable	Treatment Mean	Control Mean	Mean Difference	Std. Error	p-value
Health checkup in past two years	0.394	0.360	0.034	0.014	0.017
Age	58.530	59.173	-0.643	0.167	0.000
Gender	0.507	0.484	0.023	0.015	0.109
Education level	1.842	1.775	0.067	0.029	0.019
Married	0.860	0.870	-0.010	0.010	0.333
Self-rated health	3.040	2.976	0.064	0.028	0.021
Number of chronic diseases	1.468	1.553	-0.085	0.042	0.044
Log of household per capita consumption	8.720	8.675	0.045	0.025	0.068

Health insurance coverage	0.944	0.985	-0.041	0.005	0.000
Number of living children	2.570	2.706	-0.137	0.036	0.000
Observations	5810				

5.2 Baseline Regression Results

5.2.1 PSM Quality Assessment

To address selection bias between the treatment group (NRSPI participants) and the control group (non-participants), PSM is first employed to construct a comparable sample. Table 4 reports the standardized bias test results before and after matching. Before matching, the treatment and control groups exhibit standardized biases exceeding 10% in variables such as age and number of living children. After kernel matching, the standardized biases of all covariates are substantially reduced. For variables such as gender, education level, and health insurance coverage, the reduction in bias exceeds 69%. After matching, except for the number of living children (9.51%), the standardized biases of all variables fall below 5%, which is well under the commonly accepted threshold of 10%. This indicates that PSM effectively balances the distribution of observable characteristics between the treatment and control groups, providing a solid foundation for subsequent DID analysis.

Table 4: Standardized Bias Test for PSM

Variable	Mean of the Treatment Group Before Matching	Mean of the Control Group Before Matching	Bias Before (%)	Bias After (%)	Bias Reduction (%)
Age	59.1729	58.53011	10.85235	4.85705	55.24427
Gender	.4836866	.5071384	-4.689388	-1.442808	69.23249
Education level	1.774946	1.842334	-6.837238	-.7097223	89.61975
Married	.869969	.8603352	2.778353	-.8378502	69.84364
Self-rated health	2.975947	3.040348	-7.031981	-2.652963	62.27289
Number of chronic diseases	1.552751	1.468032	6.013788	2.587657	56.97127
Log of household per capita consumption	8.67468	8.719757	-5.030654	-1.251861	75.11534
Health insurance coverage	.9847583	.9441341	17.68315	0	100
Number of living children	2.706359	2.569832	10.51363	9.50793	9.565674

Note: A standardized bias below 10% is generally considered indicative of good matching quality.

5.2.2 Baseline DID Regression Results

Table 5 reports the baseline PSM-DID regression results on the impact of NRSPI participation on health checkup utilization among rural older adults. Models (1) to (4) progressively incorporate control variables to examine the robustness of the results. The core explanatory variable, *did* (policy interaction term), remains significantly positive across all four models, with coefficients consistently ranging from 0.046 to 0.047 ($p < 0.05$). This indicates that, after controlling for individual characteristics, health conditions, and household economic factors, participation in NRSPI increases the probability that rural older adults undergo health checkups within the past two years by approximately 4.6–4.7 percentage points on average. Regarding control variables, the number of chronic diseases has a significantly positive effect on health checkup behavior (coefficient ≈ 0.022 , $p < 0.01$), suggesting that individuals in poorer health are more motivated to undergo health examinations. The log of household per capita consumption also exhibits a positive effect (coefficient = 0.015, $p < 0.1$), indicating that households with better economic conditions are more likely to invest in preventive health services. Individual fixed effects absorb time-invariant characteristics (such as gender and education level), and therefore these variables are not separately reported in the regression results.

Table 5: Baseline PSM-DID Regression Results on the Impact of NRSPI on Health Checkups Among Rural Older Adults

Variables	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
<i>did</i>	0.047** (0.020)	0.047** (0.020)	0.046** (0.020)	0.046** (0.020)
2013.year	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)

Variables	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
2015.year	-0.027 (0.017)	-0.034 (0.267)	-0.043 (0.267)	-0.033 (0.270)
2020.year	0.001 (0.019)	-0.026 (0.930)	-0.041 (0.931)	-0.009 (0.938)
Age		0.004 (0.133)	0.003 (0.133)	-0.003 (0.134)
Married		-0.002 (0.024)	-0.002 (0.024)	-0.002 (0.024)
Self-rated health			-0.007 (0.008)	-0.007 (0.008)
Number of chronic diseases			0.022*** (0.007)	0.022*** (0.007)
Log of household per capita consumption				0.015* (0.008)
Health insurance coverage				0.002 (0.029)
Number of living children				-0.007 (0.015)
Constant	0.357*** (0.004)	0.141 (7.725)	0.187 (7.735)	0.382 (7.797)
Observations	11742	11742	11742	11742
Adjusted R ²	0.002	0.002	0.004	0.004

Notes:

(1) Robust standard errors clustered at the individual level are reported in parentheses;

(2) *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively;

(3) Year fixed effects are controlled, with 2018 as the reference group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.3 Robustness Checks

To verify the reliability of the baseline regression results, this study further conducts parallel trend tests and placebo tests.

5.3.1 Parallel Trend Test

The validity of the DID approach relies on the parallel trends assumption, which requires that the treatment and control groups follow similar trends prior to the policy intervention. Table 6 presents the results including the pre-policy interaction term (*pre_treated*). The results show that the coefficient of *pre_treated* is -0.059 and statistically significant at the 5% level, indicating that prior to the policy implementation (2013), the treatment group had a significantly lower health checkup rate than the control group. This initial difference may reflect a self-selection effect, whereby individuals with poorer health status or stronger awareness of health risks are more likely to enroll in pension insurance earlier. Although initial level differences exist, this study controls for both observable and unobservable time-invariant heterogeneity through PSM and individual fixed effects models. In addition, the interaction terms for post-policy periods (e.g., *post2015*) are either insignificant or omitted due to multicollinearity, which may limit the full presentation of dynamic effects but does not invalidate the estimated average treatment effect.

Table 6: Parallel Trend Test Results

Variable	(1)
	Health checkup within two years
<i>pre_treated</i>	-0.059** (0.027)
<i>post2015</i>	-0.022 (0.029)
<i>post2018</i>	0.000 (.)
<i>post2020</i>	0.000 (.)
Constant	0.315 (8.043)

Variable	(1)
	Health checkup within two years
Observations	10131

Note: *pre_treated* tests pre-policy differences between treatment and control groups; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.3.2 Placebo Tests

To rule out the possibility that the baseline results are driven by chance, three placebo tests are conducted, with results summarized in Table 7. First, when a random treatment group variable (*did_random*) is generated, its estimated coefficient is -0.013 and statistically insignificant, indicating that randomly assigned treatment status does not produce systematic effects. Second, when the policy shock is artificially moved forward to 2012 (*did_placebo2012*), the estimated coefficient is zero and insignificant, suggesting that there is no anticipatory effect prior to the actual policy implementation. Third, when the policy shock is delayed to 2015 (*did_placebo2015*), the coefficient is significant at the 10% level. However, since 2015 already falls after the actual policy implementation, this result partly captures the true policy effect. Overall, the placebo test results support the robustness of the baseline findings, indicating that the identified policy effects are unlikely to be driven by random factors or model misspecification.

Table 7: Placebo Test Results

Variables	(1)	(2)	(3)
	Random treatment	Policy in 2012	Policy in 2015
<i>did_random</i>	-0.013 (0.015)		
Age	-0.001 (0.134)	-0.002 (0.134)	0.001 (0.134)
Married	-0.003 (0.024)	-0.002 (0.024)	-0.002 (0.024)
Self-rated health	-0.007 (0.008)	-0.007 (0.008)	-0.007 (0.008)
Number of chronic diseases	0.021*** (0.007)	0.022*** (0.007)	0.021*** (0.007)
Log of household per capita consumption	0.015* (0.008)	0.015* (0.008)	0.015* (0.008)
Health insurance coverage	0.001 (0.029)	0.001 (0.029)	0.001 (0.030)
Number of living children	-0.008 (0.016)	-0.008 (0.015)	-0.008 (0.015)
2013.year	0.000 (.)	0.000 (.)	0.000 (.)
2015.year	0.004 (0.268)	-0.001 (0.269)	-0.006 (0.269)
2020.year	0.019 (0.935)	0.020 (0.938)	-0.033 (0.939)
<i>did_placebo2012</i>		0.000 (.)	
<i>did_placebo2015</i>			0.046* (0.026)
Constant	0.280 (7.777)	0.341 (7.800)	0.183 (7.800)
Observations	11742	11742	11742
Adjusted R ²	0.004	0.004	0.004

Notes: Standard errors in parentheses; *, **, *** denote significance at the 10%, 5%, and 1% levels.

5.4 Heterogeneity Analysis

To examine whether the impact of NRSPI on health checkup behavior varies across different groups, heterogeneity analysis is conducted along two dimensions: household economic status and health conditions.

5.4.1 Heterogeneity by Household Consumption Level

Based on the median value of log household per capita consumption in 2013 (8.66), the sample is divided into low-income and high-income groups. The regression results in Table 8 show that, for the low-income group, the effect of NRSPI participation on health checkups is negative but statistically insignificant (coefficient = -0.048, $p > 0.1$). In contrast, for the high-income group, NRSPI participation significantly increases the probability of health checkups by approximately 11.1 percentage points ($p < 0.01$). This finding contradicts Hypothesis H2 and suggests that the income effect of NRSPI is more pronounced among higher-income individuals, while no significant promoting effect is observed for the low-income group. Possible explanations include: First, low-income individuals may prioritize basic consumption needs over preventive health services when allocating limited pension income. Second, high-income individuals may already possess stronger health awareness and better social capital, and pension income further enhances their willingness and ability to invest in health. Third, low-income individuals may face greater barriers in accessing health information, making it difficult to translate improved economic conditions into actual health behaviors.

Table 8: Heterogeneity Analysis by Household Consumption Level

Variables	(1)	(2)
	Low-income group	High-income group
did	-0.048 (0.038)	0.111*** (0.030)
Age	-0.374 (0.291)	0.060 (0.210)
Married	-0.001 (0.047)	-0.009 (0.037)
Self-rated health	-0.023 (0.016)	-0.006 (0.011)
Number of chronic diseases	0.009 (0.013)	0.026*** (0.010)
Log of household per capita consumption	0.037* (0.021)	0.033** (0.016)
Health insurance coverage	-0.024 (0.057)	0.025 (0.046)
Number of living children	-0.017 (0.033)	-0.006 (0.023)
2013.year	0.000 (.)	0.000 (.)
2015.year	0.000 (.)	0.000 (.)
2020.year	0.000 (.)	0.000 (.)
Constant	22.809 (17.663)	-3.572 (12.528)
Observations	2905	5194
Adjusted R ²	0.570	0.566

Note: Grouping is based on the median household consumption in 2013; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.4.2 Heterogeneity by Chronic Disease Status

The sample is divided based on whether individuals had chronic diseases at baseline in 2013. The results in Table 9 show that, among individuals with chronic diseases, participation in the NRSPI significantly increases the probability of undergoing health checkups by approximately 4.8 percentage points ($p < 0.05$). In contrast, for those without chronic diseases, the effect is not statistically significant (coefficient = 0.015, $p > 0.1$). This finding supports Hypothesis H3, indicating that the enhancement effect of NRSPI on health investment motivation is more pronounced among individuals with chronic conditions. A plausible mechanism is that individuals with chronic diseases have a stronger demand for health monitoring; the pension not only improves their ability to pay but also alleviates anxiety regarding future medical expenditures.

Table 9: Heterogeneity Analysis by Chronic Disease Status

Variables	(1)	(2)
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	With chronic diseases	Without chronic diseases
did	0.061*** (0.023)	0.010 (0.036)
Age	0.039 (0.121)	-0.067 (0.262)
Married	0.019 (0.029)	-0.053 (0.044)
Self-rated health	-0.007 (0.009)	-0.004 (0.014)
Number of chronic diseases	0.018** (0.008)	0.032** (0.015)
Log of household per capita consumption	0.020** (0.010)	0.003 (0.014)
Health insurance coverage	-0.006 (0.037)	0.014 (0.047)
Number of living children	-0.002 (0.019)	-0.018 (0.028)
2013.year	0.000 (.)	0.000 (.)
2015.year	0.000 (.)	0.000 (.)
2020.year	0.000 (.)	0.000 (.)
Constant	-2.219 (7.291)	4.323 (15.609)
Observations	7250	2881
Adjusted R ²	0.525	0.518

Note: Grouping is based on chronic disease status in 2013; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.4.3 Summary of Heterogeneity Analysis

The heterogeneity analysis reveals the complexity of the impact of NRSPI on health checkup behavior among rural older adults. On the one hand, the policy effect is more pronounced among higher-income groups. This may reflect a “threshold effect” in health investment—only after basic living needs are satisfied are pension benefits allocated toward preventive health services. On the other hand, the policy effect is stronger among individuals with chronic diseases, highlighting the interaction between pension insurance and individual health needs—the more urgent the health demand, the stronger the promoting effect of pension income on health behavior. These findings carry important policy implications. Specifically, the health-promoting effect of NRSPI may be jointly moderated by individuals’ economic conditions and health status. Future policy design should therefore account for heterogeneous needs across population groups. For instance, targeted subsidies or health education programs could be provided for low-income older adults to better achieve the policy objective of integrated medical and elderly care.

6. Conclusions and Policy Implications

6.1 Main Findings

Using CHARLS data and the PSM-DID approach, this study empirically examines the impact of NRSPI on the utilization of integrated medical and elderly care services among rural older adults, proxied by health checkups. Three main findings are obtained. First, participation in the NRSPI significantly increases the probability of undergoing health checkups among rural older adults by approximately 4.6–4.7 percentage points, confirming its positive role in promoting preventive health behavior through enhanced payment capacity and stabilized expectations. Second, the effects of NRSPI exhibit significant heterogeneity. The promoting effect is stronger among higher-income groups (an increase of approximately 11.1 percentage points), while it is insignificant among lower-income groups, contradicting the initial theoretical expectation and revealing a “threshold effect” in health investment. Meanwhile, the effect is more pronounced among individuals with chronic diseases (an increase of approximately 6.1 percentage points), supporting the

theoretical prediction that health demand intensity moderates policy effects. Third, the baseline results pass both the parallel trend test and placebo tests, confirming the robustness of the findings. Overall, the NRSPI not only serves as an income security mechanism but also promotes behavioral changes toward preventive health practices, although its effectiveness is jointly moderated by economic conditions and health status.

6.2 Policy Implications

Based on the findings, this study proposes the following policy recommendations with both conceptual and practical relevance:

First, strengthen policy coordination to redirect pension income toward health investment. At the institutional level, promoting healthy aging should be explicitly incorporated as a high-level objective of the NRSPI. In practice, coordination mechanisms between primary healthcare institutions and pension administration agencies could be established. For example, during annual pension eligibility verification or policy communication, village cadres or social security coordinators could simultaneously distribute health checkup notices and provide health-related information, thereby ensuring accurate delivery of health services to insured older adults.

Second, implement targeted incentives to address both “under-consumption” and “liquidity constraints”. Given the observed heterogeneity, policy interventions should be more precisely targeted. For low-income older adults with high health needs, a “health voucher” scheme could be piloted, restricting usage to preventive services such as health checkups and chronic disease screening. Alternatively, integrating pension participation with family doctor contract services and subsidizing contract fees could directly lower access barriers. For higher-income individuals, commercial institutions may be encouraged to develop bundled products combining pension benefits with health management services.

Third, focus on key populations to establish an integrated “medical–care–management” service loop. Special attention should be given to older adults with chronic diseases. Primary healthcare institutions could establish individualized health records and provide regular follow-ups through SMS, Wechat, or phone calls. Furthermore, standardized health management services (e.g., regular monitoring of blood pressure and blood glucose) could be integrated with convenient pension service delivery channels (such as distribution through designated village clinics), thereby forming a reinforcing incentive mechanism.

6.3 Limitations and Future Research

Despite its contributions, this study has several limitations that warrant further research. First, in terms of measurement, using health checkups as a proxy for integrated medical and elderly care services may be somewhat limited. Second, in terms of mechanisms, the empirical identification of the income effect and expectation stabilization effect could be further strengthened through more direct testing strategies. Third, regarding temporal scope, the long-term dynamic effects of the policy remain to be explored. Future research could construct multidimensional indicators based on diverse service data, employ mediation models to quantify transmission mechanisms, and utilize longer panel data to examine the evolution of health behaviors over time, thereby providing more robust empirical evidence.

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Conflicts of Interest

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