

Gender Differences in Access to Home-based Long-term Care in Thailand

Sasatra Sudsawasd

*Graduate School of Development Economics, National Institute of Development Administration,
Bangkok, Thailand.*

Amornrat Apinunmahakul

*Graduate School of Development Economics, National Institute of Development Administration,
Bangkok, Thailand.*

Prasopchoke Mongsawad

*Graduate School of Development Economics, National Institute of Development Administration,
Bangkok, Thailand.*

Corresponding author: prasop.m@nida.ac.th

Abstract

This study examines the determinants of long-term care use, as well as the equality and horizontal equity in the use of home-based care, with a focus on gender differences. Using data from the 2021 survey of older persons in Thailand, the findings highlight the important role of gender alongside other socio-economic factors in determining caregiver arrangements for elderly individuals with disabilities living at home. Elderly males are more likely to receive care from informal caregivers than elderly females but are less likely to receive care from paid caregivers. The gender gap tends to decrease as elderly individuals age or become more dependent in activities of daily living. Additionally, this study provides empirical evidence of inequality and horizontal inequity in long-term care use. Informal caregiving favors individuals with lower socio-economic status, while paid home caregiving favors those with higher socio-economic status. The degree of inequality and horizontal inequity is more severe among elderly males than females.

Keywords: long-term care, home care, gender difference, inequality, horizontal inequity.

1. Introduction

Equality and horizontal equity in access to health care have always been important issues and predominantly explored in the literature. Equality in health care usually means equal treatment for all care recipients, regardless of their gender, age, socio-economic status, care need, or other factors. Hence, equality arises when everyone has the same level of opportunity or equal access to health care services. On the contrary, horizontal equity means equal treatment for equal need. Horizontal inequity arises when individuals, after controlling for differences in healthcare needs, receive different levels of opportunity or utilization of health care services.

Many previous studies investigated the existence of equality and horizontal equity in terms of access to long-term care services among elderly individuals with disabilities. For instance, García-Gómez et al. (2015) used data of a non-institutionalized disabled population in Spain and found evidence of inequality and horizontal inequity in terms of long-term care use as well as unmet need for long-term care services. While the use of community care services revealed high levels of pro-rich concentration, intensive use of informal care services appears to be more concentrated among individuals with lower socio-economic status. However, the findings on unmet needs for long-term care services are shown to largely depend on the type of services considered and the measure of unmet need.

Rodrigues et al. (2018) conducted a study using data from the Survey of Health, Ageing, and Retirement in Europe (SHARE) for 14 European countries examining how informal and home care use are distributed among the elderly. They found varying outcomes depending on the country, the measure of socio-economic status used for ranking elderly individuals, and the type of long-term care. The study revealed that both informal care and home care exhibited pro-poor inequality. After accounting for

differences in care needs, a less pro-poor concentration was shown for informal care. For home care, most countries did not find significant horizontal inequity in long-term care use. In contrast, Tenand et al. (2020) used the exhaustive administrative register data in the Netherlands and found significant pro-poor inequality and horizontal inequities for both home care and institutional care. Among those eligible for institutional care, higher-income individuals are, surprisingly, more likely to use home care instead.

Ilinca et al. (2017) and Lera et al. (2021) investigated the issue of inequality and inequity in the use of long-term care among European elderly people, also using data from the SHARE. Their findings consistently pointed to significant socio-economic inequality in long-term care utilization. Lera et al. (2021) highlighted that those receiving formal care are concentrated among households with high socio-economic status, whereas those receiving informal care are concentrated in low socio-economic status households. In addition, they found pro-rich horizontal inequity in both formal and informal long-term care use. On the other hand, Ilinca et al. (2017) found pro-poor inequality in home care utilization, but less evidence of horizontal inequity when accounting for differential care needs.

These studies collectively highlighted disparities in equality and horizontal equity across different forms of long-term care use for the elderly. Building upon these insights, this study utilizes concepts and measurement methods of equality and horizontal equity from previous studies to examine the case of Thailand. In addition, one of the important issues currently under consideration (e.g., EIGE, 2020; UN Women, 2017) is gender equality in relation to long-term care, where gender may influence differential access to and utilization of services. Ideally, provision of health care, including long-term care services, needs to be equally and equitably available to women and men. Hence, this study extends prior research by adding a dimension that

explores gender differences in the use of long-term care among the elderly. This additional dimension promises to be a significant and compelling area for further study.

The aim of this study is, therefore, to examine long-term care utilization among elderly individuals with disabilities in Thailand, with a focus on gender differences. It will analyze the factors influencing long-term care use as well as equality and horizontal equity in the use of home-based care. The study utilized data from the 2021 survey of older persons in Thailand conducted by the National Statistical Office of Thailand. The study sample included elderly individuals aged 60 years and older living at home with disabilities, assessed using the Thai version of the Barthel Index for activities of daily living (ADL) scoring 11 or below. To measure long-term care use at home, this study focused on having two types of care providers: informal caregivers (such as family members, friends, or neighbors) and formal caregivers (such as paid caregivers, nurses, or domestic workers). Furthermore, the study examined gender disparities in accessing long-term care by analyzing equality and horizontal equity of having a caregiver among dependent elderly individuals across genders. The findings provide valuable insights into home-based care arrangements and highlight potential areas for policy interventions to improve long-term care services for dependent elderly individuals living at home in Thailand.

In the following section, this study presents the status of the Thai dependent elderly population. Section 3 outlines the data and methods used in this study. Section 4 presents the results on the determinants of long-term care use for dependent elderly individuals living at home, followed by the results on equality and horizontal equity regarding long-term care use. The final section concludes with a discussion of policy implications.

2. Status of Dependent Elderly Population in Thailand

This section provides the statistical characteristics of dependent elderly populations based on the data from the survey of older persons in Thailand. Table 1 presents the number of elderly populations in Thailand by types of dependency and caregiver. In 2021, there were approximately 13.36 million individuals aged 60 years and above. This group comprised approximately 5.97 million males and 7.38 million females. Based on the Thai version of the Barthel Index for ADL, the dependency assessment contains 10 items that describe ADL and mobility, such as feeding, grooming, transferring, toileting, etc. A score of 0 to 4 indicates “total dependency” or being bed-bound; a score of 5 to 11 indicates “partial dependency” or being homebound; and a score of 12 to 20 indicates “independence” or being social bound. The majority (96.86%) of the elderly population was categorized as socially active and independent in activities of daily living.

Notably, 1.82% of the elderly population were identified as partially dependent (or homebound) older people, amounting to approximately 241,395 individuals. About 1.32% of the elderly were totally dependent in ADLs (or bedridden), totaling around 174,409 individuals. It is observed that elderly females had a slightly higher proportion of ADL dependence as compared to elderly males.

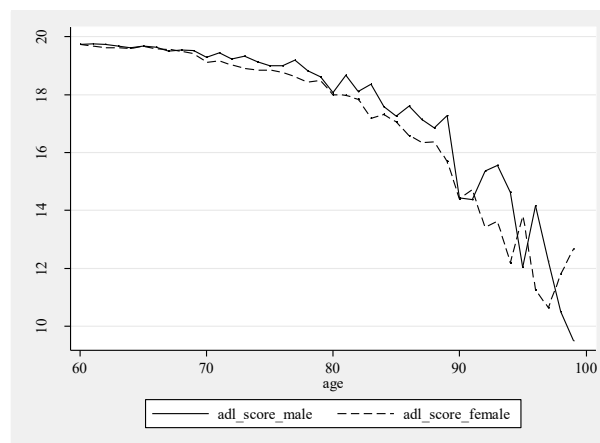
Table 1. Number of older persons by types of ADL dependency and caregiver in 2021

	Total	Male	Female
Number of persons	68,263,027	33,229,747	35,033,280
Number of persons (aged 60 and above)	13,358,751	5,974,022	7,384,729
ADL dependency status (aged 60 and above)			
Bedridden (Totally dependent, ADL 0-4) (persons)	174,409	70,921	103,487
%	1.32%	1.20%	1.41%
Homebound (Partial dependent, ADL 5-11) (persons)	241,395	83,571	157,825
%	1.82%	1.41%	2.15%
Social bound (Independent, ADL 12-20) (persons)	12,839,603	5,772,199	7,067,404
%	96.86%	97.39%	96.43%
Type of primary caregiver at home for homebound/bedridden elderly (aged 60 and above)			
Informal carer (persons)	390,246	145,312	244,934
%	93.85%	94.06%	93.73%
Paid home carer (persons)	15,562	5,808	9,754
%	3.74%	3.76%	3.73%
None (persons)	9,996	3,372	6,624
%	2.40%	2.18%	2.53%

Source: The survey of older persons in Thailand in 2021.

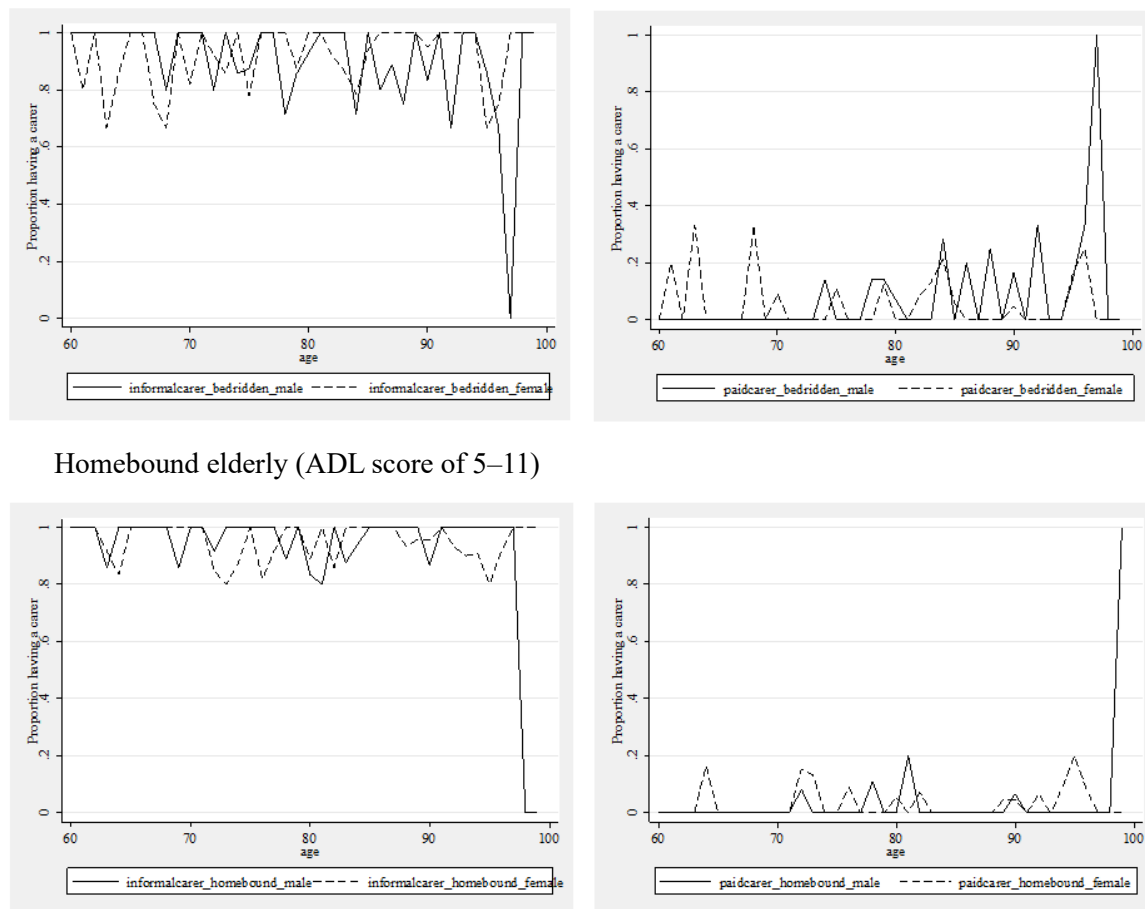
Figure 1 illustrates the relationship between ADL scores and age among the elderly. It demonstrates a decline in ADL scores with advancing age, particularly accelerating after the age of 80. Although ADL scores for male and female elderly groups exhibit similar trends across all age ranges, men appear to have average ADL scores slightly higher than women. Figure 2 displays the proportion of the Thai dependent elderly receiving care at home, categorized into informal caregivers and paid caregivers. Across all age groups, both male and female elderly with dependency predominantly receive care from informal caregivers, exceeding 90%. However, among those aged over 90 years, there is a rapid increase in the proportion receiving care from paid caregivers, particularly noticeable among elderly males. This trend is similarly observed in both homebound and bedridden elderly groups. Hence, this data may point in the direction that there are gender disparities in caregiving use among the dependent elderly in Thailand.

Figure 1. ADL score of Thai elderly in 2021 by age and gender



Source: The survey of older persons in Thailand in 2021.

Figure 2. Proportion of Thai elderly having a caregiver at home in 2021 by gender, and dependency status Bedridden elderly (ADL score of 0–4)



Source: The survey of older persons in Thailand in 2021.

One of the interests of this study is to identify which factors influence the likelihood of receiving care for dependent elderly individuals in Thailand. Hence, the subsequent section will present the analysis of determinants of long-term care use at home in Thailand.

3. Data and Methods

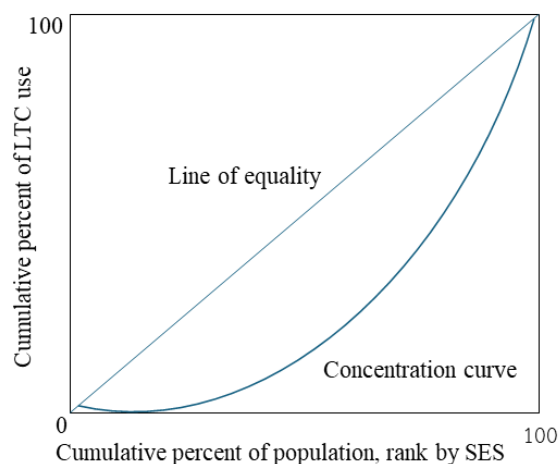
Healthcare inequality is a critical issue in public health research, and various indices have been developed to assess disparities in healthcare utilization. To measure such disparities, three commonly used measures are the Concentration Index,

the Corrected Concentration Index, and the Horizontal Inequity Index. Section 3.1 provides an overview of how the Concentration Index and Corrected Concentration Index measure inequality in the use of long-term care services. Whereas Section 3.2 focuses on the Horizontal Inequity Index, which assesses horizontal inequity. Finally, Section 3.3 provides some descriptive statistics of the variables used in this analysis.

3.1 Measuring Inequality in Long-term Care Use

In measuring socio-economic inequality in access to long-term care services, this study employs the Concentration Index (CI), one of the most commonly used measures to assess equality in accessing healthcare services (e.g., Wagstaff, 2005; Wagstaff et al., 1991; Wagstaff & van Doorslaer, 2000; Pulok et al., 2020). The CI introduced by Wagstaff et al. (1989) quantifies the degree to which healthcare services are concentrated among different socio-economic status groups. It can be visualized through a concentration curve, similar to the Gini index and the Lorenz curve, as depicted in Figure 3. Notably, the concentration curve for care utilization (y) is defined as the share of total y received by individuals with the fraction rank of individuals r or less.

Figure 3. Concentration curve of long-term care use



The CI is defined as twice the area between the equality line and the concentration curve, or as one minus twice the area under the concentration curve. If there is equality in long-term care use, irrespective of their socio-economic status, the concentration curve would coincide exactly with the equality line, and the area between these two lines would be zero. In this case, the CI is zero. In contrast, if the concentration curve lies above (below) the equality line, it indicates the pro-poor (pro-rich) distribution, an unequal distribution of long-term care use, where those with lower (higher) socio-economic status are more likely to receive care. And the CI takes a negative (positive) value.

Consider a health variable (y) that is a function of a socio-economic variable (r), i.e., $y = L(r)$, where individuals are ranked in ascending order of r . Similar to the Gini coefficient (Gini Index), the CI can be calculated using the following equation:

$$CI = 1 - 2 \int_0^1 L(r) dr$$

Kakwani (1980) and Jenkins (1988) mathematically showed that this equation can be computed as the ‘convenient covariance’ result:

$$CI = \frac{2}{\mu} \text{cov}(y_i, r_i)$$

where $\text{cov}(y_i, r_i)$ is the covariance between health variable (y_i) and the fraction rank of individuals (r_i) in the socio-economic distribution. The CI can be calculated by dividing the covariance between care utilization and socioeconomic status by the average value of the care utilization variable (μ) and then multiplying the result by two to ensure that the CI ranges between -1 and 1. Intuitively, if individuals with higher socio-economic status tend to have better access to healthcare, the covariance, $\text{cov}(y_i, r_i)$, will be positive; if individuals with lower socio-economic status have better

access, it will be negative. The $\frac{2}{\mu}$ serves as a scaling adjustment to standardize the index for comparison across different populations.

In this study, the health variable represents long-term care utilization as a binary variable. It equals 0 if elderly individuals with dependency status report ‘no caregiver/self-care’ and 1 if they report ‘having a caregiver.’ For the socio-economic status (SES) ranking variable, various measures have been used, such as income, consumption, and ownership of certain assets. However, the choice of measure may influence the inequality outcomes (Wagstaff & Watanabe, 2003). Thus, this study utilizes the three SES measures available in the survey of older persons in Thailand: income, savings, and assets of the elderly. This allows the study to examine and compare the results of different measures, which may be different in the case of Thailand.

The standard CI typically assumes a continuous outcome variable. Since the long-term care utilization variable is bounded, the mean of its distribution constrains the possible values of the concentration index between $\mu-1$ and $1-\mu$. As the mean increases, the range of the CI values shrinks (Wagstaff, 2005). Hence, the CI may depend on the mean value of the variable, making direct comparisons problematic between different populations (e.g., male versus female). To address the limitations of the CI when applied to bounded variables, this study employs Erreygers’s (2009) corrected concentration index (CCI), which normalizes the CI based on the range of the health variable $[a, b]$ and the mean (μ). Erreygers’s CCI is used appropriately where healthcare utilization rates are not symmetrically distributed. It can be calculated using this formula:

$$CCI = 4 * \frac{\mu}{b - a} * CI$$

The CCI adjusts for the bounded nature of the non-continuous variable, ensures that the index remains within a meaningful range, and allows for fair comparisons across different populations. Therefore, this study will utilize and present both the CI and CCI measurements of inequality in the use of long-term care to provide a more accurate assessment of the analysis.

3.2 Measuring Horizontal Inequity in Long-term Care Use

While the CI and CCI measure overall socio-economic status-related inequality in healthcare utilization, they do not distinguish between inequalities due to differences in healthcare needs and those due to differences in socio-economic factors. In contrast, the Horizontal Inequity Index (HI) is based on the concept of horizontal equity. Specifically, the HI refers to differences in healthcare utilization after controlling for healthcare needs. It assesses whether individuals with equal healthcare needs receive different levels of care due to their socio-economic status. In measuring horizontal equity in receiving long-term care among dependent elderly individuals at home, this study utilized the Horizontal Inequity Index (HI_{wv}), which is derived through the indirect standardization approach proposed by Wagstaff and van Doorslaer (2000). This method has been widely adopted in subsequent studies such as Pulok et al. (2020), Rodrigues et al. (2018), and Ilinca et al. (2017). The HI_{wv} can be obtained as the difference between actual value and need-predicted value of healthcare use, estimated from a regression model of healthcare use.

In this study, the model of long-term care use for estimation is based on the logistic regression model as follows:

$$y_i = \alpha + \sum_k \beta_k N_{ik} + \sum_j \beta_j Z_{ij} + \varepsilon_i$$

The dependent variable (y_i) in the model is the receipt of long-term care use at home, which is a binary variable that takes 1 if an individual i has a caregiver and 0 if not. Determinants of long-term care use are separated into need variables (N_{ik}) and non-need variables (Z_{ij}). The need variables include age, gender, and dependency levels measured by the ADL assessment of the elderly. Non-need variables, such as residential area, socio-economic status measured by individuals' income, assets, savings, and education level, are included in the model to avoid omitted-important variable bias. Additionally, this study introduced a fixed-effect variable for residential provinces to control for constant factors (fixed effects) that may vary across provinces where elderly individuals reside.

To obtain the predicted value of long-term care use adjusted for the level of need of an individual i , it is estimated from the following equation (Pulok et al., 2020):

$$\hat{y}_i = \hat{\alpha} + \sum_k \hat{\beta}_k N_{ik} + \sum_j \hat{\beta}_j \bar{Z}_{ij}$$

where $\bar{Z}_{ij}$ is set equal to the average value of a non-need indicator j . Hence, this equation predicts the predicted value of long-term care use when an elderly individual i is treated on average as others with the same level of care needs for long-term care. Notably, the indirectly standardized value of long-term care utilization for an individual i can be derived by subtracting the predicted value of long-term care use based on the need factors ($\hat{y}_i$) from actual value of long-term care use (y_i) and then adding the sample mean value of long-term care use ($\bar{y}_i$).

Finally, the concentration indexes of actual (observed) long-term CI and need-predicted long-term care utilization adjusted for the level of care needs (CI_N) can be calculated, as outlined in the previously presented methodology of the concentration index. The (HI_{WV}) is the difference between them, which is expressed by the equation:

$$HI_{WV} = CI - CI_N$$

A positive (HI_{WV}) indicates pro-rich inequity in which individuals with higher socio-economic status receive disproportionately more care than expected based on their health needs, while a negative (HI_{WV}) indicates pro-poor inequity in which individuals with lower socio-economic status receive more care than expected. By controlling the role of need-based factors, the (HI_{WV}) provides a clearer picture of unjust disparities in access to the use of care at home when all individuals are assumed to have the same level of care need.

3.3 Descriptive Statistics

Table 2 presents the unweighted statistics of the variables used in the analysis of determinants of long-term care use, based on the data from the 2021 survey of older persons in Thailand. The study sample consists of elderly individuals aged 60 years and above who live at home and lose independence in activities of daily living, categorized as being bedridden or homebound elderly. Among the total or partial dependent elderly in 2021, 93.5% of them receive care from informal caregivers, 4% from paid caregivers, and 2.5% do not have primary caregivers. 36.5% of the dependent elderly are males. The average age is 80.5 years old. Furthermore, the average asset value among the dependent elderly is approximately 377,772 THB, which is higher than the average income and savings values of 44,594 THB and 66,190 THB, respectively. Additionally, 4.2% of the dependent elderly identify as single. 53.8% of them reside in urban areas. The average household size is 3.69 members. Finally, the average score of ADL assessment among the sample is 5.17 points, almost falling within the bedridden category.

Table 2. Descriptive (unweighted) statistics of homebound/bedridden elderly aged 60 and above at home

	Obs.	Mean	Std. Dev.	Min	Max
Receiving help from informal carer (Primary)	1,251	0.935	0.246	0	1
Receiving help from paid carer (Primary)	1,251	0.040	0.196	0	1
Not receiving help from any carer (Primary)	1,251	0.025	0.156	0	1
Male	1,251	0.365	0.481	0	1
Age	1,251	80.545	10.033	60	107
Income (THB)	1,243	44,594	70,948	0	500,000
Saving (THB)	1,235	66,190	265,198	0	3,000,000
Asset (THB)	1,243	377,772	668,945	0	3,000,000
Single	1,251	0.042	0.200	0	1
University graduates	1,251	0.025	0.156	0	1
Urban	1,251	0.538	0.499	0	1
Number of household members	1,251	3.686	1.823	1	11
ADL score	1,251	5.173	4.177	0	11

Source: The survey of older persons in Thailand in 2021.

4. Empirical Results

This section is divided into two parts. The first part presents the estimation results of determinants of long-term care use for dependent elderly individuals living in their homes, obtained from the logistic regression model. This analysis categorizes the use of long-term care according to the two types of primary caregiver, informal caregivers and paid caregivers, aiming to identify potentially different influencing factors, especially the gender of the care recipient. The second part presents an analysis of equality and horizontal equity regarding long-term care use. This analysis separates the dependent elderly individuals by gender to investigate the potential gender disparity in receiving care at home.

4.1 Determinants of Long-term Care Use

Table 3 presents the estimations for the logistic regression models. Overall, the estimated coefficients reveal significant associations between various variables and the

likelihood of elderly individuals who are dependent or partially dependent in activities of daily living receiving care at home. This study categorizes the use of long-term care based on the two types of caregivers: informal caregivers and paid caregivers.

This study finds that income, marital status, and education attainment statistically affect the probability of elderly individuals receiving care at home. However, the impacts are different depending on the type of primary caregiver. Specifically, a one percent increase in the elderly's income is associated with a 0.0485% increase in the probability of having a paid caregiver, while decreasing the probability of having an informal caregiver by 0.0314%. Additionally, elderly individuals who are single are 10.97% more likely to have a paid caregiver, but no statistically significant relationship was found with the probability of having informal caregivers. In addition, elderly individuals with a university degree have an 18.97% increase in the probability of having a paid caregiver and a 16.45% lower probability of having an informal caregiver.

However, other variables such as gender, age, ADL assessment results, area of living, household size, and savings and assets do not have statistically significant associations with the probability of receiving care at home in the base regression models. Noting that, based on the estimation results, the income measure is statistically correlated with long-term care use at home, while the other two measures (savings and assets) are not. This finding suggests that the choice of measure for the socio-economic status ranking variable plays a significant role in determining the degree of inequality.

Table 3. Determinants of long-term care use at home (Logit model results and marginal effects)
(Sample: homebound/bedridden population aged 60 and above at home in 2021)

	Dependent variable: Elderly with an informal carer (Having an informal carer = 1, Not having an informal carer =0)		Dependent variable: Elderly with a paid carer (Having a paid carer = 1, Not having a paid carer =0)	
	Coefficient	Marginal Effects	Coefficient	Marginal Effects
<i>Male</i>	0.2338 (0.3624)	0.0176 (0.0275)	0.1701 (0.4346)	0.0105 (0.0267)
<i>Age</i>	0.0265 (0.2475)	0.0020 (0.0187)	0.0576 (0.2948)	0.0036 (0.0183)
<i>Age²</i>	-0.0003 (0.0016)	0.0000 (0.0001)	-0.0001 (0.0019)	0.0000 (0.0001)
<i>ADL_Score</i>	0.0332 (0.0401)	0.0025 (0.0030)	-0.0851 (0.0576)	-0.0053 (0.0035)
<i>ln(Income)</i>	-0.4157 ** (0.1886)	-0.0314 ** (0.0144)	0.7838 ** (0.3249)	0.0485 ** (0.0189)
<i>ln(Saving)</i>	-0.0070 (0.0343)	-0.0005 (0.0026)	-0.0644 (0.0449)	-0.0040 (0.0028)
<i>ln(Asset)</i>	-0.0318 (0.0314)	-0.0024 (0.0024)	0.0359 (0.0419)	0.0022 (0.0027)
<i>Single</i>	-0.8549 (0.7097)	-0.0645 (0.0533)	1.7749 ** (0.8869)	0.1097 ** (0.0518)
<i>University graduates</i>	-2.1798 *** (0.7062)	-0.1645 *** (0.0515)	3.0682 *** (0.8885)	0.1897 *** (0.0509)
<i>Urban</i>	-0.0778 (0.4186)	-0.0059 (0.0315)	0.6313 (0.5029)	0.0390 (0.0303)
<i>No. of household members</i>	0.1006 (0.1273)	0.0076 (0.0096)	0.0132 (0.1806)	0.0008 (0.0112)
Constant	6.3905 (10.1510)		-15.7310 (11.9933)	
Log pseudolikelihood	-69,670.97		-40,496.71	
Pseudo R ²	0.1650		0.2360	

Number of obs.	780		519	
----------------	-----	--	-----	--

Source: The survey of older persons in Thailand in 2021.

Notes: Robust standard errors are in parentheses. *, **, and *** denote the significance at the 10%, 5%, and 1% levels, respectively. In all specifications, province dummy variables are included but not reported in the table. Additionally, the logit model estimations are based on weighted data to accurately represent the entire population.

Since this study aims to examine the role of gender in the use of long-term care, the base regression model is extended to include interaction terms between gender and other explanatory variables. The estimated coefficients of these interaction terms are presented in Table 4. The log pseudolikelihood value obtained indicates that the extended regression model can better explain the actual data compared to the base regression model. Contrary to the findings of the base regression model, the gender of the elderly showed statistically significant coefficients. Elderly males are more likely to receive care from an informal caregiver than females, yet less likely to have a paid caregiver.

The interaction terms between gender and factors such as age and ADL scores of the elderly are shown to have statistically significant effects on the likelihood of receiving care. While elderly males initially have a higher probability of having an informal caregiver, this gender gap tends to decrease with increasing age. Similarly, although elderly males are less likely to have a paid caregiver, this gap appears to diminish with higher age. Moreover, as elderly individuals become more dependent in activities of daily living, as indicated by a decrease in ADL scores, the gender gap in the probability of having an informal caregiver or a paid caregiver also reduces. Elderly individuals' savings and household size appear to affect the gender gap in the probability of having a paid caregiver, but only at the 10% significance level. However, these effects are not significant for the probability of having an informal caregiver.

Table 4. Estimations of interaction terms (Logit model results)
(Sample: Homebound/bedridden population aged 60 and above at home in 2021)

	Dependent variable: Elderly with an informal carer (Having an informal carer = 1, Not having an informal carer =0)	Dependent variable: Elderly with a paid carer (Having a paid carer = 1, Not having a paid carer =0)
<i>Male</i>	57.5095 ** (25.7340)	-73.9699 ** (30.6943)
Interaction of <i>Male</i> with		
<i>Age</i>	-1.3158 ** (0.6176)	1.7014 ** (0.7430)
<i>Age</i> ²	0.0078 ** (0.0038)	-0.0104 ** (0.0046)
<i>ADL_Score</i>	0.1722 * (0.0894)	-0.2751 ** (0.1286)
<i>ln(Income)</i>	-0.4185 (0.3275)	0.8086 (0.5132)
<i>ln(Saving)</i>	-0.0428 (0.0676)	0.1693 * (0.1001)
<i>ln(Asset)</i>	0.0461 (0.0588)	-0.0858 (0.0795)
<i>University graduates</i>	1.6742 (1.3776)	-2.3175 (1.7777)
<i>Urban</i>	-0.5694 (0.7167)	1.5241 (1.2522)
<i>No. of household members</i>	0.2593 (0.2828)	-0.8820 * (0.5295)
Log pseudolikelihood	-66,322.34	-36,237.49
Pseudo R ²	0.2018	0.3139
Number of obs.	773	514

Source: The survey of older persons in Thailand in 2021.

Notes: Robust standard errors are in parentheses. *, **, and *** denote the significance at the 10%, 5%, and 1% levels, respectively. In all specifications, province dummy variables are included but not reported in the table. To save space, the results of non-interacted variables are not reported in this table. Additionally, the logit model estimations are based on weighted data to accurately represent the entire population.

4.2 Inequality and Inequity in the Use of Home-based Long-term Care

Table 5 presents the results of measuring inequality and horizontal equity in access to long-term care at home among dependent elderly individuals, consisting of (1) the Concentration Index (CI), (2) the normalized version of Concentration Index or the Corrected Concentration Index (CCI), which is more appropriate for a bounded variable such as LTC utilization, and (3) the Horizontal Inequity Index (HI_{wv}). Note that the predicted value of long-term care use based on an individual i 's need factors ($\hat{y}_i$) for each type of long-term care is obtained from the estimated regressions reported in Table 3.

For the measures of long-term care use, this study constructs three variables that indicate whether or not an individual has received long-term care at home: (1) having a caregiver for daily living assistance, whether informal (family, friend, or unpaid) or formal home (paid) caregivers, (2) having an informal caregiver, and (3) having a paid caregiver. For the socio-economic variables used in the ranking of individuals, this study uses three measures, an individual's income, assets, and savings. In addition, the study categorizes the sample into three groups: the whole sample of all elderly individuals, the elderly males sub-sample, and the elderly females sub-sample. The findings of the study are as follows:

4.2.1 Inequality in the Use of Home-based Long-term Care

The results obtained from the CI and the CCI are similar and consistent. Regarding the provision of long-term care for dependent elderly individuals, firstly, there is no statistically significant evidence indicating inequality in having a primary caregiver at home across the entire elderly sample, male elderly sample, or female elderly sample when using an individual's income and savings as the socio-economic ranking variables. However, when ranking elderly individuals according to the value of

assets, both CIs and CCIs are negative and statistically significant at the 10% level among the whole elderly sample and the female elderly sample, indicating a pro-poor distribution of long-term care use, as measured by having a caregiver at home.

Regarding having informal caregivers, the CI and CCI results revealed characteristics of pro-poor inequality in favor of elderly individuals with lower socio-economic status when ranking individuals according to income in all three samples. The results of CCI reveal a greater pro-poor inequality in having informal caregivers in the male elderly sample group compared to what was observed in the female elderly sample group. When sorting elderly individuals by asset value, statistically significant results were found only in the case of the entire elderly sample group and the female elderly sample subgroup. Conversely, when sorting elderly individuals by the amount of savings, statistically significant results were found only in the case of entire the elderly sample group and the male elderly sample subgroup.

For having a paid home caregiver, the CI and CCI results indicated inequality favoring individuals with higher socio-economic status or pro-rich inequality. When sorting elderly individuals based on their income, statistical significance was observed at the 1% level among the whole elderly sample, male elderly sample, and female elderly sample groups. Pro-rich inequality is shown to be more severe in the male elderly sample compared to the female elderly sample. In contrast, if the socio-economic variables used in the ranking of individuals are asset value and amount of savings, no statistically significant CI and CCI estimates were found at the 5% level. Hence, the findings of pro-rich inequality are not strongly robust across all measures of socio-economic status.

4.2.2 Horizontal Inequity in the Use of Home-based Long-term Care

Measurements of equality in long-term care use, such as the CI and the CCI, lack control over factors influencing the differences in care needs among dependent elderly individuals. The individual needs of care can vary based on factors including age, gender, and the level of independence in daily activities. It is essential that dependent elderly individuals with equal caregiving needs receive or have access to the same level of care, regardless of their economic and social status, to ensure equity in the use of long-term care at home. Therefore, the study in this section analyzes inequity in long-term care use at home by using the HI, which takes into account differences in individual needs of care.

After controlling for different care needs, the size of the HI_{WV} is smaller when compared to the size of inequality indexes (CI and CCI) in the cases of having a caregiver or an informal caregiver. In contrast, the opposite result is found for a paid caregiver. When this study analyzed horizontal inequity of long-term care use in the case where a caregiver was present, the HI_{WV} index did not show statistically significant differences at the 5% level, regardless of the choice of socio-economic variables used for ranking individuals. Hence, this study did not find that having a caregiver at home is unequally distributed.

However, in the case where the primary caregiver is an informal caregiver, the results pointed toward horizontal inequity. This finding occurs when elderly individuals were ranked by income level. There was evidence of pro-poor concentration favoring individuals with lower socio-economic status in the whole elderly sample, male elderly sample, and female elderly sample. When ranking individuals by asset value, the HI_{WV} value is statistically significant in the female elderly sample, whereas the HI_{WV} value turns out to be insignificant in the male elderly sample.

Finally, in the case where the primary caregiver was formally hired and individuals are ranked according to income level, the HI_{WVS} are positive and statistically significant in all three samples, the whole elderly sample, the male elderly sample, and the female elderly sample. Hence, the findings indicated pro-rich inequity of paid home care favoring those with higher socio-economic status. In addition, the HI_{WVS} showed a more pro-poor distribution of use of paid home care among elderly males than females. Notably, when asset value or amount of savings of the elderly is used to measure the socio-economic status, the HI_{WVS} did not show statistical significance, indicating that inequity in the use of paid home care is not robust.

Table 5. Inequality and horizontal inequity in the use of home-based long-term care
(Sample: Dependent (homebound/bedridden) older persons aged 60 and above in 2021)

	All elderly persons	Elderly males	Elderly females
Having a caregiver			
Ranked by income			
<i>CI</i>	0.0015 (0.0021)	0.0041 (0.0034)	-0.0004 (0.0040)
<i>CCI</i>	0.0057 (0.0082)	0.0160 (0.0133)	-0.0015 (0.0155)
<i>HI_{WV}</i>	0.0014 (0.0021)	0.0043 (0.0034)	-0.0004 (0.0040)
Ranked by asset			
<i>CI</i>	-0.0041 * (0.0023)	-0.0016 (0.0030)	-0.0057 * (0.0029)
<i>CCI</i>	-0.0160 * (0.0091)	-0.0063 (0.0117)	-0.0221 * (0.0114)
<i>HI_{WV}</i>	-0.0040 * (0.0023)	-0.0017 (0.0030)	-0.0052 * (0.0029)
Ranked by saving			
<i>CI</i>	-0.0055	-0.0022	-0.0074

	(0.0034)	(0.0037)	(0.0054)
<i>CCI</i>	-0.0213	-0.0086	-0.0288
	(0.0134)	(0.0145)	(0.0211)
<i>HI_{WV}</i>	-0.0057	-0.0026	-0.0074
	(0.0034)	(0.0037)	(0.0054)
Having an informal caregiver			
Ranked by income			
<i>CI</i>	-0.0161 ***	-0.0227 **	-0.0125 **
	(0.0039)	(0.0093)	(0.0058)
<i>CCI</i>	-0.0605 ***	-0.0853 **	-0.0468 **
	(0.0146)	(0.0349)	(0.0219)
<i>HI_{WV}</i>	-0.0164 ***	-0.0230 **	-0.0123 **
	(0.0040)	(0.0092)	(0.0059)
Ranked by asset			
<i>CI</i>	-0.0099 **	-0.0067	-0.0120 **
	(0.0044)	(0.0077)	(0.0058)
<i>CCI</i>	-0.0371 **	-0.0251	-0.0449 **
	(0.0163)	(0.0290)	(0.0218)
<i>HI_{WV}</i>	-0.0112 **	-0.0067	-0.0134 **
	(0.0044)	(0.0079)	(0.0058)
Ranked by saving			
<i>CI</i>	-0.0087 **	-0.0127 *	-0.0065
	(0.0044)	(0.0068)	(0.0061)
<i>CCI</i>	-0.0328 **	-0.0475 *	-0.0245
	(0.0164)	(0.0254)	(0.0229)
<i>HI_{WV}</i>	-0.0087 *	-0.0122 *	-0.0066
	(0.0044)	(0.0069)	(0.0061)
Having a paid caregiver			
Ranked by income			
<i>CI</i>	0.4396 ***	0.6614 ***	0.3042 **
	(0.0954)	(0.2036)	(0.1228)
<i>CCI</i>	0.0662 ***	0.1014 ***	0.0454 **

	(0.0144)	(0.0312)	(0.0183)
HI_{wv}	0.3117 ***	0.4415 ***	0.2204 **
	(0.0672)	(0.1323)	(0.0899)
Ranked by asset			
CI	0.1413	0.1242	0.1546
	(0.0991)	(0.1629)	(0.1492)
CCI	0.0210	0.0188	0.0228
	(0.0147)	(0.0246)	(0.0220)
HI_{wv}	0.1194 *	0.0832	0.1390
	(0.0689)	(0.1092)	(0.1076)
Ranked by saving			
CI	0.0756	0.2497 *	-0.0285
	(0.0817)	(0.1489)	(0.0888)
CCI	0.0115	0.0389 *	-0.0043
	(0.0124)	(0.0232)	(0.0133)
HI_{wv}	0.0510	0.1568	-0.0192
	(0.0585)	(0.1017)	(0.0656)

Source: The survey of older persons in Thailand in 2021.

Notes: Robust standard errors are in parentheses. *, **, and *** denote the significance at the 10%, 5%, and 1% levels, respectively. Additionally, the estimates of CI , CCI , and HI_{wv} are based on weighted data to accurately represent the entire population.

5. Conclusion

This study on long-term care utilization among elderly individuals who are dependent or partially dependent in activities of daily living and live at home is divided into two parts. The first part analyzes the factors that determine the likelihood of elderly individuals receiving care, while the second part examines issues of equality and horizontal equity in the home-based care received by these individuals. Additionally, this study extends previous research by examining gender differences in long-term care utilization. Using data from the 2021 survey of older persons in Thailand, the empirical

findings from the logistic regression model point to the important role of gender, alongside other socio-economic factors, in determining the types of caregiver arrangements for elderly individuals with disabilities living at home. This study found evidence showing that elderly males are more likely to receive care from informal caregivers than elderly females. However, they are less likely to receive care from paid caregivers compared to elderly females. This may be due to the fact that, in Thai culture, women are often expected to take on caregiving roles within the family. As a result, elderly males (husbands) may rely more on informal family care (from their daughters and wives) rather than formal or paid care services. On the other hand, elderly females, especially widows, may have fewer family caregivers and are therefore more likely to utilize formal or paid care services. Nonetheless, the gender gap tends to decrease as elderly individuals age or become more dependent in activities of daily living, as measured by a decline in their ADL assessment score.

The findings from the second part also point in the same direction, providing empirical evidence of inequality in long-term care use among dependent elderly individuals living at home, with informal caregiving showing inequality favoring those with lower socio-economic status and paid home caregiving showing inequality favoring those with higher socio-economic status. Likewise, this study found statistical evidence suggesting horizontal inequity after controlling for different care needs associated with long-term care services. When the primary caregiver is an informal caregiver, the horizontal inequity appears to favor individuals with lower socio-economic status. On the other hand, when the primary caregiver is a formal caregiver, the study indicated horizontal inequity that favors individuals with higher socio-economic status. In addition, there is evident inequity in having informal or paid caregivers among elderly males that is more severe than among females. Nonetheless,

the findings are sensitive and subject to the choice of socio-economic variables used in the ranking of individuals.

In summary, this study highlights the inequality and inequity in long-term care use, emphasizing the significant role of gender in determining the likelihood of elderly individuals with dependency receiving care at home. These findings have crucial implications for future policy development, which should address the diverse long-term care needs of elderly populations across different contexts. For example, policymakers in public health should set goals that promote equity in long-term care, ensuring that all elderly individuals, regardless of their gender or socio-economic status, have fair and equal access to care. Hence, policy measures should focus on supporting and facilitating long-term care provision. For instance, providing social benefits and services for older people with care needs could increase the utilization of formal or paid home care, particularly among elderly individuals with low socio-economic status.

Since informal care appears to be pro-poor, it is likely to negatively impact low socio-economic status individuals, as they may lose income due to caregiving responsibilities. This could further worsen overall income inequality in Thailand, especially as the country has already become an aged society. Therefore, the government should prioritize long-term care, which poses a significant burden for low-income households. Offering support to family caregivers who provide long-term care could improve access to informal home care and help reduce overall income inequality. In addition, to address gender disparities in long-term care utilization in Thailand, policies should focus on improving access to formal or paid care services for all elderly individuals, particularly elderly males without family caregivers. Encouraging males (husbands) to take on caregiving roles within the family could help reduce the demand for paid care services, especially among elderly women (wives).

Considering the changes in the economic, social, and demographic structure in Thai society (such as smaller households and a higher dependency ratio), these factors will inevitably reduce the ability of informal caregivers to provide long-term care services, leading to greater dependence on the elderly themselves. The findings also suggest that elderly individuals in lower socio-economic groups will be the most affected by these changes. Therefore, the design of the long-term care system should prioritize these vulnerable elderly individuals, and part of the solution could involve improving the formal long-term care system to provide easier access to services for the elderly in this group.

This study serves as a starting point for exploring inequality and inequity in access to long-term care at home among older people with care needs in Thailand. However, further investigation is needed in several areas. For example, future studies could examine disparities in long-term care utilization across population subgroups, e.g., by income level. In addition, expanding the data to cover more years would allow for an analysis of trends over time, providing deeper insight into the dynamics of inequality and inequity in long-term care utilization. Finally, continuous monitoring of inequality and horizontal inequity in long-term care is crucial for policymakers and healthcare providers.

Acknowledgment

This research was financially supported by the Fundamental Fund (FF2567), Science Research and Innovation (TSRI), Thailand.

References

- Erreygers, G. (2009). Correcting the concentration index. *Journal of Health Economics*, 28(2), 504–515. <https://doi.org/10.1016/j.jhealeco.2008.02.003>
- European Institute for Gender Equality (EIGE) (2020). Gender equality and long-term care at home. *Research Note*. Retrieved from <https://eige.europa.eu/publications/gender-equality-and-long-term-care-home>
- García-Gómez, P., Hernández-Quevedo, C., Jiménez-Rubio, D., & Oliva-Moreno, J. (2015). Inequity in long-term care use and unmet need: Two sides of the same coin. *Journal of Health Economics*, 39, 147–158. <https://doi.org/10.1016/j.jhealeco.2014.11.004>
- Ilinca, S., Rodrigues, R., & Schmidt, A. E. (2017). Fairness and eligibility to long-term care: An analysis of the factors driving inequality and inequity in the use of home care for older Europeans. *International Journal of Environmental Research and Public Health*, 14(10), 1224. <https://doi.org/10.3390/ijerph14101224>
- Jenkins, S. (1988). Calculating income distribution indices from micro-data. *National Tax Journal*, 41(1), 139–142.
- Kakwani, N. (1980). *Income inequality and poverty: Methods of estimation and policy applications*. Oxford: Oxford University Press.
- Lera, J., Pascual-Sáez, M., & Cantarero-Prieto, D. (2021). Socioeconomic inequality in the use of long-term care among European older adults: An empirical approach using the SHARE survey. *International Journal of Environmental Research and Public Health*, 18, 1–14. <https://doi.org/10.3390/ijerph18010020>
- Pulok, M. H., van Gool, K., Hajizadeh, M., Allin, S., & Hall, J. (2020). Measuring horizontal inequity in healthcare utilisation: A review of methodological developments and debates. *European Journal of Health Economics*, 21, 171–180. <https://doi.org/10.1007/s10198-019-01118-2>
- Rodrigues, R., Ilinca, S., & Schmidt, A. E. (2018). Income-rich and wealth-poor? The impact of measures of socio-economic status in the analysis of the distribution of long-term care use among older people. *Health Economics*, 27(3), 637–646.

- Tenand, M., Bakx, P., & van Doorslaer, E. (2020). Equal long-term care for equal needs with universal and comprehensive coverage? An assessment using Dutch administrative data. *Health Economics*, 29(4), 435–451. <https://doi.org/10.1002/hec.3994>
- UN Women (2017). Long-term care for older people: A new global gender priority. *Policy Brief no.9*. Retrieved from <https://www.unwomen.org/en/digital-library/publications/2017/12/long-term-care-for-older-people>
- Wagstaff, A. (2005). The bounds of the concentration index when the variable of interest is binary, with an application to immunization inequality. *Health Economics*, 14(4), 429–432. <https://doi.org/10.1002/hec.953>
- Wagstaff, A., & van Doorslaer, E. (2000). Measuring and testing for inequity in the delivery of health care. *Journal of Human Resources*, 35(4), 716–33.
- Wagstaff, A., van Doorslaer, E., & Paci, P. (1991). On the measurement of horizontal inequity in the delivery of health care. *Journal of Health Economics*, 10(2), 169–205.
- Wagstaff, A., van Doorslaer, E., & Paci, P. (1989). Equity in the finance and delivery of health care: Some tentative cross-country comparisons. *Oxford Review of Economic Policy*, 5(1), 89–112. <https://doi.org/10.1093/oxrep/5.1.89>
- Wagstaff, A., & Watanabe, N. (2003). What Difference does the Choice of SES make in health inequality measurement? *Health Economics*, 12(10), 885–890. <https://doi.org/10.1002/hec.805>