

RESEARCH ARTICLE

The impact of old-age pension on nutritional outcomes: Evidence from Kyrgyzstan

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Abstract

Extensive studies have discussed the economic and welfare effects of social pensions worldwide, while scant attention has been paid to their nutritional effects, especially in emerging economies. Using multitopic longitudinal survey data of households and individuals in Kyrgyzstan covering four waves of 2012, 2013, 2016, and 2019, this study aims to examine the impact of an old-age pension on the nutritional outcomes of the elderly and shed light on their underlying mechanisms. Our empirical identification rests on a propensity score matching with difference-in-differences estimation design to address the endogeneity problem of receiving an old-age pension. Overall, the results indicate that receiving an old-age pension has a significant and negative impact on body mass index and the probability of being overweight for males, while no significant impact of the old-age pension has been observed for females. Receiving an old-age pension has no significant effect on expenditure of food consumption, calorie intake, and macronutrient intake, while it significantly reduces the ratio of protein intake to total calorie intake. We also observe significant heterogeneity in the

Abbreviations: 2SLS, two-stage least squares; BMI, body mass index; DDS, dietary diversity score; FAO, Food and Agriculture Organization; FSU, former Soviet Union; GDP, gross domestic product; HEI, healthy eating index; IPW, inverse probability weighting; LKS, The Life in Kyrgyzstan Study; NRPS, New Rural Pension Scheme; PAYG, pay-as-you-go; PSM-DID, propensity score matching with difference-in-differences; WHO, World Health Organization.

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nutritional effect of an old-age pension across various education levels and income levels; the negative nutritional effect is more salient for elderly individuals who are relatively poor or who have lower education. Our findings provide profound implications for policies targeting improving the nutritional status of rural residents in emerging economies through the implementation of the old-age pension [EconLit Citations: H55, I15, I38].

KEYWORDS

BMI, food consumption, obesity, old-age pension, overweight

1 | INTRODUCTION

Population aging has become a major challenge worldwide, especially in emerging economies. According to the latest estimation from the World Health Organization (WHO), three-quarters of elderly people will live in low- and middle-income countries.¹ The evidence indicates that many Asian countries, as well as those in Latin America and the Caribbean, experience the highest growth rates of aging.² Globally, the proportion of the population over 60 years of age will nearly double from 12% to 22% between 2015 and 2050. Thus, it is extremely important to design appropriate policies for promoting the well-being of the growing number of elderly people around the world.

Public pension programs, one of the most important tools to preserve the social welfare of the elderly, have been implemented in many emerging economies. For instance, Brazil and South Africa have recently introduced or expanded social pension programs for elderly informal sector workers who are not covered by existing pension provisions (Jung & Tran, 2012). In Asian countries, China unveiled its New Rural Pension Scheme in 2009, offering a basic social safety net to rural residents. Among these countries, Kyrgyzstan was an early adopter of a social pension program in 1992; its pension system has undergone major reforms, which offer a unique quasi-experiment pertaining to evaluating the welfare impact of the old-age pension on the elderly. Although the social pension is known to improve the welfare of rural elderly people, the evidence from previous studies is mixed. In particular, whether the old-age pension could contribute to the nutrition transition in emerging economies is still unknown. This study aims to extend the discussion on the power of social pensions from the perspective of public health by examining the effect on nutritional outcomes of the elderly.

With the global implementation of old-age pension programs, the primary concern of the existing literature focusing on the impact of social pensions is its economic impact. Many studies show that old-age pensions have resulted in an 18% increase in household income (Huang & Zhang, 2021), reduced elders' dependence on support from their adult children (Cheng et al., 2018a; Li et al., 2018), and increased their capacity to be independently living (Chen, 2017; Cheng et al., 2018b). However, other studies reveal that the elderly with migrant children receive similar levels of financial transfers to those without migrant children, suggesting that the elderly with migrant children have a higher risk of falling into poverty than those living close to their children (Giles et al., 2011). In addition, social pensions may lower the propensity of receiving transfers from adult children, indicating a small crowd-out effect (e.g., Nikolov & Adelman, 2019). On the contrary, Ning et al. (2019) argue that pension payments do not significantly crowd out economic support from adult children to their elder parents.

¹WHO: Aging and health, <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>, access on December 12, 2023.

²United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Aging (2019): Highlights (ST/ESA/SER.A/430).

The labor market consequence of the old-age pension is another research interest of the existing studies, as it is highly related to the welfare of the elderly. The first strand of literature believes that old-age pensions have no significant effect on labor market participation (e.g., Ning et al., 2016). This finding is partially supported by Zhao et al. (2016), who find that old-age pensions do not affect the labor supply of the rural elderly but that it reduces participation for the elderly who are in poor health. The possible reason is that the amount of social pension benefits is far below the minimum cost of living (Cheng et al., 2018a); thus, the rural elderly need to keep working. However, more recent empirical studies generally support that the old-age pension reduces labor market participation and working time. Some studies argue that receiving an old-age pension can substantially increase the likelihood of retirement and reduce the number of working hours among women (Börsch-Supan & Schnabel, 1998; Jung & Tran, 2012; Shu, 2018). More specifically, social pensions reduce the hours of farm work and increase the hours of grandchild care among elderly rural men (Li et al., 2018). Studies also discuss the spillover effect of old-age pensions on adult children's labor market participation. For instance, Li et al. (2018) show that the old-age pension reduces adult children's out-migration and increases their hours spent in farming activities. The main mechanism is that adult children can benefit from the intergenerational transmission of wealth and time reallocation of elderly adults, such as taking care of grandchildren (Huang & Zhang, 2021; You & Niño-Zarazúa, 2019).

The other research focus area is on social pensions' health effects, including physical and mental health. The findings largely support the idea that the social pension improves the health condition of the rural elderly. Regarding physical health status, the results reveal that pension enrollment increases the physical health and cognitive function of the rural elderly (Cheng et al., 2018a; Huang & Zhang, 2021). This finding is further echoed by the evidence that pension enrollment increased the use of outpatient, healthcare, and inpatient healthcare and the growth of preventative healthcare utilization (Hu et al., 2019). A review of the mental health effects of old-age pensions indicates that pension enrollment significantly reduces the risk of depressive symptoms and improves elderly people's subjective well-being (Chen et al., 2019; Ding, 2017). As discussed by Cheng et al. (2018b) pension recipients in China respond to the newly acquired pension income in multiple ways: improving nutritional intake, better accessibility to healthcare, increasing informal care, increasing leisure activities, and better self-perceived relative economic situation. These, in turn, act as channels from pension income to the health outcomes of the Chinese rural elderly.

Nutritional outcomes in older adults have important impacts on both well-being and physical health. Studies show that the prevalence of overweight and obesity among older people in Canada is 39% and 13%, respectively, and 49% and 31.5%, respectively, among older men in Spain, and 22.8% and 11.1%, respectively, among older people in Ghana, a developing country (Gutiérrez-Fisac et al., 2004; Kaplan et al., 2003; Lartey et al., 2020). Overweight and obesity also significantly increase the risk of cardiovascular disease (Pereira et al., 2022). In addition to being overweight and obesity, underweight is also a problem, usually as a result of anorexia nervosa, which is often caused by nutritional inadequacy (Crogan, 2017). At the same time, an adequate intake of high-quality food is an important safeguard for the health and well-being of older people (Bernstein, 2017). These nutritional health problems are all related to food intake, not only with respect to quantity, but also with regard to quality of intake (Pereira et al., 2022). As food access is highly correlated with income levels, it is of great interest to study the impact of pensions on nutritional outcomes for older people.

However, less attention has been paid to the impact of old-age pensions on the nutrition outcomes of the elderly, especially in central Asian countries, like, Kyrgyzstan. Therefore, the present study attempts to fill the gap in this topic and also to provide empirical evidence for older people to have healthier nutritional outcomes. The primary objective of this study is to estimate the causal effect of social pensions on the nutritional outcomes of elderly people in Kyrgyzstan. Using multitopic longitudinal survey data of households and individuals in Kyrgyzstan covering four waves of 2012, 2013, 2016, and 2019,³ this study aims to examine the impact of social pensions on

³The research starts with a baseline study in 2010 and is repeated five times since then, but not every year, so there is no issue of missing data.

the nutritional outcomes of the elderly and shed light on their underlying mechanisms. Our empirical identification rests on a propensity score matching with difference-in-differences (PSM-DID) estimation design to address the endogeneity problem of receiving an old-age pension. Overall, the results indicate that receiving an old-age pension has a significant and negative effect on body mass index (BMI) and the probability of being overweight for males, while a significant impact of an old-age pension has been observed for females. Receiving an old-age pension has no significant effect on expenditure on food consumption, calorie intake, or macronutrient intake, but it significantly reduces the ratio of protein intake to total calorie intake. We also observe significant heterogeneity in the nutritional effect of an old-age pension across various education levels and income levels; the negative nutritional effect is more salient for elderly individuals who are relatively poor or who have lower education. Our findings provide profound implications for policies targeting improving the nutritional status of rural residents in emerging economies through the implementation of social pensions.

The rest of the paper is organized as follows. Section 2 introduces the intuitional background of the old-age pension program in Kyrgyzstan. Section 3 presents the empirical framework. Section 4 describes the survey and the data used in this study. Section 5 provides the empirical results. Section 6 offers conclusion and discussion.

2 | THE CONTEXT OF THE OLD-AGE PENSION PROGRAM IN KYRGYZSTAN

Kyrgyzstan has an extensive social welfare system in the former Soviet Union, including a comprehensive pay-as-you-go pension system characterized by a low retirement age and relatively generous early retirement opportunities (Barrientos, 2015). In the Soviet era, the social pension system is complex. There are three funds that provide a full range of social protection instruments: the Pensions Fund, a Social Insurance Fund and an Employment Fund. Kyrgyzstan's industrial structure has also undergone tremendous changes since the disintegration of the Soviet Union. Kyrgyzstan has also experienced a period of severe economic dislocation due to the transformation of its entire society, with Kyrgyzstan's gross domestic product per capita falling by more than half between 1990 and 1995 (Anderson & Becker, 1999). During this period, the incidence of poverty was increasing, and the government could not afford a high pension budget, so a series of pension policy reforms were carried out. Discussions on reforming the pension system began in 1994. In 1996 and 1997, the government passed two major laws reforming the pension system, raising the retirement age and introducing nominal accounts, while maintaining minimum contribution pensions.

In 1997, to tackle the current deficit in the Social Fund, the government promised to raise the retirement age for men and women by 3 years (to 63 and 58, respectively) over 9 years. Old-age pension is available to all, regardless of whether they have contributed to the Social Fund. According to the State Statistical Commission, elderly pensioners in the Kyrgyz Republic account for 73% of the total number of pensioners. Pension amounts are made up of total employment, average wages, and deposits in payers' insurance accounts. The total pension is the amount of the basic part of the pension and the insurance part. Every citizen will receive a basic pension when they reach pension age. The basic pension is guaranteed by the state, and its amount depends on the total number of pensioners employed.

According to the law "ON NATIONAL PENSION SOCIAL INSURANCE OF THE KYRGYZ REPUBLIC," the amount of pension is calculated by the following formula. A man will receive a basic pension in full if his total employment is 25 years, whereas a woman will receive it after working 20 years. As of October 1, 2017, the basic pension is 1780 soms. If a person has worked less than the stated period, the basic pension will be reduced proportionately to the years of employment. For example, the basic pension of a retired woman who has worked for 10 years instead of the required 20 years will be 890 soms instead of 1780 soms. The new pension system has alleviated the fiscal deficit caused by the high welfare system to some extent, while also guaranteeing people a minimum income, which alleviates the country's poverty problem.

To the best of our knowledge, no specific study is found to discuss the impact of old-age pension in Kyrgyzstan and the topic of the impact of pensions on nutritional outcome has been little studied in the existing literature. First, as pensions are part of the income source, receiving pensions inevitably leads to higher income, so the mechanism of the role of income on nutritional outcome found in the existing studies has widely discussed the aspect of nutritional intake, including energy and macronutrient intake (Ren et al., 2019). Second, the literature on the impact of pensions on households suggests that pension receipt can increase food consumption expenditures of older adults in rural areas (Lloyd-Sherlock et al., 2020; Zheng & Zhong, 2016), as has been found for some developing countries (e.g., Africa and China). Therefore, it is important to first consider expenditure as a mechanism of action. This is divided into food expenditures, medical expenditures, and other expenditures. Food expenditures and medical expenditures are important aspects in relation to nutritional health. Third, we also consider the share of each macronutrient in energy intake as a supplement to observe the structural changes of macronutrient intake. In this study, dietary quality could also be an important channel under the effect of old-age pension, as extra income might motivate the elderly to adjust the quality of their food consumption. Therefore, in this study, the healthy eating index (HEI) and dietary diversity score (DDS) are selected as two indicators to measure dietary quality.

3 | EMPIRICAL FRAMEWORK

3.1 | DID design

We aim to evaluate whether an old-age pension affect the nutritional outcomes of the elderly. The old-age pension is a policy welfare that is far more significant to the social security of older families than the amount of the pension. One of the most direct ideas is to let y_1 be the outcome variable when individual i is affected by an old-age pension, and y_0 be the outcome variable when the same individual i is not affected. Ideally, the impact of an old-age pension on the nutritional outcome of individual i is the difference in the outcome variables between the two, which is $y_1 - y_0$. However, the challenge is that it is impossible to observe individuals who are both affected and not affected by an old-age pension at the same time. This is often referred to as a missing data problem in impact evaluation. In this study, those who receive an old-age pension are the intervention group and those who do not receive an old-age pension are the control group. Thus, the DID model can be employed to construct the counterfactual to address the missing data issue using longitudinal data from treated and control groups to obtain an appropriate counterfactual to estimate a causal effect. By doing so, the DID estimator can be used to estimate the effect of a specific intervention or treatment, such as enactment of policy, or large-scale program implementation, by comparing the changes in outcomes over time between the intervention group and control group.

In this study, we employ a time-varying DID model to estimate the effect of an old-age pension on the nutritional outcomes of the elderly. Before introducing the time-varying DID model, we first present the traditional DID model under a two-way fixed-effects estimation framework (Beck et al., 2010).

$$Nutrition_{it} = \alpha_0 + \alpha_1 Pension_i \times time_t + \alpha_2 control_{it} + \delta_r + \gamma_t + \varepsilon. \quad (1)$$

The corresponding generalized model setting of the time-varying DID is as follows:

$$Nutrition_{it} = \beta_0 + \beta_1 Pension_{it} + \beta_2 control_{it} + \delta_r + \gamma_t + \varepsilon. \quad (2)$$

where $Nutrition_{it}$ denotes the nutritional outcomes including BMI and the probabilities of being overweight and obese; $Pension_{it}$ indicates whether a household receives old-age pension, and all of the following estimates in this study are based on household receipt of the old-age pension; $control_{it}$ denotes the control variables that change with time and the individual, includes years of education, ethnicity, marriage status, household size, average

monthly household income; δ_r presents the regional fixed effects; and γ_t is the time fixed effects. The main difference between formulae (1) and (2) lies in the independent variables: $Pension_i \times time_t$ and $Pension_{it}$. $Pension_i \times time_t$ is possible for multiple combinations. Since the study is conducted at ages close to the period of pension receipt, $Pension_{it}$ is when resident i will remain at 1 after receiving an old-age pension in year t and will not produce a further change from 1 to 0. All the following results are calculated based on Equation (2). In other words, the time-varying DID model replaces the commonly used interaction items in the standard DID model with a processing variable that changes with time and between individuals. The main coefficient of interest β_1 can be interpreted as the causal effect of the old-age pension on nutritional outcomes.

Additionally, we include several important sets of fixed effects. We begin with our preferred specification, which includes fixed effects for the different regions (δ_r), year (γ_t), and region-by-year fixed effects ($\delta_r * \gamma_t$). δ_r is regional fixed effects that control for all time-invariant differences across the different regions, absorbing all time-invariant characteristics of the communities that are associated with receiving an old-age pension and nutritional outcomes. γ_t is the year fixed effects that control for all changes over time; they are similar across regions, accounting for any shocks to nutritional outcomes. $\delta_r * \gamma_t$ is the interacted region-by-year fixed effects to control for the region-by-year fixed effects, coping with nutritional outcomes due to any city-wide food consumption dynamics, such as any annual pattern in food consumption that may differ across cities. In our empirical estimation, the standard errors are clustered at the community level.

3.2 | Identification strategy

The identifying assumption of our research design is that all individuals, whether receiving an old-age pension or not, should be ex ante identical, with the exception of the effect of the old-age pension. However, this might not be true. If the initial conditions affect subsequent changes in our outcome variables, the DID estimation would give a biased estimate of the impacts of the old-age pension. To address the shortcoming of DID estimation, we use propensity score matching (PSM) to balance observable cohort characteristics and initial conditions between the treatment and control groups (Chen & Jin, 2012). The PSM method has been widely used to estimate the effects of health behaviors and other policy interventions (e.g., Ma et al., 2020; Wang, et al., 2019), whereas randomized controlled trials are not feasible. Age and education affect pensions and nutritional outcomes. It is also noted that income, ethnicity, marital status, household size, and work intensity can affect nutritional outcomes (Ren et al., 2019; Sanchez-Vaznaugh et al., 2008). Combining the availability of existing research data, the study uses age, education, ethnicity, marital status, household size, and household income as covariates for matching.

PSM is implemented as follows. We first run a logit regression of being a pension receipt on a set of initial individual and household characteristics. Inverse probability weighting is used to control for differences in covariates across treatment groups and/or over time. Estimating the propensity scores based on a rich set of covariates from logistic regression, we initially restrict the potential control group by considering the main individual and household characteristics of the treatment group and the availability of data before receiving an old-age pension. To verify the validity of the PSM estimations and the reduced sampling bias achieved through kernel matching, we test the balancing property of each observed covariate and the overall balance between the treatment and control groups.

4 | DATA

4.1 | The sample

The Life in Kyrgyzstan Study (LKS) is a research-based, multitopic longitudinal survey of households and individuals in Kyrgyzstan that tracked the same 3000 households and more than 8000 individuals over time in all seven regions

(oblasts) of Kyrgyzstan and in the cities of Bishkek and Osh. The survey collected information at the household and individual levels, as well as at the community level. The survey was first conducted in 2010 and was repeated five times, in 2011, 2012, 2013, 2016, and 2019. Each wave of the survey followed all household members included in 2010, and new household members were added to the survey and followed up.

To achieve the objectives of the study, there are several considerations regarding the selection of the sample. First, since this study estimates the effect of an old-age pension on nutritional outcomes, with a focus on the effect of BMI, information on the height and weight of individuals is needed. Second, a 10-year sample is selected around each pensionable age, following existing research cases. There are different age ranges for different genders as the pensionable age is 63 for men and 58 for women. Third, the rural sample is selected because the income level of the rural population is lower than that of the urban population and the pension payment has a greater impact on the food consumption row of the rural population. Finally, four periods, 2012, 2013, 2016, and 2019, are selected to satisfy the above conditions at the same time, and after removing outliers, the sample size is 2272 for males aged 53–73 and 3452 for females aged 48–68.

4.2 | Variables

4.2.1 | Old-age pension

In Kyrgyzstan, the basic situation regarding pensions is that a male can receive an old-age pension at the age of 63 and a female at the age of 58. The household questionnaire "Does anyone in your household receive old-age pension?" is used to determine whether anyone in the household receives an old-age pension in the survey year. This study also excludes those receiving foreign pensions from the actual estimation. As shown in Table 1, the number of pensioners in the full sample is 3245, representing 56.7% of the full sample. Here the pensioner is the family with old-age pension. The per capita income of households receiving an old-age pension is significantly higher than that of households without old-age pension.

4.2.2 | Nutritional outcomes

The dependent variables are all nutrition outcomes related to food consumption, including BMI, overweight, and obesity. LKS individual questionnaires included height and weight variables so that BMI (kg/m^2) could be calculated. According to the WHO criteria (World Health Organization, 2000), $25 < \text{BMI} \leq 29.99$ is classified as overweight and $\text{BMI} > 30$ is defined as obesity.

As shown in Table 1, overall, the average BMI is 27.207, the percentage of the sample that is overweight is 0.434, and the percentage of the sample that is obese is 0.156. There is a significant difference in BMI and obesity between the group receiving an old-age pension and the group without old-age pension. BMI is lower in the pension group, but obesity is also higher in the pension group. Separating the nutritional outcome by gender, Table 2 shows that in the male sample, BMI levels are significantly lower in the pensioned group than in the nonpensioned group. There is a difference in nutritional outcomes in the female sample, but it is not significant. As shown in Figure 1, the distribution of BMI for the different samples is illustrated. More than half of the overall sample has a high proportion of overweight and obesity. The distribution of BMI by gender also shows a high proportion of overweight and obesity. It can also be observed that when BMI is low, pensioners are to a large extent less likely to be pensioners than nonpensioners, which explains why in Tables 1 and 2, the obesity rate is higher among pensioners than among nonpensioners but the mean BMI is lower.

The trailing is more serious on the right side than on the left. The year-on-year trend is shown in Figure 2, with BMI showing an upward trend overall and a downward trend in 2019 for the female sample. The year-on-year trend

TABLE 1 Descriptive statistics of variables by pension status.

Variables	Definition	Full	Pension == 1	Pension == 0	Differences
<i>Treatment</i>					
Pension	Old-age pension participation (YES = 1; NO = 0)	0.567 (0.496)	1	0	
<i>Nutritional outcomes</i>					
BMI	Body mass index (kg/m ²)	27.207 (9.874)	26.995 (8.752)	27.484 (3.71)	-0.489*
Overweight	=1 if 29.99 ≥ BMI ≥ 25, =0 otherwise	0.434 (0.496)	0.427 (0.495)	0.444 (0.497)	-0.016
Obesity	=1 if BMI ≥ 30, =0 otherwise	0.156 (0.363)	0.164 (0.370)	0.147 (0.354)	0.017*
<i>Expenditure</i>					
Food expenditure	Natural logarithm of per month: Food expenditure (soms)	3.647 (1.340)	3.673 (1.371)	3.614 (1.296)	0.059*
Medical	Natural logarithm of per month: Medical expenditure (soms)	6.418 (1.799)	6.504 (1.700)	6.304 (1.916)	0.200***
Others	Natural logarithm of per month: Other expenditure (soms)	8.481 (1.880)	8.434 (1.944)	8.541 (1.790)	-0.107**
<i>Nutritional intakes</i>					
Log calorie	Natural logarithm of per day: Calorie (kcal)	6.980 (1.326)	7.053 (1.324)	6.884 (1.324)	0.170***
Log carbohydrate	Natural logarithm of per day: Carbohydrate (g)	5.188 (1.360)	5.264 (1.356)	5.088 (1.360)	0.176***
Log fat	Natural logarithm of per day: Fat (g)	3.158 (1.224)	3.233 (1.226)	3.060 (1.215)	0.174***
Log protein	Natural logarithm of per day: Protein (g)	3.418 (1.299)	3.480 (1.299)	3.336 (1.296)	0.145***
Ratio carbohydrate	Carbohydrate intake as a ratio of energy	0.110 (0.031)	0.109 (0.031)	0.111 (0.032)	-0.002**
Ratio fat	Fat intake as a ratio of energy	0.674 (0.125)	0.676 (0.123)	0.671 (0.127)	0.004
Ratio protein	Protein intake as a ratio of energy	0.203 (0.094)	0.204 (0.092)	0.202 (0.096)	0.001

(Continues)

TABLE 1 (Continued)

Variables	Definition	Full	Pension == 1	Pension == 0	Differences
<i>Dietary quality</i>					
HEI	Healthy eating index	48.025 (8.433)	47.646 (8.409)	48.520 (8.440)	-0.874***
DDS	Dietary diversity score	5.790 (1.337)	5.719 (1.332)	5.884 (1.338)	-0.165***
<i>Covariates</i>					
Education	Years of education	5.267 (1.019)	5.310 (0.980)	5.210 (1.064)	0.100***
Ethnicity	Kyrgyzstan = 1, =0 otherwise	0.739 (0.439)	0.764 (0.425)	0.707 (0.455)	0.057***
Married	1 = Married; 0 = Unmarried or married without a companion	0.791 (0.406)	0.760 (0.427)	0.833 (0.373)	-0.073***
Household size ^a	Number of household members	3.322 (1.167)	3.343 (1.204)	3.296 (1.116)	0.047
Household income	Natural logarithm of the month average: Household income (soms)	9.832 (0.858)	9.875 (0.791)	9.776 (0.936)	0.099***
Observations		5724	3245	2479	

Notes: Standard deviations are presented in parentheses.

^aThe age-weighted household size is applied: The first adult in the household has a weight of 1. Each additional adult aged 14 and over has a weight of 0.5. Each child aged under 14 has a weight of 0.3.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

for overweight shows a downward trend. Obesity trends for the whole sample and female sample show a general upward trend, with the male sample showing a downward trend in 2019. Since the data used are mixed panel data and some age groups are intercepted, the age distribution of the sample does not show a normal distribution. There are different variations in the mean age of the final data for each period, with the mean age of males decreasing and then increasing, and the mean age of females decreasing year by year. Therefore, the nutritional results in Figure 2 do not show a period-by-period increase.

4.2.3 | Potential mechanisms

Considering the mechanisms of the old-age pension influence on nutritional outcomes, three indicators of household consumption expenditure, nutritional intake, and diet quality are used. The LKS covers all types of household consumption expenditure, of which this study focuses on food consumption expenditure, health expenditure, and other expenditures. The authors calculate the average daily intake of calories, carbohydrates, fats,

TABLE 2 Descriptive statistics of variables for male and female samples.

Variables	Male sample			Female sample		
	Pension == 1 (1)	Pension == 0 (2)	Differences (1)–(2)	Pension == 1 (4)	Pension == 0 (5)	Differences (4)–(5)
<i>Nutritional outcomes</i>						
BMI	26.433 (7.222)	27.306 (11.139)	–0.873**	27.364 (9.609)	27.602 (11.193)	–0.238
Overweight	0.471 (0.499)	0.491 (0.500)	–0.02	0.399 (0.490)	0.413 (0.492)	–0.014
Obesity	0.127 (0.333)	0.113 (0.316)	0.014	0.188 (0.391)	0.169 (0.375)	0.018
<i>Expenditure</i>						
Food expenditure	3.696 (1.384)	3.634 (1.303)	0.062	3.658 (1.363)	3.600 (1.292)	0.058
Medical	6.555 (1.696)	6.260 (1.975)	0.295***	6.471 (1.702)	6.334 (1.876)	0.137**
Others	8.461 (1.963)	8.564 (1.800)	–0.103	8.416 (1.932)	8.526 (1.784)	–0.110*
<i>Nutritional intakes</i>						
Log calorie	7.064 (1.317)	6.859 (1.321)	0.205***	7.046 (1.328)	6.900 (1.327)	0.146***
Log carbohydrate	5.281 (1.350)	5.068 (1.351)	0.214***	5.253 (1.360)	5.101 (1.366)	0.152***
Log fat	3.234 (1.207)	3.037 (1.213)	0.197***	3.233 (1.238)	3.074 (1.217)	0.159***
Log protein	3.491 (1.298)	3.310 (1.291)	0.182***	3.473 (1.299)	3.353 (1.299)	0.120***
Ratio carbohydrate	0.678 (0.12)	0.673 (0.123)	0.006	0.674 (0.125)	0.670 (0.130)	0.004
Ratio fat	0.201 (0.089)	0.201 (0.093)	0.000	0.205 (0.094)	0.203 (0.098)	0.002
Ratio protein	0.109 (0.030)	0.110 (0.033)	–0.001	0.109 (0.032)	0.111 (0.031)	–0.002
<i>Dietary quality</i>						
HEI	47.538 (8.379)	48.143 (8.377)	–0.605*	47.717 (8.430)	48.769 (8.476)	–1.052***

(Continues)

TABLE 2 (Continued)

Variables	Male sample			Female sample		
	Pension == 1	Pension == 0	Differences	Pension == 1	Pension == 0	Differences
	(1)	(2)	(1)–(2)	(4)	(5)	(4)–(5)
DDS	5.691	5.830	–0.139**	5.738	5.920	–0.182***
	(1.321)	(1.349)		(1.339)	(1.330)	

Notes: Standard deviations are presented in parentheses.

Abbreviations: BMI, body mass index; DDS, dietary diversity score; HEI, healthy eating index.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

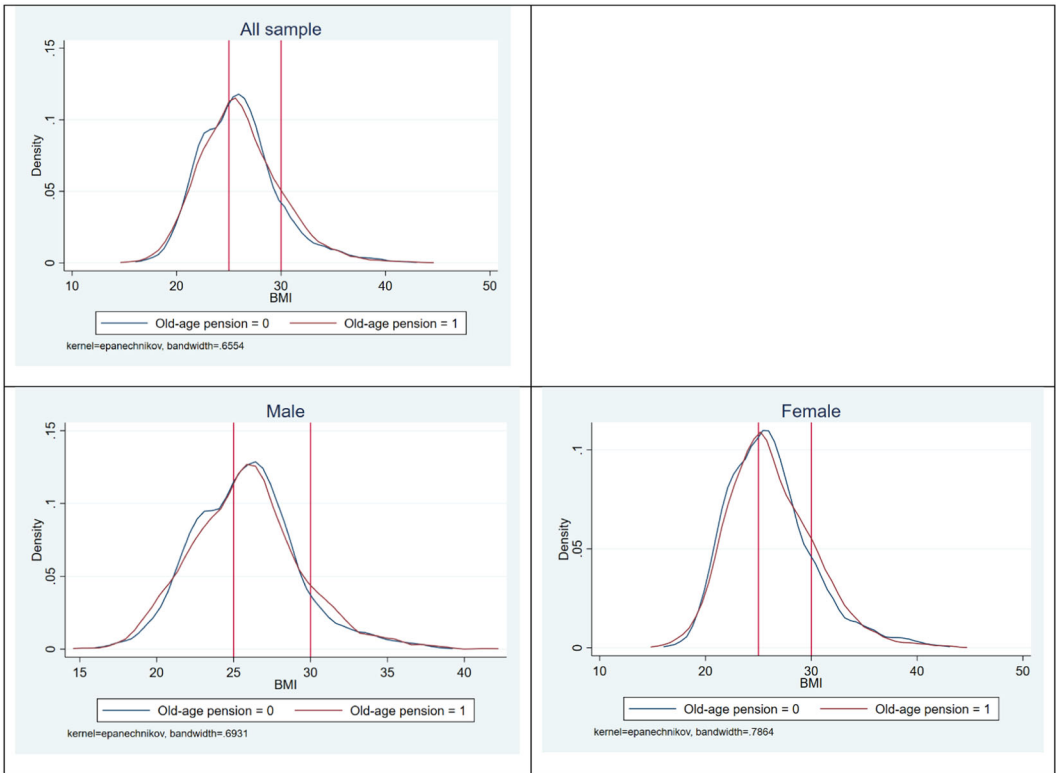


FIGURE 1 The distribution of body mass index (BMI). $25 \leq \text{BMI} \leq 29.99$ is defined as overweight. $\text{BMI} > 30$ is defined as obesity. Source: Authors' own calculation based on the data from The Life in Kyrgyzstan Study (2012–2019).

and proteins, as well as the ratio of macronutrients to energy intake. Dietary quality is calculated using two indicators: the HEI and the DDS.

For the HEI, this study uses an index evaluation method that is consistent with the Asian diet, based on Yuan's calculation system (Yuan et al., 2017). The index has 12 food groups assessed for adequacy of diet and five food groups assessed for restrictiveness of consumption in moderation. With all 17 components, better

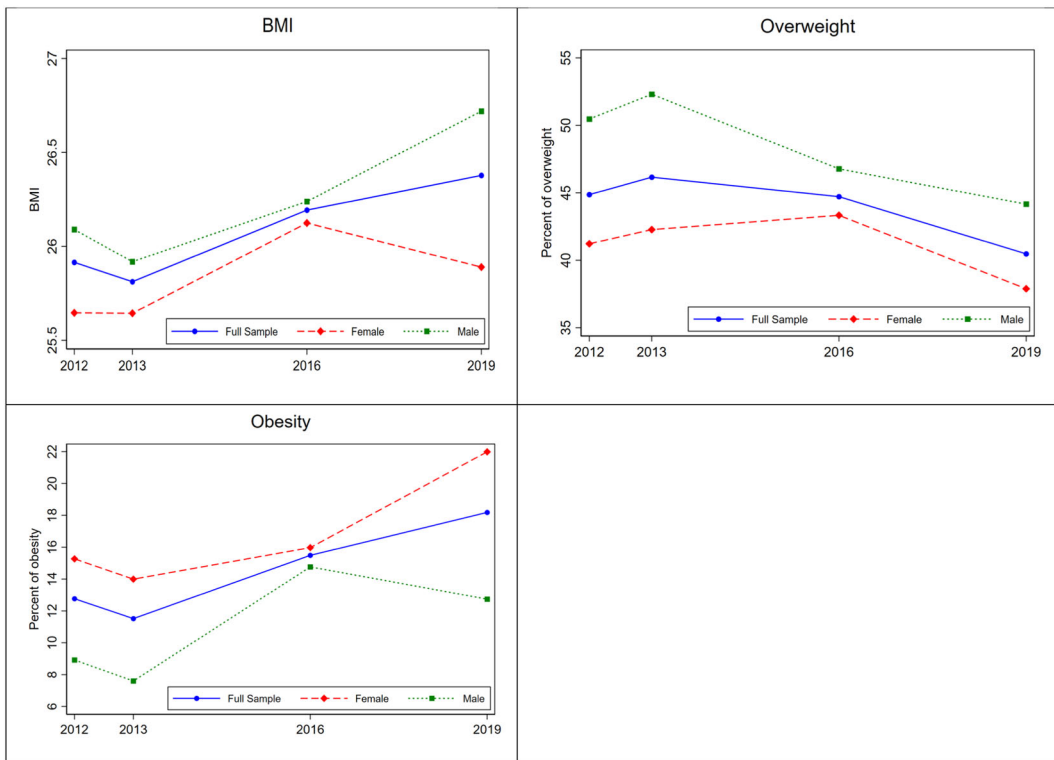


FIGURE 2 The trend of nutrition outcomes across the survey years from 2012 to 2019. *Source:* Authors' own calculation based on the data from The Life in Kyrgyzstan Study (2012–2019). BMI, body mass index.

dietary quality is reflected in higher overall scores. The index ranges from 0 to 100. In this study, the highest total score for the HEI is 75 due to the absence of information on mixed beans, soybeans, seeds and nuts, and sodium in the data.

The DDS is calculated by drawing on the Food and Agriculture Organization of the United Nations dietary diversity (Kennedy et al., 2011), scoring nine groups of 33 subcategories of foods. The major groups include grains, potatoes, vegetables, fruits, seeds and nuts, meat, fish, eggs, and milk and dairy products. The food group is given a value of 1 if any food in the food group is consumed; otherwise, it is given a value of 0. The summed score for the food group is given as DDS, with a range of 0–9. In this study, the maximum score for DDS is 8, which is due to the lack of information on seeds and nuts in the data.

Regarding food consumption, as shown in Table 1, the average food and health expenditure is significantly higher for pensioners than for nonpensioners. By gender, pension men spend significantly more on medical expenses than nonpensioners. The female pensioner group also has a higher medical expenditure than the nonpensioner group. The female sample is significantly lower in other consumption expenditures than the nonpensioner group.

With respect to nutritional intake, the average energy intake and macronutrient intake of the pensioner group is higher than that of the nonpensioner group. However, the proportion of carbohydrates in the total energy intake of the pensioner group is significantly lower than that of the nonpensioner group for each macronutrient. By gender, pensioned men have a significantly higher intake of macronutrients than the nonpensioner group. The same is true for women. In terms of dietary quality, both HEI and DDS are significantly lower in the pensioner group than in the nonpensioner group. The results are similar for each gender.

5 | ESTIMATION RESULTS

5.1 | The impact of the old-age pension on nutrition outcomes

In this section, we begin with the DID estimation to examine the impact of an old-age pension on the nutritional outcomes of BMI, overweight, and obesity. Then, the PSM-DID estimation is applied to partially address the potential endogeneity from self-selection. The estimation results are presented in Tables 3 and 4, respectively.

As shown in Table 3, we show all estimations based on three kinds of model specifications: Columns (1)–(3) without covariates; Columns (4)–(6) with controls, year fixed effect, and regional fixed effect but without region-by-year fixed effect; and Columns (7)–(9) with all controls and fixed effects. In general, the results indicate that receiving an old-age pension could significantly decrease BMI and the likelihood of being overweight for elderly males, and this finding is largely consistent in the three model specifications. Surprisingly, we also find that receiving an old-age pension may raise the likelihood of being obese for elderly females, despite the significance level of 10%.

To address potential endogeneity from self-selection because of observable factors that might bias our estimates, we rematch the samples of the treatment group and the control group by using the kernel matching method. As shown in Supporting Information Tables S1 and S2, the covariates show significant differences before matching, the relevant quality indicators after matching indicate that the covariates are balanced. Similar evidence could be found in the propensity score distribution and common support for propensity score estimation in Supporting Information Figures S1 and S2. The main results from PSM-DID are presented in Table 4. Similar to the estimates in Table 3, they show that receiving an old-age pension could decrease BMI and the likelihood of being overweight by 1.217% and 5.7% for the male sample, respectively, while old-age pension increases the likelihood of being obese by 2.9% for the female sample. Thus, we can conclude that the old-age pension has a significant effect on nutritional outcomes in the elderly in Kyrgyzstan.

A robustness check is also conducted in this study. The instrumental variable estimation is applied by using the existence of pensionable members in the household as an instrument. According to the F test (F statistics = 61 for male samples, and F statistics = 107 for female samples) from the first stage, the instrumental variable is highly related to the endogenous variable of receiving an old-age pension. As shown in Table 5, for males, receiving an old-age pension has a significant negative effect on both BMI and overweight, but no significant effect on obesity. The results estimated are generally consistent with the previous results, but the coefficients are larger than that in Table 4. However, the estimation results for females show that receiving an old-age pension only has a significant positive effect on overweight and no significant effect on any other indicators of nutritional outcomes.

5.2 | Heterogeneous effect of the old-age pension on nutritional outcomes

To examine whether significant heterogeneity exists in the effect of the old-age pension on nutritional outcomes, we further estimate model (2) across different education and income levels. We define the university-educated sample as the high-education group and those living below the international poverty line of less than \$1.90 per person per day as the low-income group. The estimation results are presented in Tables 6 and 7.

As shown in Table 6, for the male sample, it is found that the old-age pension has a significant positive effect on the likelihood of being obese for the elderly with higher education, but the opposite is true for the elderly with lower education. For the female sample, the effect of the old-age pension is quite complicated for the elderly with higher education, as it has a positive effect on the likelihood of being obese but a negative effect on the likelihood of being overweight. We do not observe a significant effect of the old-age pension on females' nutritional outcomes among those with lower education.

TABLE 3 DID estimation for the impact of the old-age pension on nutrition outcomes.

	BMI (1)	Overweight (2)	Obesity (3)	BMI (4)	Overweight (5)	Obesity (6)	BMI (7)	Overweight (8)	Obesity (9)
Panel A: Male sample									
Pension	-0.873** (0.408)	-0.020 (0.021)	0.014 (0.014)	-1.197** (0.518)	-0.055** (0.026)	-0.006 (0.018)	-1.216** (0.512)	-0.060** (0.026)	-0.007 (0.018)
Controls	NO	NO	NO	YES	YES	YES	YES	YES	YES
Year fixed effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional fixed effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Observations	2272	2272	2272	2270	2270	2270	2270	2270	2270
Panel B: Female sample									
Pension	-0.238 (0.362)	-0.014 (0.017)	0.018 (0.013)	-0.441 (0.483)	-0.028 (0.022)	0.031* (0.016)	-0.386 (0.487)	-0.031 (0.022)	0.030* (0.016)
Controls	NO	NO	NO	YES	YES	YES	YES	YES	YES
Year fixed effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional fixed effect	NO	NO	NO	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	NO	NO	NO	NO	NO	NO	YES	YES	YES
Observations	3542	3542	3542	3450	3450	3450	3450	3450	3450

Notes: Standard deviations are presented in parentheses.
Abbreviations: BMI, body mass index; DID, difference-in-differences.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

TABLE 4 PSM-DID estimation for the impact of old-age pension on nutrition outcomes.

Variables	Male sample			Female sample		
	BMI (1)	Overweight (2)	Obesity (3)	BMI (4)	Overweight (5)	Obesity (6)
Pension	-1.217** (0.515)	-0.057** (0.026)	-0.008 (0.018)	-0.380 (0.488)	-0.029 (0.022)	0.029* (0.016)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	2265	2265	2265	3365	3365	3365

Notes: Standard deviations are presented in parentheses.

Abbreviations: BMI, body mass index; PSM-DID, propensity score matching with difference-in-differences.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

TABLE 5 2SLS estimation for the impact of old-age pension on nutrition outcomes.

Variables	Male sample			Female sample		
	BMI (1)	Overweight (2)	Obesity (3)	BMI (4)	Overweight (5)	Obesity (6)
Pension	-5.651** (2.672)	-0.333** (0.169)	0.008 (0.109)	-0.644 (2.491)	0.28** (0.129)	-0.105 (0.099)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	2270	2270	2270	3450	3450	3450

Notes: Standard deviations are presented in parentheses.

Abbreviations: 2SLS, two-stage least squares; BMI, body mass index; LKS, The Life in Kyrgyzstan Study.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from LKS (2012–2019).

As shown in Table 7, for the male sample, it is found that the old-age pension has a significant negative effect on BMI and overweight for older people with lower incomes but no significant effect on nutritional outcomes for older people with higher incomes. For the female sample, it is observed that an old-age pension has a positive effect on obesity for older people with higher incomes, but no significant effect for females with lower incomes.

TABLE 6 Heterogeneity effect of the old-age pension across different education levels.

	Male sample			Female sample		
	BMI	Overweight	Obesity	BMI	Overweight	Obesity
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: High education						
Pension	0.381 (0.307)	−0.052 (0.037)	0.052** (0.024)	−0.124 (0.553)	−0.056* (0.029)	0.038* (0.021)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	1251	1251	1251	1950	1950	1950
Panel B: Low education						
Pension	−3.905*** (1.075)	−0.091* (0.040)	−0.060* (0.028)	−1.256 (0.820)	0.007 (0.033)	0.014 (0.026)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	1019	1019	1019	1500	1500	1500

Notes: Standard deviations are presented in parentheses.

Abbreviation: BMI, body mass index.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

5.3 | Placebo test

The effectiveness of the DID estimation strategy depends on the same influence of age trends or regional characteristics in different groups of individuals. This assumption implies that the key coefficient estimated for Equation (2) should be insignificant in the absence of an old-age pension. As we cannot observe the nutritional outcomes of the elderly in both pension receivers and nonreceivers, it is not possible to directly verify whether the assumptions on which the DID identification strategy is based are valid. However, a corollary to the DID recognition assumption can be tested indirectly. The following falsification test is conducted: male respondents aged 53–63 are selected, and age group dummy variable T is defined according to whether their age is greater than or equal to 58; for female samples, respondents aged 48–58 are selected, and age group dummy variable T is defined according to whether their age is greater than or equal to 53. Model (2) is re-estimated. Since all male respondents under 63 years of age and female respondents under 58 years of age were ineligible for old-age pension, the identification of model (2) assumes that the effect of age trends or the effect of regional characteristics is homogeneous across groups, meaning that the estimated coefficient for T should not be significant. Table 8 reports the results of the falsification test, showing that the cross-term only has a marginally significant effect on the BMI (for the female

TABLE 7 Heterogeneity effect of the old-age pension across different income levels.

	Male sample			Female sample		
	BMI	Overweight	Obesity	BMI	Overweight	Obesity
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: High income</i>						
Pension	0.224 (0.499)	-0.028 (0.051)	-0.004 (0.039)	0.347 (0.491)	-0.064 (0.040)	0.053* (0.032)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	1135	1135	1135	1725	1725	1725
<i>Panel B: Low income</i>						
Pension	-1.754** (0.671)	-0.080** (0.031)	-0.007 (0.020)	-0.683 (0.691)	-0.019 (0.026)	0.023 (0.019)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	1135	1135	1135	1725	1725	1725

Notes: Standard deviations are presented in parentheses.

Abbreviation: BMI, body mass index.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

sample) and no significant effect on other variables; thus, it largely supports the assumption that DID identification relies on to a large extent.

5.4 | Mechanisms underlying the impact of the old-age pension

To shed light on the potential mechanisms through which the old-age pension could have the impact on the nutritional outcome of the elderly, we extend our estimation to show the impact of the old-age pension on household expenditure (food expenditure, medical expenditure, and other expenditures), patterns of nutrition (nutritional intakes and ratio of nutritional intakes), and dietary quality.

Table 9 indicates that receiving an old-age pension has no significant effect on food expenditure, but it shows a significant and positive effect on medical expenditure, suggesting that the elderly are more likely to spend pension income on medical use instead of consuming more food. It has been shown that receiving the pension can increase healthcare expenditure (Cheng et al., 2018a), which is consistent with our findings. Regarding the effect of the old-age pension on nutrition patterns, as shown in Table 10, there is no significant effect of the old-age pension on

TABLE 8 Falsification test: Male age 53–57 versus 58–63 and female age 48–52 versus 53–58.

Variables	Male sample			Female sample		
	BMI (1)	Overweight (2)	Obesity (3)	BMI (4)	Overweight (5)	Obesity (6)
Pension	–0.353 (0.923)	–0.038 (0.049)	–0.014 (0.030)	–1.640* (0.891)	0.010 (0.041)	–0.005 (0.031)
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES
Observations	1636	1636	1636	2238	2238	2238

Notes: Standard deviations are presented in parentheses.

Abbreviation: BMI, body mass index.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

TABLE 9 Impact of the old-age pension on household expenditure.

	Expenditure		
	Food (1)	Medical (2)	Others (3)
<i>Panel A: Male sample</i>			
Pension	–0.029 (0.035)	0.263** (0.102)	–0.033 (0.087)
Controls	YES	YES	YES
Year fixed effect	YES	YES	YES
Regional fixed effect	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES
Observations	2270	2270	2270
<i>Panel B: Female sample</i>			
Pension	–0.002 (0.030)	0.226** (0.081)	–0.224** (0.074)
Controls	YES	YES	YES
Year fixed effect	YES	YES	YES
Regional fixed effect	YES	YES	YES

(Continues)

TABLE 9 (Continued)

	Expenditure		
	Food	Medical	Others
	(1)	(2)	(3)
Region-by-year fixed effect	YES	YES	YES
Observations	3450	3450	3450

Notes: Standard deviations are presented in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

TABLE 10 Impact of the old-age pension on household expenditure.

	Nutrition intakes				Ratio of nutrition intakes (%)		
	Log calorie	Log carbohydrate	Log protein	Log fat	Carbohydrate	Protein	Fat
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A: Male sample</i>							
Pension	−0.012 (0.037)	−0.016 (0.041)	−0.033 (0.038)	0.032 (0.031)	−0.004 (0.007)	−0.003* (0.002)	0.007 (0.005)
Controls	YES	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES	YES
Observations	2270	2270	2270	2270	2270	2270	2270
<i>Panel B: Female sample</i>							
Pension	0.012 (0.033)	0.009 (0.035)	−0.035 (0.032)	0.045 (0.028)	−0.001 (0.006)	−0.004** (0.001)	0.006 (0.004)
Controls	YES	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES	YES
Regional fixed effect	YES	YES	YES	YES	YES	YES	YES
Region-by-year fixed effect	YES	YES	YES	YES	YES	YES	YES
Observations	3450	3450	3450	3450	3450	3450	3450

Notes: Standard deviations are presented in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

TABLE 11 Impact of the old-age pension on dietary quality.

	HEI	DDS
	(1)	(2)
<i>Panel A: Male sample</i>		
Pension	-0.144	-0.076
	(0.438)	(0.067)
Controls	YES	YES
Year fixed effect	YES	YES
Regional fixed effect	YES	YES
Region-by-year fixed effect	YES	YES
Observations	2270	2270
<i>Panel B: Female sample</i>		
Pension	-0.225	-0.082
	(0.443)	(0.069)
Controls	YES	YES
Year fixed effect	YES	YES
Regional fixed effect	YES	YES
Region-by-year fixed effect	YES	YES
Observations	3450	3450

Notes: Standard deviations are presented in parentheses; *significant at 10%, **significant at 5%, and ***significant at 1%. Abbreviations: BMI, body mass index; DDS, dietary diversity score.

Source: Authors' own estimation based on the data from The Life in Kyrgyzstan Study (2012–2019).

nutritional intake, but receiving an old-age pension tends to decrease the ratio of protein intake in the total calorie intake for both samples. This could be one of the most important channels through which the old-age pension decreases BMI and the probability of being overweight. Dietary quality is the last channel underlying the effect of the old-age pension, as extra income might affect the food consumption quality of the elderly. However, as presented in Table 11, we do not find a significant effect of the old-age pension on either HEI or DDS. In sum, the negative effect of the old-age pension on nutritional outcomes is due mainly to its effect on the structure of nutritional intake.

6 | CONCLUSION AND DISCUSSION

The power of social pensions has been extensively discussed, while less attention has been paid to nutritional effect. Simultaneously, the health of elderly individuals constitutes a crucial issue in developing countries. To address this gap, our study utilizes multitopic longitudinal survey data of households and individuals in Kyrgyzstan, covering four waves 2012, 2013, 2016, and 2019. By doing so, we aim to contribute to the existing literature by estimating the effect of the old-age pension on the nutritional outcomes of the elderly and shedding light on the underlying mechanisms. This research also serves as a significant supplement to the broader theme of the health of older individuals.

Based on PSM-DID estimation, our empirical estimation indicates that receiving an old-age pension has a significant and negative impact on BMI and the probability of being overweight for males, while it has a positive effect on the likelihood of being obese for females. We also observe significant heterogeneity in the nutritional effect of the old-age pension across various education levels and income levels; the negative nutritional effect is more salient for elderly individuals who are relatively poor or who have lower education. This is a very interesting finding, while some studies point to a causal relationship between poverty and obesity (Drewnowski & Specter, 2004; Griffith, 2022). Thus, in emerging economies, governments may consider implementing the universal old-age pension policy to reduce the public health burden due to overweight and obesity problems. The estimation regarding the channel underlying the effect of the old-age pension suggests that receiving an old-age pension has no significant effect on food expenditure and nutritional intake, but it significantly reduces the ratio of protein intake to total calorie intake.

Our findings contribute to a long discussion about the power of the social pension, and provide profound implications for the policies targeting improving the nutrition status of the elderly in emerging economies. The previous studies have extensively discussed the impact of social pension from various aspects, including its economic impact, labor market consequence, and physical and mental health effects. With the significant changes in the economy and social demographics, nutritional health in emerging countries is undergoing dramatic transition. In this process, the nutritional health of the elderly needs to be paid more attention as they are more likely to be left behind. Old-age pension program, as an important social security system, is proven as an effective tool to deal with the nutrition-related health issues of the elderly, such as overweight. In addition, the study also reveals that receiving an old-age pension not only has a decreasing effect on BMI and overweight, but also suggests that medical expenditures of the older have been significantly increased after receiving an old-age pension. The effect on medical expenditure is consistent with existing research (Kaushal, 2014; Riumallo-Herl & Aguila, 2019). Old-age pension policy has the same catalytic effect as a health insurance policy in facilitating access to healthcare for older persons.

There are several limitations that should be noted. One of the main limitations of this study is that we can hardly identify which household member received the old-age pension, due to the fact that, with the exception of 2013, the survey only asked respondents to report if the household receiving old-age pension. Thus, if there are more than two household members received the pension, the effect of old-age pension should be interpreted as the average effect. If more precise and enough data are available in the future, regression discontinuity can be used for further studies to check the robustness of our findings. Second, food consumption is generally reported at the household level, so the nutrition pattern for each elderly is calculated as a mean value for an adult to measure macronutrients intakes and their proportion. This procedure might overestimate the nutritional intakes of the elderly if they are not fully qualified as an adult with respect to food consumption. In this regard, future studies that capture the real food consumption of older people could more precisely evaluate the impact of the old-age pension.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Life in Kyrgyzstan Study, 2010–2019 at <https://datasets.iza.org/dataset/124/life-in-kyrgyzstan-study-2010-2019>.

PEER REVIEW

The peer review history for this article is available at <https://www.webofscience.com/api/gateway/wos/peer-review/10.1002/agr.21859>.

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SUPPORTING INFORMATION

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