

# Elderly Poverty in Vietnam: Trends and Determinants

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Linh Hoang Vu <sup>1\*</sup> and Thuy-Anh Nguyen<sup>2</sup>

<sup>1</sup> Vietnam Japan University, Vietnam

<sup>2</sup> University of Economics and Business, Vietnam

\* Linh Hoang Vu, corresponding author. Email: [vhlinh76@gmail.com](mailto:vhlinh76@gmail.com)

Submitted: 1 October 2020, Accepted: 17 June 2021, Published: 22 July 2021

Volume 29, 2021. pp. 526-543. <http://doi.org/10.25133/JPSSv292021.033>

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## Abstract

Adopting data from the 2010 and 2016 Vietnam Household Living Standard Surveys, this paper identifies factors of elderly poverty incidences and depth in Vietnam. Our analysis shows that overall, elderly poverty is lower than the overall poverty headcount in Vietnam. Yet, some elderly groups are more vulnerable to poverty than others. In particular, the elderly living in rural areas are more susceptible to poverty than those living in urban areas. The ethnic minority elderly are likewise more vulnerable to poverty than those who belong to the Kinh-Hoa ethnic majority. We found several determining factors for elderly poverty in urban and rural areas, including region, ethnicity, education, and household age composition. Remittances and social assistance are also crucial in reducing elderly poverty in rural areas. With these findings, this study proposes several policy implications, including improving the social assistance support for the elderly, reducing regional and ethnic disparities, and supporting the employment of older people.

## Keywords

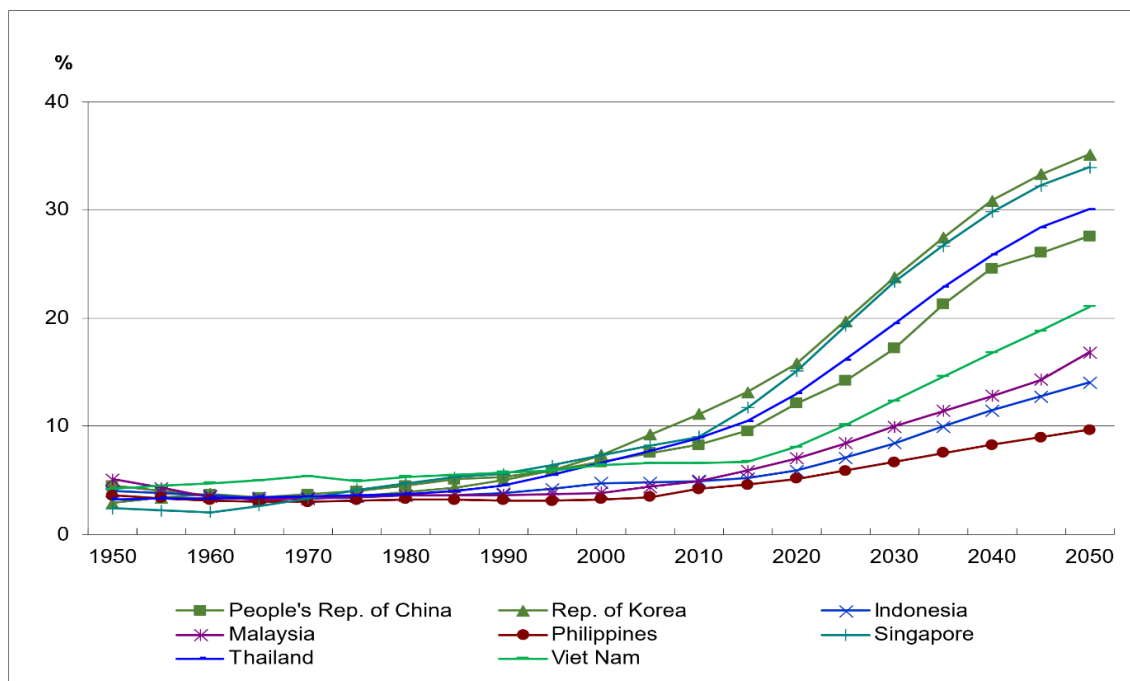
Determinants; elderly; poverty; social policy; Vietnam

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## Introduction

Vietnam currently has two critical demographic trends: demographic dividend and demographic aging. The former trend, demographic dividend, means an increasing number and share of the working-age population, while the latter, demographic aging, implies a growing number and percentage of older people. The family planning programs in Vietnam have contributed to a decline in the fertility rate during the last three decades. Total fertility rate reduced from 3.8% in 1989 to 2.1% in 2014, while life expectancy at birth increased from 65.2 years in 1989 to 72.8 years in 2009 (General Statistics Office, 2011). A rapid decline in fertility rates and mortality rates, and substantial improvements in health care systems, have resulted in the growth of the elderly population in Vietnam. In 2017, Vietnam had an estimated 10 million older adults aged 60 and over. This number is expected to rise to 19 million by 2030 and 28 million by 2050 (Vietnam News Agency, 2017). Among the 10 ASEAN member countries, the aging index of Vietnam (calculated as the fraction of elderly per 100 persons younger than 15 years old in a specific population) is 30.3%. This is lower than Singapore (73.2%) and Thailand (59.8%), but much higher than other ASEAN countries, even countries with higher per capita income such as Indonesia (22.8%) and Malaysia (22.5%) (Nguyen, 2016). Figure 1 indicates the ratio of the older population in selected Asian countries projected until 2050. The data shows that Vietnam's population is aging more than its neighbors such as Malaysia, Indonesia, and the Philippines.

**Figure 1:** Ratio of Older Population Aged  $\geq 65$  to Total Population, 1950–2050



*Note: Asian Development Bank (2021)*

While rapid economic growth has improved the wellbeing of most people in Vietnam, older persons are among the most vulnerable to poverty (Giang & Pfau, 2009). About three-fourth of older people who live in rural areas of Vietnam are more disadvantaged than the urban elderly

regarding access to health services, housing quality, and information (HelpAge International, 2018). Older people, especially in rural areas, are more likely to depend on their savings and family support sources than the social security system (Long & Pfau, 2009). The population aging trend requires efforts to understand the age dimensions of poverty, particularly in developing countries where the social safety net is not well-covered. Understanding old-age poverty is critical to recognize the opportunities and challenges of population aging and inform evidence-based poverty reduction policies and programs. However, the literature focusing on old-age poverty is quite limited, especially in developing countries.

Among the limited studies, there is mixed empirical evidence on the elderly poverty incidence in developing countries. Gasparini et al. (2007) suggested that the elderly poverty rate is similar to the overall poverty rate in countries with weak security systems but is lower in countries with well-developed pension systems. Some studies find that poverty among elderly households is higher than in other age groups (Barrientos et al., 2003). Yet, other studies (Deaton & Paxson, 1995; Pal & Palacios, 2011) find that the poverty rate among the elderly is lower than that of non-elderly households.

Southeast Asia is experiencing a rapidly aging population. For example, the aging population in Thailand and Singapore is expected to reach 22.8% and 26.6% of the total population in 2035, respectively (ASEAN Post, 2020). In consideration of the aging population, several studies have tackled the determinants of poverty in Southeast Asia. Mapa et al. (2011) used logistic regression to show that the presence of a young dependent (aged 14 years old or below) in the Philippines increased the probability that the elderly-headed household will become poor by about nine percentage points. Rodrigues and Rueanthip (2019) studied the links between poverty and being old by analyzing whether the determinants of poverty change with the age of the household head. The results indicated that the role of age with the probability of a household being poor is minimal once other socioeconomic aspects are considered. Based on several rounds of household survey data for Indonesia, Priebe (2017) indicated that poverty rates among the elderly were substantially higher than those of the rest of the population. They also highlighted essential differences in living arrangements across gender, with most older women being widows.

In Vietnam, there are few studies on old-age poverty. Evans et al. (2007) examined the relationship between old age and poverty in Vietnam. The authors focused on the impact of social security benefits and remittances, and the determinants of the poverty status of elderly households. However, that study used aggregate data for all the elderly families without disaggregating the families into urban and rural areas, which could be substantially different in socioeconomic conditions. Giang and Pfau (2009) used Vietnam Household Living Standard Survey data to assess the determinants and vulnerability of poverty among older people in Vietnam. Their results indicated different patterns between the urban and rural areas in Vietnam. In the urban areas, the factors associated with higher elderly poverty were age, unmarried status, residential regions, and working status. In rural areas, age, gender, sex, ethnicity, residential areas, household composition, and household size were the most critical factors. Remittances and social security benefits appeared to be essential for reducing the poverty of elderly households, particularly in rural areas. However, their study does not address the determinants of poverty intensity among the elderly poor.

The population of Vietnam has been aging fast over the last decade, and the factors influencing elderly poverty may have changed. A study examining the poverty situation of older people and finding the determinants of poverty among the elderly population during the 2010s (January 1, 2010 to December 31, 2019) is helpful for academic and policy purposes. Therefore, this paper has two primary objectives. Firstly, this study attempted to understand the poverty situation of the elderly and non-elderly households in Vietnam during the 2010s. Secondly, this study examined the socioeconomic determinants of elderly poverty in Vietnam, using both the poverty headcount (P0) and the poverty gap (P1). To the knowledge of the authors, examining the determinants of the poverty gap among the elderly population has not been covered in the literature.

## Data and method

This study used the 2010 and 2016 waves of the Vietnam Household Living Standard Survey (VHLSS). The surveys are nationally representative, administered by the General Statistics Office of Vietnam, and implemented biennially. In both 2010 and 2016, the surveys included 9,399 households. The surveys contain rich information on socio-demographics, living conditions, and health characteristics at the household and individual levels (General Statistics Office, 2012, 2018).

To measure elderly poverty, we applied the GSO/WB official poverty line, measured by the average per capita expenditure for the households. The World Bank and Vietnam's General Statistical Office introduced this monetary-based poverty line based on expenditure and subsequently used by the World Bank and Vietnamese government (e.g., World Bank & Ministry of Planning and Investment of Vietnam, 2016). Besides this poverty line, in 2015 Vietnam published another poverty line for the 2016-2020 period using the multidimensional poverty approach based on the Alkire-Foster method (Alkire & Foster, 2011; Lo, 2019).

Multidimensional poverty is measured through the deprivation of people in five dimensions: education, healthcare, housing, water and sanitation, and information access. Each dimension has two equally weighted indicators. A household is considered multidimensionally poor if it is deprived in at least three indicators. Yet, the multidimensional poverty index has several drawbacks, as pointed out by Duclos and Tiberti (2016), Ravallion (2011), and United Nations Development Programme (2020). Firstly, using a single index by aggregating several indicators in varied social services is not convincing. Secondly, the choice of weights is often arbitrary. Thirdly, data constraints can be a severe issue for measuring, especially in health and nutrition. Fourthly, the multidimensional poverty index fails to meet all three properties that a poverty index is supposed to obey: continuity, monotonicity, and sensitivity to multiple deprivations. Therefore, our study used the standard expenditure-based poverty measure to define poverty.

The elderly poverty rate is the percentage of the elderly population whose average household per capita expenditure is lower than the official poverty line. The official poverty line was 653 thousand VND per person per month (~US\$34) in 2010, and 969 thousand VND per person per month (~US\$42.50) in 2016 (Pimhidzai, 2018.) In addition to the official poverty line, the sensitivity of the poverty measures was examined by applying an additional poverty line of 150% of the official poverty line. The 150% of the poverty line can be called the 'near-poverty line' to

reflect the population living on an income marginally above the poverty line and vulnerable to poverty.

The study focused on two poverty measures: (1) headcount ratio and (2) poverty gap ratio. These two measures are the most common measures of poverty that capture different facets of poverty. The measures belong to a single class of additive separable poverty measures called the Foster–Greer–Thorbecke indices (Foster et al., 1984). The individual indices within the family are derived by substituting different values of the parameter  $\alpha$  into the following equation:

$$FGT_{\alpha} = \frac{1}{N} \sum_{i=1}^H \left( \frac{z - y_i}{z} \right)^{\alpha} \quad (1)$$

Where  $z$  is the poverty threshold,  $N$  is the number of people in the economy,  $H$  is the number of poor people whose incomes are at or below  $z$ ,  $y_i$  is the income of each individual  $i$ . The higher the value of  $\alpha$ , the greater the weight placed on the poorest individuals.

With  $\alpha = 0$ , one has the poverty headcount ratio  $P_0$ , i.e., the fraction of the population that lives below the poverty line. With  $\alpha = 1$ , it becomes the poverty gap ratio  $P_1$ , a measure of the intensity of poverty. Each poor person is weighted by the distance from their income to the poverty line. It is defined as the average poverty gap of the total population as a proportion of the poverty line.

To assess the determinants of elderly poverty, a *probit* model was constructed to estimate the probability of being poor as follows:

$$P(p_i = 1) = \beta_i X_i + \varepsilon_i \quad (2)$$

Where  $p_i$  is the probability of an older person  $i$  is poor, and  $X_i$  is a vector of control variables. The dependent variable is a binary variable indicating if an older adult is poor. The probit model is a popular specification in studies examining the determinants of poverty. The probit model is used in Kinh-Hoa to model dichotomous or binary outcome variables. In the probit model, the inverse standard normal distribution of the probability is modeled as a linear combination of the predictors. Compared to the level OLS regression that uses consumption or income as the dependent variable, the probit model has several advantages. First, it can directly indicate the effect of independent variables on the probability of being in poverty. In contrast, the OLS regression on consumption can only inform about the factors influencing consumption and not poverty. Thus, for example, if the level of consumption of households is already above the poverty line, one cannot conclude the impacts on poverty. Secondly, the level regression has a disadvantage: it imposes constant parameters over the entire distribution, leading to bias in estimates if the poor face different constraints from the non-poor. Thirdly, the level regression is more likely to be affected by measurement errors than the probit model (Rani & Schmid, 2007).

Besides the model of poverty incidence, the determinants of poverty intensity were also examined, as reflected in the poverty gap index. The poverty gap for household  $i$  was calculated as:  $P1_i = \left( \frac{z - y_i}{z} \right)$ .  $P1_i$  is in the interval  $[0,1]$ . While all non-poor individuals have zero values for  $P1_i$ , the higher  $P1_i$  is, the worse poverty intensity the individual  $i$  possesses.

The *Tobit* model was used to examine the determinants of poverty intensity. The Tobit model, also called a censored regression model, is designed to estimate linear relationships between variables when it is left- or right-censoring in the dependent variable (Wooldridge, 2010). As  $P1_i$  is in the interval  $[0,1]$ , the model is suitable for the study's purpose.

The model can be stated as a latent regression model:

$$y^* = X\beta + \varepsilon \quad (3)$$

With  $\varepsilon \sim N(0, \sigma^2)$ .

We observed:

$$\begin{aligned} y &= y^* \text{ if } y^* \geq 0 \\ y &= 0 \text{ otherwise} \end{aligned}$$

The Tobit model uses maximum likelihood estimation to estimate (3) censored from below at 0.

## Individual and household characteristics

For both the probit and Tobit models, the following variables representing the characteristics of the elderly and the households were used. The characteristics included:

*Age*: The elderly population was divided into three groups, including those between 60 and 69, 70-79, and those aged 80 years old and older. The 60-69 years group was used as the reference group.

*Location*: A binary variable for urban areas.

*Gender*: A binary variable for females.

*Household head*: A binary variable if the individual was the household head.

*Married*: We compared the married elderly to the non-married elderly. The latter included widowed, divorced, and never-married people.

*Ethnicity*: We compared the majority Kinh-Hoa ethnic groups with the ethnic minority elderly population. The majority ethnic group was used as the reference group.

*Education*: We divided this characteristic into four educational levels: primary school or less than primary education; lower secondary education, high school; and college or above. The *primary school or less* was used as the reference group.

*Working*: Binary variable, equal to 1 if the elderly was working.

*Pension*: Binary variable, equal to 1 if the older person had a pension.

*Household characteristics:* We used several variables reflecting household characteristics, including household size, the proportion of elderly, children and females in the household, residential areas (in logarithm), housing condition, receiving remittance from family members or relatives, and receiving social assistance from the government or other organizations.

*Residential regions:* There are six regions in Vietnam, including Red River Delta, Midlands, Northern Mountains, North Central and Coastal Centre, Southeast and Mekong River Delta. The Red River region was used as the reference group.

Table 1 indicates the summary statistics for the variables for the elderly and the non-elderly population in 2010 and 2016. The elderly population increased from 10.2% of the total population in 2010 to 13.4% in 2016, indicating a steady aging process.

**Table 1:** Demographic Characteristics of Elderly Population in Vietnam

	2010 (%)	2016 (%)
<b>Proportion of the population</b>		
Non-elderly	89.8	86.6
Elderly	10.2	13.4
<b>Proportion of the elderly population</b>		
60-69 years old	48.0	55.5
70-79 years old	33.9	25.4
80+ years old	18.1	19.1
<b>Living arrangement</b>		
Living alone	6.5	7.9
Living with spouse only	20.4	22.1
Living with children/grandchildren only	19.7	17.8
Living with both spouse and children/grandchildren	52.6	51.1
<b>Gender</b>		
Female	59.1	58.4
Male	40.9	41.6
<b>Location</b>		
Urban	31.6	33.7
Rural	68.4	66.3
<b>Ethnicity</b>		
Kinh-Hoa ethnic majority	90.0	90.4
Ethnic minorities	10.0	9.6
<b>Marital Status</b>		
Married	61.4	63.6
Not married	38.6	36.4
<b>Working status</b>		
Working	45.4	47.2
Not working	55.6	52.8

	2010 (%)	2016 (%)
<b>Receiving remittances</b>		
Yes	88.3	90.3
No	11.7	9.7
<b>Receiving social assistance</b>		
Yes	23.0	40.5
No	77.0	59.5
Number of observations	3,625	4,642

Among the elderly population, the younger elderly (60-69 years old) was the largest group, accounting for 48% in 2010 and 55.5% in 2016, followed by the middle elderly aged (70-79 years old). Due to demographic change, the fraction of the younger elderly increased by 7.5 percentage points during this period while the fraction of the middle elderly decreased by 8.5 percentage points.

Regarding living arrangements, the proportion of elderly living alone was still relatively small, at 7.9% in 2016, compared to those who lived with other elderly (21.3%) and those who lived with non-elderly household members (70.7%) in 2016. More older people lived alone or with their spouse, but not with their children, in 2016 than in 2010. This reflects the changing family structure in Vietnam, where more older people do not live with their children or grandchildren. The proportion of women was stable at 59% in 2010 and 58% in 2016. There was, however, an increase in the share of the elderly population who lived in urban areas, married elderly, and working elderly. While the percentage of the elderly who lived in households that received remittances increased slightly from 88% in 2010 to 20% in 2016, the percentage of the elderly who lived in the households that received social assistance increased sharply from 23% to 41% in the same period, reflecting a remarkable rise in social assistance scheme in the same period.

Table 2 shows that the poverty rate decreased significantly for both elderly and non-elderly during the 2010-2016 period. The poverty headcount fell by 11.5 percentage points for the non-elderly and 11.4 percentage points for the elderly, using the official poverty lines. The poverty gap similarly reduced for both groups, from 7.3% to 3.7% for the non-elderly and from 5.8% to 2.4% for the elderly.

**Table 2:** Poverty Headcount and Poverty Gap Among Elderly Population

	2010				2016			
	Official poverty line		150% of the poverty line		Official poverty line		150% of the poverty line	
	P0	P1	P0	P1	P0	P1	P0	P1
Non-elderly (including children)	24.3	7.3	48.6	17.3	12.8	3.7	28.8	9.3
Non-elderly (excluding children)	21.0	6.1	44.7	15.1	10.8	2.9	25.8	8.0

	2010				2016			
	Official poverty line		150% of the poverty line		Official poverty line		150% of the poverty line	
	P0	P1	P0	P1	P0	P1	P0	P1
Elderly	20.5	5.8	44.6	14.9	9.1	2.4	25.9	7.3
<b>Age</b>								
60-69 years	19.5	5.5	41.3	14.1	8.6	2.5	24.3	7.0
70-79 years	21.2	6.0	46.0	15.5	10.0	2.7	28.8	8.2
80 years or above	22.1	6.1	50.4	16.1	9.0	1.9	26.7	7.3
<b>Living arrangement</b>								
Living alone	38.9	11.0	39.6	11.3	4.8	0.9	15.0	3.7
Living with other elderly	36.5	11.6	37.7	11.8	4.4	0.8	14.6	3.4
Living with younger members	44.8	15.0	45.4	15.4	9.8	2.7	27.7	7.9
<b>Sex</b>								
Female	21.2	6.0	45.6	15.4	9.9	2.5	26.9	7.7
Male	19.6	5.5	43.1	14.3	7.9	2.3	24.6	6.9
<b>Location</b>								
Urban	6.7	1.7	21.2	5.5	1.7	0.3	8.2	1.7
Rural	27.0	7.7	55.5	19.3	13.0	3.5	35.3	10.4
<b>Ethnicity</b>								
Ethnic minorities	63.0	22.0	80.9	39.6	42.6	13.7	73.4	28.7
Kinh-Hoa majority	14.6	3.5	14.6	3.5	4.4	0.9	19.3	4.4
<b>Marital status</b>								
Married	19.4	5.3	43.0	14.0	8.7	2.6	26.2	7.4
Unmarried	22.3	6.6	47.2	16.4	9.8	2.1	25.4	7.1
<b>Working</b>								
Yes	25.0	7.1	50.1	17.7	14.6	4.3	29.9	8.5
No	17.2	4.8	40.5	12.9	10.4	3.1	22.7	6.4
<b>Receiving remittance</b>								
Yes	19.6	5.5	44.2	14.5	8.0	1.9	25.1	7.0
No	26.8	7.7	47.0	17.9	8.3	2.2	31.9	10.3
<b>Receiving social assistance</b>								
Yes	23.9	6.9	53.0	18.0	9.4	2.9	23.3	7.5
No	19.6	5.5	42.3	14.1	8.8	2.1	27.6	7.3

Compared with the non-elderly, the elderly population had lower poverty rates than the headcount P0 and the poverty gap P1 in 2010 and 2016. This fact was due to the accumulated saving of the elderly through their life course. If we take out the children from the non-elderly population, the non-elderly poverty rate was slightly higher than the elderly poverty rate.

Table 2 also shows that older females were more likely to be poor than older males. The poverty headcount of female elderly was 21.2% in 2010 and 9.9% in 2016, compared to the rate of 19.6% in 2010 and 7.9% in 2016 for male elderly. In addition, poverty was much more severe among ethnic minorities. The poverty headcount of the elderly ethnic minorities was 42.6% in 2016, nearly ten times the Kinh-Hoa ethnic majority counterpart. The ethnic minority elderly accounted for about 9.6% of the elderly population but half of the elderly poor living in Vietnam. Several causes lead to the wide gap between the two groups. Notably, the ethnic minority people lived primarily in midland and mountainous areas, with limited access to quality land and market in geographical isolation. They also had lower levels of education and face difficulty in social inclusion (Demombynes, 2013). Ethnic minority older people were even more disadvantaged than the younger individuals because they were less able to speak the Vietnamese language proficiently, less educated, and less able to migrate. Unmarried older adults had a higher poverty headcount rate than the married elderly by 2.9 percentage points in 2010 and 1.1 percentage points in 2016.

Interestingly, the working elderly had a much higher poverty rate than the non-working elderly, with a gap of nearly 7.8 percentage points in 2010 and 4.2 percentage points in 2016. This result implied that many older people work after retirement age due to poverty. Receiving remittances was associated with lower elderly poverty. In contrast, elderly households that received social assistance were poorer than those without social assistance, although the gap was narrower in 2016 than in 2010.

When we apply the near-poverty line of 150% of the poverty line, the trend was similar. Yet, compared to the official poverty line, the poverty headcount and poverty gap increased sharply. For example, elderly poverty rose from 9.1% using the official poverty line to 25.9% using the near-poverty line. The results showed that there were many older people in Vietnam vulnerable to poverty.

## Empirical findings and discussion

The probit regression for all the older people in 2016 was first run using the individual and household variables mentioned earlier (Model 1). Since the determinants of elderly poverty may structurally differ between the urban and the rural areas, separate regressions for urban and rural areas were also ran (Model 2 and 3, respectively). In addition to the official poverty line, 150% of the poverty line was used to check the robustness of the results.

Table 3 summarizes the results. Among the variables, the urban elderly population was less likely to be poor than the rural elderly. This result was not surprising since poverty in Vietnam was mainly a rural issue (World Bank, 2012). Furthermore, many urban older people were formerly wage earners and were more likely to receive pensions than rural dwellers.

**Table 3:** Probit Regression-Poverty Incidence

	(1)	(2)	(3)	(4)	(5)	(6)
	Official poverty line			150% of the poverty line		
	All	Urban	Rural	All	Urban	Rural
70-80 years old	0.037 (0.090)	0.045 (0.255)	0.004 (0.098)	0.183*** (0.065)	-0.070 (0.148)	0.229*** (0.073)
80+ years old	0.181 (0.124)	0.235 (0.378)	0.143 (0.133)	0.330*** (0.083)	0.121 (0.185)	0.361*** (0.095)
Urban	-0.447*** (0.106)			-0.515*** (0.073)		
Female	0.046 (0.095)	-0.170 (0.271)	0.075 (0.105)	0.063 (0.086)	-0.023 (0.191)	0.107 (0.094)
Household head	0.026 (0.089)	-0.250 (0.265)	0.076 (0.099)	0.062 (0.076)	-0.034 (0.166)	0.105 (0.085)
Married	0.093 (0.105)	0.215 (0.270)	0.093 (0.116)	0.337*** (0.082)	0.356* (0.183)	0.376*** (0.092)
Ethnic minorities	1.095*** (0.101)	1.873*** (0.354)	1.085*** (0.108)	1.023*** (0.082)	1.068*** (0.248)	1.027*** (0.089)
Lower secondary	-0.399*** (0.129)	-0.489 (0.342)	-0.385*** (0.139)	-0.155 (0.098)	-0.301 (0.183)	-0.105 (0.112)
High school	-0.479** (0.244)	-0.201 (0.564)	-0.494* (0.286)	-0.497*** (0.157)	-0.558* (0.321)	-0.447*** (0.165)
College	0.065 (0.090)	0.409 (0.286)	0.046 (0.096)	0.118 (0.078)	0.019 (0.166)	0.125 (0.090)
Working	-0.020 (0.089)	0.522** (0.258)	-0.073 (0.096)	0.060 (0.065)	0.157 (0.150)	0.018 (0.072)
Have pension	-0.469*** (0.160)	-0.630* (0.322)	-0.412** (0.186)	-0.452*** (0.099)	-0.394** (0.162)	-0.413*** (0.122)
Midlands and Northern Mountains	0.315** (0.142)	-0.130 (0.562)	0.312** (0.148)	0.287** (0.118)	0.093 (0.296)	0.292** (0.129)
North Central and Coastal Centre	0.569*** (0.120)	1.178*** (0.424)	0.515*** (0.128)	0.484*** (0.103)	0.409** (0.208)	0.489*** (0.115)
Central Highlands	0.593*** (0.168)	-0.046 (0.590)	0.635*** (0.186)	0.252* (0.149)	-0.610* (0.359)	0.443** (0.174)
South East	-0.523** (0.263)		-0.379 (0.279)	-0.385*** (0.134)	-0.538** (0.262)	-0.280* (0.151)
Mekong River Delta	0.500*** (0.125)	0.708* (0.390)	0.478*** (0.133)	0.276*** (0.104)	0.220 (0.217)	0.259** (0.116)
Household size	0.177*** (0.033)	0.348*** (0.092)	0.168*** (0.037)	0.195*** (0.028)	0.206*** (0.063)	0.196*** (0.033)
Elderly proportion	0.563** (0.232)	3.509*** (0.772)	0.293 (0.251)	0.244 (0.168)	0.922** (0.391)	0.100 (0.187)

	(1)	(2)	(3)	(4)	(5)	(6)
	Official poverty line			150% of the poverty line		
	All	Urban	Rural	All	Urban	Rural
Children proportion	1.341*** (0.277)	3.863*** (0.893)	1.198*** (0.298)	1.079*** (0.247)	0.951* (0.578)	1.112*** (0.275)
Female proportion	0.273 (0.205)	-0.018 (0.474)	0.365 (0.229)	0.226 (0.175)	-0.574* (0.308)	0.424** (0.208)
Log of residential area	-0.743*** (0.106)	-1.320*** (0.241)	-0.747*** (0.118)	-0.773*** (0.086)	-0.766*** (0.126)	-0.795*** (0.108)
Permanent house	-0.392*** (0.103)	-0.802** (0.361)	-0.333*** (0.110)	-0.485*** (0.080)	-0.960*** (0.181)	-0.363*** (0.091)
Have remittance	-0.225** (0.099)	-0.421 (0.335)	-0.208** (0.105)	-0.074 (0.082)	0.071 (0.255)	-0.120 (0.089)
Have social assistance	-0.017 (0.077)	0.272 (0.245)	-0.039 (0.082)	-0.130** (0.059)	-0.192 (0.136)	-0.112* (0.066)
Constant	0.018 (0.496)	-1.204 (1.176)	0.183 (0.544)	1.048*** (0.398)	0.877 (0.729)	1.009** (0.482)
Observations	4,642	1,185	3,204	4,642	1,438	3,204

Notes: Robust standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ , Primary schooling or lower, Red River Delta are omitted

Interestingly, the middle-aged elderly and the older elderly were not more likely to be poor than the younger elderly. This result contrasted with the study over a decade ago by Giang and Pfau (2009), who found that poverty was strongly related to age. The lessening effect of age on poverty can be explained by the Government policies to support the elderly population. The Vietnamese government expanded the coverage of old-age social pension in 2011 by reducing the cut-off age from 85 to 80. In a report for International Labor Organization, Kidd et al. (2019) indicated that the current old-age pension system has a notable impact on the wellbeing of older persons. Both the Vietnam Social Security pension (contributed by employers and employees) and social pension reduced the near-poverty rate among those aged 65 and above from 23.7% to 16.1% in 2016.

Gender, household head status, and marital status did not correlate with being poor among the elderly. However, if the 150% of the poverty line was applied, the middle-aged elderly and the oldest elderly were more likely to be poor than the young elderly, while married elderly were more likely to be poor.

Ethnic minorities older persons were more vulnerable to poverty than their Kinh Hoa counterparts for both poverty thresholds for both urban and rural areas. As for the education level, those who had lower secondary schooling and high schooling were less vulnerable to poverty than those with only primary education or less. However, the effect of a college education was not statistically significant.

Working had little if any effect on the likelihood of being poor for the elderly. Having a pension was a significant predictor for not being poor in all the models.

The Red River Delta was used as the reference region in Vietnam. Those elderly who lived in Midland, Northern Mountains, North Central, Coastal Centre, Central Highlands, and Mekong River Delta were more vulnerable to poor than the elderly living in Red River Delta. In contrast, those who lived in the economically better-off Southeast were less likely to be poor.

Among the household characteristics, older people living in households with a higher elderly proportion or higher children proportion were more likely to be poor. This is reasonable since, for these households, the resources in the families must be shared with more members who may not be able to work or earn livings. Better housing condition, reflected by residential housing and a binary variable for a permanent house, was negatively correlated with the likelihood of being poor.

Remittances seemed an excellent income source for the elderly to avoid being poor. However, it was only significant for those living in rural areas and not in urban areas. With the higher poverty threshold, the role of remittance in reducing poverty dissipate as well. Thus, remittances were highly significant in reducing poverty in rural areas. In contrast, receiving social assistance was positively related to not being poor if the higher poverty line was used and not the official poverty line. As social assistance coverage was still relatively low in Vietnam, this result reflected that the social assistance receipt was helping the near-poor more than the poor in reducing poverty, particularly in rural areas.

Table 4 presents the Tobit regression for poverty depth. Most of the signs were similar to those in the probit model of poverty incidence. However, age was now a more critical factor to poverty depth than poverty incidence. In particular, if the near-poor line was used, the poverty rate of the 70-80 age and the 80+ age group were significantly higher.

Among individual factors, urban, ethnic minorities, education levels, regions were strongly correlated with poverty depth. Pensions were essential in reducing poverty, indicating a critical role in increasing the pension system coverage in Vietnam to improve older people's wellbeing.

Among the household characteristics, housing conditions, household size and composition, and receiving remittances influenced poverty depth. However, social assistance seemed to have no significant effect on poverty depth.

**Table 4:** Tobit Regression- Poverty Depth

	(7)	(8)	(9)	(10)	(11)	(12)
	Official poverty line			150% of the poverty line		
	All	Urban	Rural	All	Urban	Rural
70-80 years old	0.000 (0.028)	-0.000 (0.079)	-0.013 (0.030)	0.040** (0.017)	-0.000 (0.040)	-0.013 (0.030)
80+ years old	0.063* (0.034)	0.046 (0.106)	0.052 (0.036)	0.071*** (0.021)	0.058 (0.055)	0.052 (0.036)
Urban	-0.190*** (0.036)			-0.160*** (0.018)		

	(7)	(8)	(9)	(10)	(11)	(12)
	Official poverty line			150% of the poverty line		
	All	Urban	Rural	All	Urban	Rural
Female	0.017 (0.031)	-0.043 (0.083)	0.024 (0.033)	0.012 (0.018)	-0.008 (0.039)	0.024 (0.033)
Household head	0.015 (0.028)	-0.061 (0.076)	0.029 (0.030)	0.014 (0.017)	-0.009 (0.036)	0.029 (0.030)
Married	0.041 (0.032)	0.031 (0.092)	0.041 (0.034)	0.080*** (0.020)	0.120*** (0.046)	0.041 (0.034)
Ethnic minorities	0.350*** (0.031)	0.446*** (0.122)	0.347*** (0.033)	0.281*** (0.020)	0.310*** (0.061)	0.347*** (0.033)
Lower secondary	-0.132*** (0.038)	-0.077 (0.127)	-0.132*** (0.040)	-0.046** (0.019)	-0.078 (0.050)	-0.132*** (0.040)
High school	-0.192** (0.080)	-0.086 (0.135)	-0.204** (0.096)	-0.161*** (0.037)	-0.157** (0.062)	-0.204** (0.096)
College	0.023 (0.027)	0.111 (0.085)	0.018 (0.028)	0.042** (0.018)	0.028 (0.046)	0.018 (0.028)
Working	0.006 (0.026)	0.124 (0.078)	-0.006 (0.028)	0.003 (0.016)	0.052 (0.036)	-0.006 (0.028)
Have pension	-0.134*** (0.051)	-0.157 (0.121)	-0.109* (0.056)	-0.139*** (0.025)	-0.120** (0.050)	-0.109* (0.056)
Midlands and Northern Mountains	0.041 (0.045)	-0.148 (0.177)	0.049 (0.047)	0.046* (0.025)	-0.068 (0.074)	0.049 (0.047)
North Central and Coastal Centre	0.163*** (0.037)	0.201 (0.133)	0.155*** (0.039)	0.120*** (0.020)	0.074 (0.054)	0.155*** (0.039)
Central Highlands	0.219*** (0.053)	-0.000 (0.183)	0.235*** (0.056)	0.095*** (0.034)	-0.177* (0.091)	0.235*** (0.056)
South East	-0.180** (0.084)	-0.951 (48.491)	-0.169* (0.088)	-0.094*** (0.031)	-0.097 (0.065)	-0.169* (0.088)
Mekong River Delta	0.131*** (0.040)	0.097 (0.137)	0.129*** (0.042)	0.063*** (0.022)	0.024 (0.056)	0.129*** (0.042)
Household size	0.069*** (0.010)	0.111*** (0.037)	0.067*** (0.010)	0.059*** (0.006)	0.059*** (0.016)	0.067*** (0.010)
Elderly proportion	0.216*** (0.068)	0.946*** (0.279)	0.135* (0.072)	0.080** (0.040)	0.296*** (0.099)	0.135* (0.072)
Children proportion	0.430*** (0.085)	0.861*** (0.329)	0.387*** (0.090)	0.306*** (0.053)	0.360*** (0.132)	0.387*** (0.090)
Female proportion	0.094 (0.065)	0.016 (0.190)	0.125* (0.070)	0.077** (0.039)	-0.124 (0.091)	0.125* (0.070)
Log of residential area	-0.273*** (0.024)	-0.348*** (0.086)	-0.272*** (0.025)	-0.244*** (0.014)	-0.248*** (0.035)	-0.272*** (0.025)
Permanent house	-0.131*** (0.035)	-0.217* (0.128)	-0.116*** (0.037)	-0.124*** (0.018)	-0.243*** (0.045)	-0.116*** (0.037)

	(7)	(8)	(9)	(10)	(11)	(12)
	Official poverty line			150% of the poverty line		
	All	Urban	Rural	All	Urban	Rural
Have remittance	-0.067** (0.031)	-0.055 (0.109)	-0.064** (0.032)	-0.031 (0.021)	-0.020 (0.058)	-0.064** (0.032)
Have social assistance	0.004 (0.023)	0.087 (0.069)	-0.004 (0.024)	-0.015 (0.014)	-0.011 (0.036)	-0.004 (0.024)
Constant	0.081 (0.123)	-0.339 (0.426)	0.114 (0.131)	0.421*** (0.076)	0.354** (0.177)	0.114 (0.131)
Observations	4,642	1,438	3,204	4,642	1,438	3,204

Note: Standard errors in parentheses \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## Policy implication and conclusion

The aging population in Vietnam has posed complicated challenges for policymakers in designing a comprehensive social welfare system that can cater to the elderly. The analysis points out that overall, elderly poverty is lower than the overall poverty headcount in Vietnam. A large share of the older people is still actively working in the economy. Yet, the elderly population is diverse, and some groups are more vulnerable to poverty than others. In particular, the elderly living in rural areas and the ethnic minority elderly are much more susceptible to poverty than those living in urban areas or belong to the Kinh-Hoa majority. The gaps in poverty measures between the rural and urban older people and the ethnic minorities and the Kinh-Hoa people were even widened during the 2010-2016 period. Based on the analysis, the findings can indicate the following policy directions considering the elderly population in Vietnam.

Firstly, the elderly in the more advanced group are more vulnerable to poverty. While age is minor at the official poverty line, it is significant for the near-poor group. The problem will grow in importance as aging continues and life expectancy increases. Therefore, these groups of elderly should receive priority in the government's social welfare policy. So far, the Government policy is quite effective. For example, the government reduced the eligible age for social assistance to the elderly in 2011 from 85 years old to 80 years old and increased it from 120,000 to 270,000 VND per person per month. This policy contributed to a decrease in poverty among the oldest elderly (aged 80 or above). While in 2010, this group had a higher poverty rate than the 70-79 years old (22.1% versus 21.2%), their poverty rate in 2016 was lower than the latter group (9% versus 10%). Yet, other policies in this direction, including lowering the eligible age and increasing the allowance, may help alleviate poverty in this group.

Secondly, inequality between ethnic groups is a particularly challenging task. The ethnic minority elderly group lagged behind the Kinh-Hoa ethnic majority groups in all poverty measures related to the inequality between economic regions. Older people living in disadvantaged areas such as the Midlands, Northern Mountains, and the Central Highlands were more vulnerable to chronic poverty.

Thirdly, the proportion of dependents is a strong predictor of being poor, especially for older people living in rural areas. Therefore, policies aimed at generating livelihood for working-aged people will be necessary to lower poverty.

Fourthly, remittances are effective in helping to increase elderly households' income, especially in rural areas. Studies on migration and remittance (e.g., Chuong & Linh, 2018; Nguyen et al., 2015) showed that remittances contributed significantly to improving the household's wellbeing and reducing poverty in rural areas. Policies to facilitate remittances, such as developing mobile payment that allows migrants to conveniently send remittances, will benefit older people in Vietnam.

Finally, policies that encourage older people to work beyond their retirement age will help alleviate poverty among older people and enable the sustainability of the pension system in the context of increased life expectancy and rapid demographic aging in Vietnam. These policies may include a gradual increase of the retirement age and a system of supporting older people to work.

## Acknowledgments

We acknowledge financial support from Vietnam Japan University for this project and would like to thank the editor and two anonymous reviewers for their helpful comments.

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