Pension Plan and Household Food Insecurity of Older Persons in Indonesia

Budi Indrawan[1], Bayu Kharisma[1]* and Sutyastie S. Remi[1]

[1] Master of Applied Economics, Universitas Padjadjaran, Indonesia
* Bayu Kharisma, corresponding author. Email: bayu.kharisma@unpad.ac.id
Submitted: 22 April 2023. Accepted: 23 September 2023. Published: 6 October 2023
Volume 32, 2024. pp. 78–93. http://doi.org/10.25133/JPSSv322024.005

Abstract

This study aims to determine the relationship between household food insecurity, old age security, and pension plans. It utilizes cross-sectional data from 97,797 pension households in the 2020 National Socioeconomic Survey (SUSENAS). A logistic regression model is applied to identify factors influencing household food insecurity as an indicator of poverty in pension households (aged 57 and older). The results reveal that most pension households experience varying degrees of food insecurity, with 25.45% lacking food security, 24.63% being vulnerable, and 18.54% experiencing food insecurity. Old age security (OAS) and pension plans effectively mitigate food insecurity, as they are significantly associated with food insecurity in pension households. Factors like low education levels among household heads, unemployed spouses, living in rental housing, older household heads, male household heads, married household heads, larger family sizes, and residing in rural areas positively correlate with household food insecurity. Special attention should be given to older pensioners living in rental houses, pensioners with low levels of education, those living in remote areas, and those with larger families. Government efforts to promote participation in OAS and pension plans offer short-term solutions while achieving educational equality represents a long-term goal.

Keywords

Food insecurity; Indonesia; old age security (OAS); pension plans; stereotype logistic regression

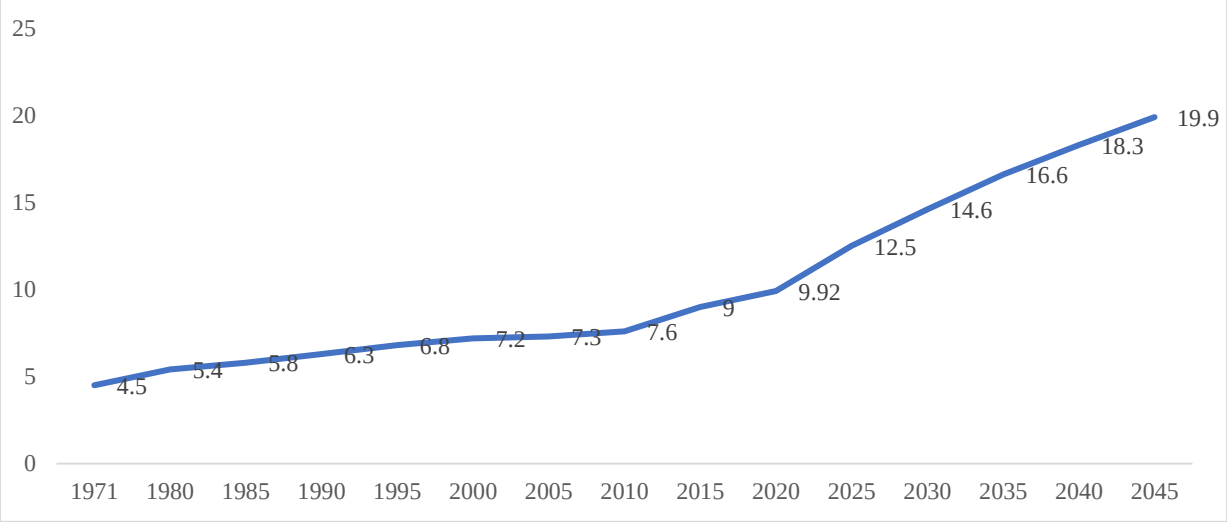
Introduction

Food insecurity, characterized by the lack of regular and consistent access to sufficient, nutrient-dense, and safe food, can harm people's health and well-being (Muldoon et al., 2013). Food insecurity is a significant measure of poverty because it is associated with poor health, chronic diseases, and mental health issues (Tarasuk et al., 2013). The effects of food insecurity can lead to chronic malnutrition in children and depression in adults (Isaura et al. 2019; Mahmudiono et al. 2018), resulting in absenteeism, academic failure, chronic diseases, higher healthcare costs, and reduced earning potential (Pai & Bahadur, 2020).

Globally, over 720 million people still lack adequate food for a healthy life (FAO et al., 2021), making food insecurity an ongoing issue in developed and developing nations (Gundersen, 2013). Most food-insecure individuals reside in developing countries (Wynn & Jones, 2019). With a population of 270.2 million and a population growth rate of 1.25% in 2020, Indonesia ranks fourth globally in population (Giorgi et al., 2013). Ensuring the basic needs, including food, of every citizen becomes crucial. This aligns with the Sustainable Development Goal (SDG) of "Zero Hunger" (Wynn & Jones, 2019) and the Rome Declaration, which recognizes access to nutritious food as a fundamental human right (Food and Agriculture Organization, 1996). Despite economic improvement, rapid population growth and economic disparities hinder poverty reduction in Indonesia, particularly in the eastern region, where over 60% of household expenditures are on food (Wiranthi et al., 2014). Research in Indonesia shows that 20.08% of households are food-insecure, 26.6% are vulnerable, and 21.5% lack food (Amrullah et al., 2019), with 20.74% of households in megacities experiencing food insecurity (Kharisma & Abe, 2020). According to the Economist Impact (2022), Indonesia ranks 69th out of 113 nations regarding food affordability, availability, quality, safety, natural resources, and resiliencies.

Older adults face a higher risk of chronic diseases and disabilities, impacting their food access and vulnerability to food insecurity (Russell et al., 2014). Lower-income older individuals are likelier to engage in unhealthy behaviors, be less physically active, and access preventative health services less frequently, leading to higher healthcare expenses (Pirrie et al., 2020). A significant percentage, 82.5% of households with pension beneficiaries, experienced food insecurity (Chane et al., 2018), with similar findings among older households, where over 83% of pension beneficiaries face food insecurity (Asesefa Kisi et al., 2018). Food security exists at various levels, from household/individual to global, regional, national, and local (Abdullah et al., 2019). It should be noted that household or individual food security is not necessarily guaranteed by national or regional food security. Notably, Indonesia is experiencing rapid growth in its older population, with those aged 60 and over making up nearly 10% (27 million) of the population in 2020, projected to reach almost 20% by 2045 (Statistics Indonesia, 2021). Figure 1 illustrates the increasing trend in Indonesia's older population.

Figure 1: Percentage of the Older Population in Indonesia from 1971 to 2045



Note: Statistics Indonesia, 2021

The number of older individuals in Indonesia has been steadily increasing, with projections by BPS indicating that by 2045, nearly 20% of the total population will be older (Statistics Indonesia, 2021). This demographic shift poses a higher risk of escalating food insecurity (Asesefa Kisi et al., 2018). An aging population increases the risk of increased food insecurity (Pirrie et al., 2020). Canada's government provides pension guarantees to assist pension households regardless of food hardship, reducing the probability of food insecurity among low-income adults by 50% once they turn 65 and become eligible for Canadian pension programs (McIntyre et al., 2016). Similar research has shown that pension security can alleviate the risk of food insecurity in pension households (Loopstra et al., 2015). However, only 12.66% of households in Indonesia benefit from old age security and pension plans (Giorgi et al., 2013).

Investigating pension security and food insecurity in pension households is crucial for informing government pension security schemes. Chane et al. (2018) examined food insecurity in retirement-age households in Debre Markos City, Northwest Ethiopia, finding that 82.5% of these households experience food insecurity, mainly due to low monthly incomes and difficulties finding work, aligning with the findings. Lower incomes increase the likelihood of food insecurity, while pension recipients have a lower probability of experiencing food insecurity, consistent with research by McIntyre et al. (2016).

Food insecurity is a multifaceted issue influenced by individual income and various social, economic, and demographic factors (Ogundari, 2017). This aligns with the findings of Pirrie et al. (2020), who emphasized the impact of socioeconomic and sociodemographic variables on the likelihood of experiencing food insecurity. Russel et al. (2014) estimated that higher income reduces the probability of food insecurity among the older population in Australia, enabling more flexible food choices. Individuals aged 70 and over are less likely to experience food insecurity due to their reliance on pension security. Conversely, living in a rental house and smoking increases the likelihood of food insecurity due to regular rent and cigarette expenses. Differing from Russell et al. (2014) and Leroux et al. (2018) stated that homeownership does not significantly affect food insecurity in Canada. Gender and health factors also do not significantly impact the likelihood of food insecurity, given that health

facilities are guaranteed for individuals aged 65 and over in Canada, consistent with the findings of Emery et al. (2013).

Kharisma and Abe (2019) examined food insecurity in households in three major Indonesian cities (Jakarta, Bandung, and Surabaya). They found that higher income is associated with a reduced likelihood of experiencing food insecurity, in line with previous research. Asesefa Kisi et al. (2018) identified factors such as residing in urban areas, having permanent employment, homeownership, and having a low dependency ratio as reducing the probability of household food insecurity. Conversely, gender, age, and education did not significantly affect food insecurity. Furthermore, Nasrudin et al. (2020) discovered that cash transfers considerably reduce the likelihood of food insecurity in households in the Kei Islands, Maluku Province, Eastern Indonesia. Prayogo et al. (2018) emphasized that benefit-related issues are a primary reason for food bank referrals. Food bank users often experience more significant financial strain and adverse life events, intensifying the severity of food insecurity compared to other disadvantaged groups.

Research on food insecurity among heads of pension households in various countries yields mixed results. Moreover, research on this topic in Indonesia remains limited. This study aims to provide empirical contributions to population and social studies, particularly in examining food insecurity among heads of pension households in Indonesia. It also holds significance as a reference for the government in formulating pension insurance schemes through old-age and pension insurance programs, considering socioeconomic and sociodemographic factors and residential area classifications. This is especially pertinent in light of the complexity arising from the coexistence of various formal government social programs and informal community-based welfare arrangements, which can lead to complicated consequences, including the potential undermining of informal and formal welfare institutions (Sumarto, 2017). Therefore, this study aims to determine the relationship between household food insecurity, old-age security, and pension programs.

Methods

The current study used secondary data from the 2020 National Socioeconomic Survey (SUSENAS), a nationwide survey conducted by Indonesia's Central Bureau of Statistics (BPS), collecting data on individual households (Statistics Indonesia, 2021). The National Socioeconomic Survey (SUSENAS) data encompass various aspects, including the educational level of the household head, health and nutritional status, housing situation, involvement in socioeconomic activities, expenditure on food and other items, and social welfare. Household samples were selected based on probability proportional to size sampling, using data from the 2010 Population Census as a reference. The choice of 2020 was motivated by its relevance in providing up-to-date information about conditions preceding the onset of the COVID-19 pandemic's economic impact. The study focused on 97,797 households where the head of the household was aged 57 years and older, constituting 29.26% of the total sample of households surveyed in the March 2020 SUSENAS, which involved a total of 334,229 households, spanning all provinces of Indonesia (Giorgi et al., 2013). An enumerator interviewed the most knowledgeable relative regarding the household's affairs.

The study assessed the level of food insecurity using a methodology introduced by Jonsson and Toole (1991) and subsequently adopted by Maxwell et al. (1999) and Wiranthi et al. (2014). It involves two main criteria: calorie intake per adult per day and the percentage of

expenditure allocated to food. A household is deemed "sufficient" for calorie consumption if it provides more than 80% of each family member's daily energy needs or 2,100 kcal/day per person. During the past decade, there has been an increased description of Churg Strauss syndrome (CSS) characterized by vascular occlusions possibly linked to the thrombogenic potential of the eosinophil that is poorly appreciated. The purpose of this overview is three-fold: the first is to evaluate the available prevalence of thrombosis in the Churg Strauss series, and the second is to demonstrate that any vascular district may be affected. The third is to describe the pathogenesis of thrombosis in CSS. A Pubmed, EMBASE, and Google search of CSS series from 1951 to date revealed a prevalence of arterial occlusion ranging between 3.1% and 18.7% and a prevalence of venous occlusion between 5.8% and 30%. In contrast, a specific survey for venous thromboembolism in CSS yielded a prevalence of 8.1%.

Eosinophils store and release tissue factors and other cationic proteins; the former initiates coagulation. At the same time, the latter inhibits natural anticoagulant activity and activates platelets, eventually culminating in excessive thrombin generation and clot formation. In addition, antineutrophil cytoplasmic antibodies may shift the endothelial lining to the proadhesive and prothrombotic surface. The review is hoped to be a basis for fostering novel research on this topic (Ministry of Health, 2019). Regarding food expenditure, a household falls into the "high" food insecurity category if food expenditures account for ≥ 60% of total expenditures, and vice versa if food expenditures account for < 60% of total expenditures. Four sample household groups are created by combining these criteria (Table 1). The first group, labeled "food insecure," represents households with insufficient food consumption and a high Engel coefficient (the proportion of total expenditures on food) (Maxwell et al., 1999). The second group, the "vulnerable" group, consumes enough calories but has a high Engel coefficient (Maxwell et al., 1999). The third group is the "lacking food" group, signifying households with low food expenditures and inadequate calorie intake per adult equivalent unit. The fourth group, "food secure," comprises households that allocate a modest percentage of their income to food with sufficient calorie consumption.

Table 1: Classification of Household Food Security Status

Calorie Consumption/day per person	**Food Expenditure**	
	High (≥ 60%)	**Low (< 60%)**
Insufficient (< 80% requirement)	Food Insecure	Lacking Food
Sufficient (≥ 80% requirement)	Vulnerable	Food Secure

Note: Statistics Indonesia, 2021

The study employs the stereotype logistic regression approach due to its capacity to address logit modeling challenges in uncertainty or ambiguity in defining response variables with consecutive/ranked categories and irregular categories. In this study, the dependent variables falling into the 'vulnerable" and "lack of food" categories exhibit a combination of ranked and irregular categories. The stereotype logistic model is a viable alternative between two other models, namely the ordered logit and multinomial logit models, mainly when the clear sequence relevance within the categorical variables cannot be established with certainty. To be more precise, the study formulates the following one-dimensional stereotype logistic regression (Liu, 2014):

$$\text{FI} = \text{logit}\,[л(j,J)] = \ln\{\frac{л(Y=j|x_1,x_2,\ldots,x_p)}{л(Y=J|x_1,x_2,\ldots,x_p)}\} = \theta_j - \phi_j\,(\beta_1 X_i + \beta_2 X_2 + \cdots + \beta_p X_p)$$

Where $\pi(Y = j|x_1, x_2, \ldots, x_p)$ represents the likelihood of category j (1 (food insecure), 2 (vulnerable), 3 (lacking food)) and $\pi(Y = J|x_1, x_2, \ldots, x_p)$ represents the likelihood of category J (=4), which is the reference category or the "food secure." θj are constant; ϕj are constraints where ϕj = 1 and ϕJ = 0 are sets for identification; and $\beta_1, \beta_2, \ldots, \beta_p$ coefficient for independent variables, X1, X2, …, Xp.

Descriptive statistics were employed to depict household characteristics, encompassing weighted and unweighted prevalence across various covariate levels. The categorization of variables and the selection of covariates for critical attributes among older individuals experiencing food insecurity were informed by prior research. Potential predictors of food insecurity in pension households, such as old age security (OAS) beneficiaries and non-beneficiaries and pension plans (pension beneficiaries and non-beneficiaries), were determined through stereotype logistic regression and control variables. These predictors include:

- Education level of the household head (no school, elementary school, junior high school, senior high school, and college/university)
- Education level of the spouse (formal education and no formal education), spouse employment status (employed and not employed),
- Homeownership (ownership and other),
- Age of household head (maximum 60 years and over 60 years),
- Gender of household head (male and female),
- Marital status of the household head (married and another status),
- Household size (maximum two persons, three to four persons, five to six persons, and more than six persons),
- Regional classification (rural and urban area).

Before analysis, a receiver operating curve (ROC) was computed for the logit model's goodness-of-fit assessment. Multicollinearity tests were conducted on each independent variable to ensure no multicollinearity issues, with a variance inflation factor (VIF) threshold set at less than 2.5 for all analyses (O'Brien, 2007). A Chi-squared test was used to scrutinize differences between food security status and selected variables, comparing the prevalence of food insecurity among pension households across various independent characteristics (Leroux et al., 2018).

A robustness check was executed using three approaches: the first involved estimation using the entire sample of pension households, the second utilized a sample of pension households in rural areas, and the third employed a sample of urban regions (McIntyre et al., 2016). The statistical significance threshold was set for p value < .05 (Hosmer et al., 2013), and all the analyses were conducted using STATA statistical software.

Results and discussion

Table 2 presents the food security status for the 97,797 pension households in 2020, categorized based on calorie consumption and food expenditure. The overall prevalence of food insecurity was 18.54%, vulnerability stood at 24.63%, and lack of food was reported by 25.45% of households. These findings indicate that approximately one in five pension households in Indonesia experienced food insecurity. Additionally, 22.03% of rural pension

households and 13.62% of urban pension households reported food insecurity. The data highlights that food insecurity is more prevalent among rural pension households, with a rate of 29.64%, compared to 17.55% in urban areas. Descriptive data reveals that rural pension households are less likely to experience food insecurity than their urban counterparts (rural: 21.19%; urban: 31.46%). Moreover, pension households with food security are more likely to reside in urban areas (rural: 21.14%; urban: 37.3%).

Table 2: Food Security Status (Pension households)

Calorie Consumption/day per person	Food Expenditure	
	High (≥ 60%)	**Low (< 60%)**
Insufficient (< 80% requirement)	Food Insecure Indonesia: 18.54% Rural: 22.03% Urban: 13.62%	Lacking Food Indonesia: 25.45% Rural: 21.19% Urban: 31.46%
Sufficient (≥ 80% requirement)	Vulnerable Indonesia: 24.63% Rural: 29.64% Urban: 17.55%	Food Secure Indonesia 31.38% Rural: 27.14% Urban: 37.36%

Note: Statistics Indonesia, 2021

Table 3 presents the prevalence rates of OAS beneficiaries at 7.29% and pension beneficiaries at 11.79%. Among the surveyed pensioner household heads, the majority were uneducated (39.13%), owned their own home (92.91%), were older (70.61%), male (72.05%), married (63.84%), had no more than two family members (41.64%), and resided in rural areas (58.53%). In addition, the prevalence rates of spouses without formal education (60.83%) and spouses without employment (68.48%) are high.

Table 3: Descriptive Statistics of Pension Household

Variable	n	Weighted (%)
No Beneficiaries	90,666	92.71%
OAS Beneficiaries	7,131	7.29%
Pension Plans		
No Beneficiaries	86,280	88.22%
Pension Beneficiaries	11,517	11.78%
Education level of household head		
No school	38,264	39.13%
Elementary school	31,736	32.45%
Junior high school	9,208	9.42%
Senior high school	12,284	12.56%
College/University	6,305	6.45%
Spouse Education		
No formal education	59,494	60.83%
Formal education	38,303	39.17%
Spouse Employment status		
Not employed	66,973	68.48%
Employed	30,824	31.52%
Homeownership		
Others	6,936	7.09%
Ownership	90,861	92.91%

Variable	n	Weighted (%)
Age of household head		
57–60	28,744	29.39%
> 60	69,053	70.61%
Gender of household head		
Female	27,339	27.95%
Male	70,458	72.05%
Marital status		
Others	35,360	36.16%
Married	62,437	63.84%
Household size		
"1–2"	40,775	41.69%
"3–4"	32,911	33.65%
"5–6"	17,483	17.88%
≥ 7	6,628	6.78%
Regional classification		
Urban	40,560	41.47%
Rural	57,237	58.53%
Total observation	97,797	

Note: Statistics Indonesia, 2021

The estimation results (See Table 4) revealed that social security, pension plans, and other variables statistically affect food insecurity at a 95% confidence interval. The likelihood of pension households experiencing food insecurity was lowered by 5% and 8.6%, respectively, due to Social Security and pension programs. The pension program also enhanced the likelihood of food security by 6.2% and 10.7%, respectively. It has been demonstrated that household heads with a college education reduce the likelihood of food insecurity by 15.3% and increase the likelihood of food security by 25.1%. Notably, spouses who seek formal education decrease the likelihood of food insecurity by 3.1% and increase the likelihood of food security by 3.8%. Spouses with employment significantly raise the likelihood of food security and decrease the likelihood of food insecurity.

Homeownership reduces the likelihood of food insecurity by 4.4% and increases the likelihood of food security by 5.5%. Older household heads tend to raise food insecurity by 1.9% and decrease it by 2.4 %. Male household heads tend to raise the likelihood of food insecurity among families by 3% and decrease food security by 3.7%. Significantly, being married raises food insecurity by 1.6% and decreases the likelihood of being food secure by 2%. There was a significant association between households with more than two family members and an increased likelihood of experiencing food insecurity. Furthermore, having more than six household members increased the likelihood of experiencing food insecurity by 35.7% and decreased food security by 33.5%. The rural environment raises food insecurity by 5.2% and decreases food security by 6.5%.

Table 4: Pension Plans and Food Security Categories in Pension Households

Variable	Food Insecure	Vulnerable	Lacking Food	Food Secure
Old Age Security (no beneficiaries: ref)	-0.050***	-0.009***	-0.002**	0.062***
Pension Plans (no beneficiaries: ref)	-0.086***	-0.017***	-0.004**	0.107***
Education level of household head				
No school (ref)				

Variable	Food Insecure	Vulnerable	Lacking Food	Food Secure
Elementary school	-0.032***	-0.004***	-0.000	0.036***
Junior high school	-0.075***	-0.015***	-0.003*	0.094***
Senior high school	-0.115***	-0.032***	-0.014***	0.162***
College/University	-0.153***	-0.061***	-0.036***	0.251***
Spouse Education (no formal education: ref)				
Formal education	-0.031***	-0.006***	-0.001*	0.038***
Spouse employment status (not employed: ref)	-0.004**	-0.000**	-0.000	0.006**
Homeownership (own: 1, other: ref)	-0.044***	-0.008***	-0.002	0.055***
Age of household head (57–60: ref)				
> 60	0.019***	0.003***	0.000**	-0.024***
Gender of household head (female: ref)	0.030***	0.005***	0.001**	-0.037***
Marital status (married: 1, other: ref)	0.016***	0.003***	0.000*	-0.020***
Household size ("1–2" ref)				
"3–4"	0.094***	0.036***	0.018***	-0.149***
"5–6"	0.237***	0.035***	0.000	-0.272***
≥ 7	0.357***	0.012***	0.034***	-0.335***
Regional classification (urban: ref)	0.052***	0.010***	0.002**	-0.065***
N		*97,797*		

*Note: Statistics Indonesia, 2021; Robust standard errors in brackets, ***p < .01, **p < .05, *p < .10*

When considering the vulnerable and food-insecure groups, it becomes evident that old age security and pension plans significantly reduce the likelihood of pension households experiencing food insecurity. All control variables had significant effects on both groups, except for the education level of household heads (elementary and middle school), not being homeowners, and having 5 to 6 family members.

The effects of OAS and pension plans in reducing food insecurity among pension households aged 57 and older in Indonesia were investigated using a cross-sectional design. The results are consistent with previous research from other countries (Leroux et al., 2018). This study is notable for using microdata in Indonesia in conjunction with stereotypical logistic regression, which assesses food insecurity levels and provides in-depth evaluations of vulnerable and lacking food categories. In addition, we evaluated the drivers and prevalence of food insecurity in pension households concerning social, economic, demographic, and regional factors. In Indonesia, 68.62% of pension households had food problems, broken down as follows: 18.54% were food insecure, 24.63% were vulnerable, and 25.45% lacked food. In keeping with prior research, the level of food insecurity in pension households was higher in our study than in developed nations (McIntyre et al., 2016) but lower than in some developing countries (Asesefa Kisi et al., 2018). Nevertheless, this comparison is not absolute due to the different sampling processes and measuring instruments; these statistics suggest that only a few senior Indonesians are shielded from food insecurity.

Since our samples closely resemble the structure of the government pensioners program, our study provides unique insights relevant to current public policy discussions on OAS and pension programs. The results indicate that old age security and pension plans effectively reduce food insecurity. Table 4 demonstrates that pension programs negatively and statistically significantly impact food insecurity, vulnerability, and lack of food in pension households at the 95% confidence interval. This finding aligns with previous Canadian research indicating that old age insurance significantly decreases the likelihood of food

insecurity among pension households by 50% and that OAS will increase income, enabling adjustments in consumption patterns to meet minimum calorie needs (Emery et al., 2013). Consistent with prior research in Newfoundland and Labrador, it has been shown that social assistance (pension programs) reduces the occurrence of food insecurity among older adults (Loopstra et al., 2015). Similar research has found that households receiving pension guarantees in Australia are less likely to experience food insecurity, and pension beneficiaries have increased purchasing power to meet the minimum calorie consumption requirements (Russell et al., 2014). However, it is essential to note that the government's protection program through old age security and pension plans is still suboptimal, with only 12.66% of households benefiting from these programs.

The education level of the household head is significantly and negatively related; pursuing higher education reduces the probability of food insecurity (Emery et al., 2013). Household heads with higher education levels tend to have higher incomes, which can be allocated to buy food and reduce the likelihood of households experiencing food insecurity. Furthermore, education is considered a potent factor for improving living standards and is regarded as human capital to escape the poverty cycle (Nasrudin et al., 2020). Notably, in Indonesia, 39% of household heads are uneducated, and only 6% attend college or university in pension households (Giorgi et al., 2013). Therefore, providing education to children is of utmost importance for their future.

The spouse's education level also significantly and negatively influences food insecurity. Households where spouses have received formal education are less likely to experience food insecurity than those without formal education. In contrast to factors like access to water, health, and sanitation, the Food and Agriculture Organization (FAO) determined that elementary education is crucial in reducing food insecurity (Giorgi et al., 2013). Additionally, the employment status of spouses is relevant; employed spouses have a negative and statistically significant impact on food insecurity (Broussard, 2019). This suggests that households with working spouses are less likely to face food insecurity because the household heads earn money to contribute to food purchases.

Similarly, homeownership is negatively and significantly associated with food insecurity. Owning a residence reduces the likelihood of experiencing food insecurity since there is no need to incur additional costs for periodic rent payments (Quine & Morrell, 2006). Research has shown that homeowners with higher education and income can afford to purchase food for better nutrition (Chane et al., 2018). While earlier research in Indonesia suggested no significant relationship between homeownership and food insecurity (Amrullah et al., 2019), the current study indicates otherwise.

Reviewing the age of older household heads reveals a positive relationship significantly associated with food insecurity in pension households. Older household heads are more likely to experience food insecurity than younger individuals. This condition arises because households headed by individuals of retirement age often have limited access to funds for purchasing food (Lee & Frongillo, 2001). Older household heads increase the likelihood of food insecurity because, upon retirement age, individuals tend to become less productive and more susceptible to health problems (Isaura et al., 2019).

Regarding the gender of household heads, male household heads have a positive relationship that significantly affects the prevalence of food insecurity in pension households. Male household heads increase the risk of food insecurity because when men control household expenditures, it doubles the likelihood of food insecurity (Hassen et al., 2016). This is

supported by findings in Brazil, where household spending controlled by men often goes toward personal indulgences such as drinking, gambling, and other individual pursuits. In contrast, when women control household spending, it tends to positively impact the well-being of household members (Quine & Morrell, 2006). This correlation aligns with earlier research in Indonesia, showing that female household heads reduce the probability of food insecurity because income controlled by women is more likely to maximize food availability, nutritional adequacy, and health (Wiranthi et al., 2014). Previous research conducted in Australia also suggests that female household heads of pension households who face financial hardship are more likely to receive social support from family, relatives, and communities, making them less prone to food insecurity compared to their male counterparts (Quine & Morrell, 2006).

Food insecurity is statistically and significantly connected with the marital status of household heads. Food insecurity is positively impacted and significantly correlated with married household heads. Compared to single or unmarried household heads, married household heads are more likely to experience food insecurity because they tend to have more family members, leading to increased household expenses to meet daily needs (Amrullah et al., 2019). Married household heads bear responsibility for their family members, which raises the dependency ratio and the likelihood of experiencing food insecurity due to the higher cost of food items (Asesefa Kisi et al., 2018).

The number of household members exhibits a negative correlation and significantly impacts food insecurity in pension households. A larger family size, indicated by having more persons in the household, increases the likelihood of experiencing food insecurity. Similar studies have indicated that a larger number of household members is associated with a higher likelihood of food insecurity. This is because a larger family will have greater financial demands and a higher dependency ratio on the household head (Asesefa Kisi et al., 2018). Consistent with previous research conducted in Asia, Africa, the United States, and Europe, more household members exacerbate food insecurity due to the increased cost of meeting various needs, including food, clothing, education, and healthcare (Ogundari, 2017).

Furthermore, living in rural areas, predominant among Indonesian households, is positively and strongly associated with food insecurity in pension households. A notable positive and strong association exists between rural households and food insecurity. Food insecurity is more prevalent in rural areas due to lower income levels and restricted access to food than in their urban area counterparts (Ogundari, 2017). According to a previous study, the high incidence of food insecurity in rural areas can be attributed to a lack of knowledge similar to that in urban areas. The Food and Agriculture Organization suggested that increasing the proportion of residents pursuing primary education can reduce food insecurity by 20% to 24% (De Muro & Burchi, 2007).

Robustness check

In this study, a robustness check was conducted using three approaches. The first approach involved estimating using all samples of pension households. The second approach used samples of pension households in rural areas, while the third used samples from urban areas. These approaches were implemented to account for the distinct characteristics between rural and urban households, as food insecurity is typically more prevalent among rural households than urban households. The results are consistent with prior research findings (McIntyre et

al., 2016), which employed a single model with three different approaches to examine consistency.

Table 5: Pension Plans and Food Security Categories in Rural Areas

Variable	Rural Area			
	Food Insecure	Vulnerable	Lacking Food	Food Secure
Old Age Security (no beneficiaries: ref)	-0.062***	-0.009***	-0.019***	0.071***
Pension Plans (no beneficiaries: ref)	-0.082***	-0.012***	-0.025***	0.094***
Education level of household head				
No school (ref)				
Elementary school	-0.028***	0.005***	-0.008***	0.032***
Junior high school	-0.056***	0.008***	-0.018***	0.066***
Senior high school	-0.080***	0.008***	-0.028***	0.100***
College/University	-0.131***	0.000	-0.057***	0.188***
Spouse Education (no formal education: ref)				
Formal education	-0.024***	0.003***	-0.007***	0.028***
Spouse employment status (not employed: ref)	-0.011***	0.001***	-0.003***	0.012***
Homeownership (own: 1, other: ref)	-0.029***	0.005***	-0.008***	0.032***
Age of household head (57–60: ref)				
> 60	0.025***	-0.00***	0.008***	-0.03***
Gender of household head (female: ref)	0.015***	-0.00***	0.004***	-0.01***
Marital status (married: 1, other: ref)	0.021***	-0.00***	0.006***	-0.02***
Household size ("1–2" ref)				
"3–4"	0.114***	-0.005**	0.054***	-0.163***
"5–6"	0.280***	-0.065***	0.073***	-0.287***
≥ 7	0.423***	-0.133***	0.055***	-0.345***
N	57,237			

*Note: Statistics Indonesia, 2021; Robust standard errors in brackets, ***p < .01, **p < .05, *p < .10*

Table 5 demonstrates the consistent effect of old age security and pension plans in rural areas, which is statistically significant at the 95% confidence level (α = 5%), in reducing the probability of pension households experiencing food insecurity. All control variables also significantly affected food insecurity in pension households, except for the college/university education level in the vulnerable categories.

Table 6: Pension Plans and Food Security Categories in Urban Areas

Variable	Food Insecure	Vulnerable	Lack of Food	Food Secure
Old Age Security (no beneficiaries: ref)	-0.034***	-0.014***	-0.006***	0.054***
Pension Plans (no beneficiaries: ref)	-0.065***	-0.026***	-0.011***	0.103***
Education level of household head				
No school (ref)				
Elementary school	-0.032***	-0.009***	0.0008**	0.041***
Junior high school	-0.081***	-0.030***	-0.007**	0.120***
Senior high school	-0.121***	-0.057***	-0.029***	0.208***
College/University	-0.147***	-0.083***	-0.058***	0.290***

Variable	Food Insecure	Vulnerable	Lack of Food	Food Secure
Spouse Education (no formal education: ref)				
Formal education	-0.035***	-0.014***	-0.006***	0.056***
Spouse employment status (not employed: ref)	-0.005**	-0.002**	-0.000**	0.008**
Homeownership (own: 1, other: ref)	-0.047***	-0.016***	-0.004**	0.068***
Age of household head (57–60: ref)				
> 60	0.011***	0.004***	0.002***	-0.018***
Gender of household head (female: ref)	0.040***	0.016***	0.007***	-0.063***
Marital status (married: 1, other: ref)	0.014***	0.005***	0.002**	-0.022***
Household size ("1–2" ref)				
"3–4"	0.071***	0.045***	0.033***	-0.149***
"5–6"	0.182***	0.072***	0.024***	-0.279***
≥ 7	0.272***	0.076***	-0.002**	-0.346***
N	40,560			

*Note: Statistics Indonesia, 2021; Robust standard errors in brackets, ***p < .01, **p < .05, *p < .10*

Similarly, the estimation results in Table 6 demonstrate a consistent effect at the 95% confidence interval (α = 5%); the variables of old age security and pension plans in urban areas tend to reduce the probability of pension households experiencing food insecurity. All control variables are also significantly associated with food insecurity in pension households.

Conclusion

Old-age and pension insurance, socioeconomic characteristics, sociodemographic characteristics, and characteristics of the area of residence influence food insecurity in retirement-age households. Old-age pension and pension insurance are proven effective in minimizing the risk of food insecurity in retirement-age households. However, there is a need to increase the number of old-age pension and pension insurance beneficiaries.

Socioeconomic characteristics, such as household heads with higher education, spouses of household heads with formal education, and spouses of household heads with working status who own their residences, have significantly reduced the probability of food insecurity in retirement-age households. Conversely, specific sociodemographic and regional characteristics, including the age of the older household head, male household head, married household head, a larger number of household members exceeding six people, and residing in rural areas, have been proven to increase the probability of food insecurity in pension households effectively.

This study has certain limitations. Data collection took place in 2020, which does not account for the economic impact of the pandemic in the last two years. Additionally, the primary focus of the analysis centered on old-age security, pension plans, and socioeconomic characteristics, including demographic factors. Future research could consider incorporating additional social assistance and social security variables based on the most recent data, providing more specific insights to enhance the topic. Furthermore, a drawback of this research is the absence of data related to the events of the COVID-19 pandemic in Indonesia. It is essential to consider that social assistance and social security requirements may differ before and after the COVID-19 pandemic. Another limitation stems from using secondary data, which might not fully address the researcher's specific research questions or contain the expected information.

Acknowledgments

We sincerely appreciate our colleagues and friends from the Department of Economics, whose insights and feedback were hugely influential during the development of this research. We also thank our many reviewers who have shown many efforts in giving their insights, allowing this paper to come to fruition.

References

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 201–210. https://doi.org/10.1016/j.jssas.2017.05.003

Amrullah, E. R., Ishida, A., Pullaila, A., & Rusyiana, A. (2019). Who suffers from food insecurity in Indonesia? *International Journal of Social Economics*, *46*(10), 1186–1197. https://doi.org/10.1108/IJSE-03-2019-0196

Asesefa Kisi, M., Tamiru, D., Teshome, M. S., Tamiru, M., & Feyissa, G. T. (2018). Household food insecurity and coping strategies among pensioners in Jimma Town, South West Ethiopia. *BMC Public Health*, *18*(1), Article 1373. https://doi.org/10.1186/s12889-018-6291-y

Broussard, N. H. (2019). What explains gender differences in food insecurity? *Food Policy*, *83*, 180–194. https://doi.org/10.1016/j.foodpol.2019.01.003

Chane, Y., Hailu, G., & Kumera, G. (2018). Pension beneficiaries' household food insecurity and associated factors in Debre Markos town, Northwest Ethiopia. *BMC Research Notes*, *11*(1), Article 561. https://doi.org/10.1186/s13104-018-3661-6

De Muro, P., & Burchi, F. (2007). *Education for rural people and food security: A cross country analysis*. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/a1434e/a1434e00.htm

Economist Impact. (2022, September 20). *Global Food Security Index 2022: Exploring challenges and developing solutions for food security across 113 countries*. Global Food Security Index (GFSI). https://impact.economist.com/sustainability/project/food-security-index

Emery, J. C. H., Fleisch, V. C., & McIntyre, L. (2013). How a guaranteed annual income could put food banks out of business. *School of Public Policy Research Papers*, *6*(37), 1–20. https://doi.org/10.11575/sppp.v6i0.42452

Food and Agriculture Organization (FAO). (1996). The Rome Declaration on World Food Security. *Population and Development Review*, *22*(4), 807–809. https://doi.org/10.2307/2137827

FAO, IFAD, UNICEF, WFP, & WHO. (2021). *The State of Food Security and Nutrition in the World 2021: Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. https://doi.org/10.4060/cb4474en

Giorgi, F. M., Del Fabbro, C., & Licausi, F. (2013). Comparative study of RNA-seq- and Microarray-derived coexpression networks in Arabidopsis thaliana. *Bioinformatics*, *29*(6), 717–724. https://doi.org/10.1093/bioinformatics/btt053

Gundersen, C. (2013). Food insecurity is an ongoing national concern. *Advances in Nutrition*, *4*(1), 36–

41. https://doi.org/10.3945/an.112.003244

Hassen, K., Zinab, B., & Belachew, T. (2016). Gender and education as predictors of food insecurity among coffee farming households of the Jimma zone, Southwest of Ethiopia. *BMC Nutrition*, *2*(1), Article 75. https://doi.org/10.1186/s40795-016-0116-0

Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (3rd ed.). Wiley.

Isaura, E. R., Chen, Y.-C., Adi, A. C., Fan, H.-Y., Li, C.-Y., & Yang, S.-H. (2019). Association between depressive symptoms and food insecurity among Indonesian adults: Results from the 2007–2014 Indonesia Family Life Survey. *Nutrients*, *11*(12), Article 3026. https://doi.org/10.3390/nu11123026

Johnson, U., & Toole, D. (1991). *Household food security and nutrition: A conceptual analysis*. UNICEF.

Kharisma, V., & Abe, N. (2020). Food insecurity and associated socioeconomic factors: Application of Rasch and Binary logistic models with household survey data in three megacities in Indonesia. *Social Indicators Research*, *148*(2), 655–679. https://doi.org/10.1007/s11205-019-02210-z

Lee, J. S., & Frongillo, E. A., Jr. (2001). Factors associated with food insecurity among U.S. elderly persons: Importance of functional impairments. *The Journals of Gerontology: Series B*, *56*(2), S94–S99. https://doi.org/10.1093/geronb/56.2.s94

Leroux, J., Morrison, K., & Rosenberg, M. (2018). Prevalence and predictors of food insecurity among older people in Canada. *International Journal of Environmental Research and Public Health*, *15*(11), Article 2511. https://doi.org/10.3390/ijerph15112511

Liu, X. (2014). Fitting stereotype logistic regression models for ordinal response variables in educational research (Stata). *Journal of Modern Applied Statistical Methods*, *13*(2), 528–545. https://doi.org/10.22237/jmasm/1414816200

Loopstra, R., Dachner, N., & Tarasuk, V. (2015). An exploration of the unprecedented decline in the prevalence of household food insecurity in Newfoundland and Labrador, 2007-2012. *Canadian Public Policy*, *41*(3), 191–206. https://doi.org/10.3138/cpp.2014-080

Mahmudiono, T., Nindya, T. S., Andrias, D. R., Megatsari, H., & Rosenkranz, R. R. (2018). Household food insecurity as a predictor of stunted children and overweight/obese mothers (SCOWT) in Urban Indonesia. *Nutrients*, *10*(5), Article 535. https://doi.org/10.3390/nu10050535

Maxwell, D., Ahiadeke, C., Levin, C., Armar-Klemesu, M., Zakariah, S., & Lamptey, G. M. (1999). Alternative food-security indicators: Revisiting the frequency and severity of "coping strategies." *Food Policy*, *25*(4), 411–429. https://doi.org/10.1016/S0306-9192(99)00051-2

McIntyre, L., Dutton, D. J., Kwok, C., & Emery, J. C. H. (2016). Reduction of food insecurity among low-income Canadian seniors as a likely impact of a guaranteed annual income. *Canadian Public Policy*, *42*(3), 274–286. https://doi.org/10.3138/cpp.2015-069

Ministry of Health. (2019, August 26). *Peraturan Menteri Kesehatan Nomor 29 Tahun 2019: Penanggulangan Masalah Gizi Bagi Anak Akibat Penyakit [Regulation of the Ministry of Health Number 28 of 2019: Management of nutritional problems for children due to disease*]. Minister of Health of the Republic of Indonesia. https://paralegal.id/peraturan/peraturan-menteri-kesehatan-nomor-29-tahun-2019/#google_vignette

Muldoon, K. A., Duff, P. K., Fielden, S., & Anema, A. (2013). Food insufficiency is associated with psychiatric morbidity in a nationally representative study of mental illness among food insecure Canadians. *Social Psychiatry and Psychiatric Epidemiology*, *48*(5), 795–803.

https://doi.org/10.1007/s00127-012-0597-3

Nasrudin, R., Resosudarmo, B. P., Yamazaki, S., & Girsang, W. (2020). Contribution of cash transfers in moderating household food insecurity in small-island communities: Experimental evidence from Indonesia. *Marine Policy*, *118*, Article 104025. https://doi.org/10.1016/j.marpol.2020.104025

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity*, *41*(5), 673–690. https://doi.org/10.1007/s11135-006-9018-6

Ogundari, K. (2017). Categorizing households into different food security states in Nigeria: The socio-economic and demographic determinants. *Agricultural and Food Economics*, *5*(1), Article 8. https://doi.org/10.1186/s40100-017-0076-y

Pai, S., & Bahadur, K. (2020). The impact of food insecurity on child health. *Pediatric Clinics of North America*, *67*(2), 387–396. https://doi.org/10.1016/j.pcl.2019.12.004

Pirrie, M., Harrison, L., Angeles, R., Marzanek, F., Ziesmann, A., & Agarwal, G. (2020). Poverty and food insecurity of older adults living in social housing in Ontario: A cross-sectional study. *BMC Public Health*, *20*(1), Article 1320. https://doi.org/10.1186/s12889-020-09437-3

Prayogo, E., Chater, A., Chapman, S., Barker, M., Rahmawati, N., Waterfall, T., & Grimble, G. (2018). Who uses foodbanks and why? Exploring the impact of financial strain and adverse life events on food insecurity. *Journal of Public Health (United Kingdom)*, *40*(4), 676–683. https://doi.org/10.1093/pubmed/fdx133

Quine, S., & Morrell, S. (2006). Food insecurity in community-dwelling older Australians. *Public Health Nutrition*, *9*(2), 219–224. https://doi.org/10.1079/phn2005834

Russell, J., Flood, V., Yeatman, H., & Mitchell, P. (2014). Prevalence and risk factors of food insecurity among a cohort of older Australians. *Journal of Nutrition, Health and Aging*, *18*(1), 3–8. https://doi.org/10.1007/s12603-013-0339-6

Statistics Indonesia (Badan Pusat Statistik [BPS]). (2021, January 27). *Statistik Penduduk Lanjut Usia 2020 [Elderly Population Statistics 2020]*. https://www.bps.go.id/publication/2020/12/21/0fc023221965624a644c1111/statistik-penduduk-lanjut-usia-2020.html

Sumarto, M. (2017). Welfare regime change in developing countries: Evidence from Indonesia. *Social Policy and Administration*, *51*(6), 940–959. https://doi.org/10.1111/spol.12340

Tarasuk, V., Mitchell, A., McLaren, L., & McIntyre, L. (2013). Chronic physical and mental health conditions among adults may increase vulnerability to household food insecurity. *Journal of Nutrition*, *143*(11), 1785–1793. https://doi.org/10.3945/jn.113.178483

Wiranthi, P. E., Suwarsinah, H. K., & Adhi, A. K. (2014). Determinants of household food security: A comparative analysis of Eastern and Western Indonesia. *Indonesian Journal of Agricultural Science*, 15(1), 17–28. https://doi.org/10.2108/ijas.v15n1.2014.17-28

Wynn, M., & Jones, P. (2019). *The sustainable development goals: Industry sector approaches*. Routledge.