

**INFLUENCE OF HUMAN CAPITAL ON RETIREMENT  
PREPARATION:  
EMPIRICAL EVIDENCE FROM THAILAND**



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**A Thesis Submitted in Partial  
Fulfillment of the Requirements for the Degree of  
Master of Economics  
School of Development Economics  
National Institute of Development Administration  
2019**

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## ABSTRACT

<b>Title of Thesis</b>	INFLUENCE OF HUMAN CAPITAL ON RETIREMENT PREPARATION:EMPIRICAL EVIDENCE FROM THAILAND
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This study has two main objectives. The first objective is to compare the values of individual Human Capital Indices (HCIs) in different groups and different years. The second objective is to examine and support the components of the Human Capital Index that determine the preparation of the pre-retirement population in Thailand. This study uses secondary data from the National Statistical Office's National Survey of Older Persons in Thailand from surveys conducted in 2011, 2014, and 2017. It also uses data such as the number of doctors per 1,000 population from the Ministry of Public Health, in order to study the effect of policy variables on retirement preparation among the Thai pre-retirement population.

Since the first goal of this study was to measure and compare the values of individuals' human capital in our sample, we created a new instrument, a Human Capital Index (HCI) for the pre-retirement population in Thailand, which is consistent with both human capital theory and the WHO concept of functional ability. The results of the HCIs in different groups of data (in 2011, 2014, and 2017) can be summarized as follows: first, the mean HCIs of males is higher than that of females. Second, people who lived in urban areas had a higher average HCI value than did people who lived in rural areas. Third, people who lived in Bangkok had a higher HCI when compared to those living in other regions, on average. Fourth, people who had a high average annual income tended to have a higher HCI in every survey, and the people who lived in the top 10 provinces (in terms of GPP) had higher HCIs than did people who lived in the bottom 10 provinces. Lastly, the mean HCIs among the pre-retirement group (50–59 years) were higher than they were for people aged 60 years and above. Moreover, people aged 60 years and above had a chance of a decrease in their HCIs as they aged.

To achieve the second purpose of this study, which was to examine the components in the Human Capital Index that determined the preparation of the pre-retirement population in Thailand, the determinants of retirement preparation were identified by employing logit, probit regression and Ordinary Least Square (OLS) estimation. The dependent variables of this research were confined to 6 dimensions: (1) housing, (2) financial security, (3) physical health, (4) leisure activities and social relationship activities, (5) safe environment (home adaptation) preparation, and (6) overall preparation index. Independent variables included Human Capital Index components (level of education, occupational skills, training and health status index), policy variables, specific variables of each model, and other variables as control variables.

These findings can be the foundation for suggestions regarding how to support and promote key components in the Human Capital Index. The government should support not only school and university education but also promote lifelong learning for the Thai population. Moreover, the government should promote skill development for the pre-retirement population, providing re-training courses that provide the opportunity for people to update their skills in order to meet the needs and demands of the labor sector. Such courses can increase the level of skills and increase income from their occupations, which will encourage them to prepare for their old age in terms of financial security, etc. And participating in occupational clubs or taking re-training courses will also increase preparation in social relationship activities.

In addition, the public sector should provide free or inexpensive vaccines to build up disease resistance among the population as well as promoting physical activity in order to help older persons maintain mobility as well as cognitive function.

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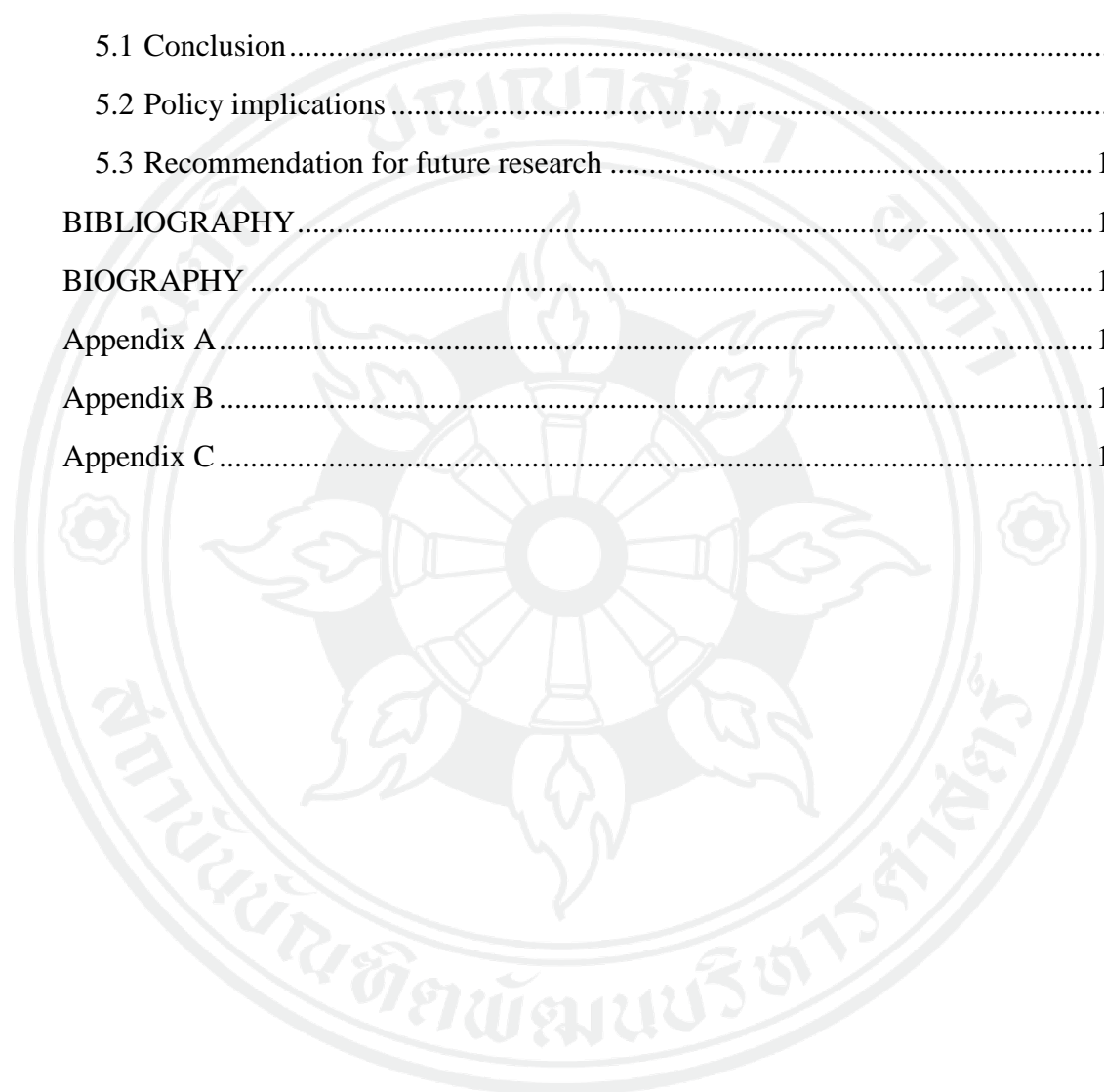
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## CHAPTER 1

### INTRODUCTION

#### 1.1 Background and significance of the study

##### 1.1.1 Situation of older people in Thailand

Many countries in Asia have become ageing societies, with decreasing fertility rates and increasing numbers of elderly. Thailand also has faced rapid demographic changes that create significant economic challenges, such as the Thai workforce not being able to meet the demands of the labor market and a high dependency ratio.

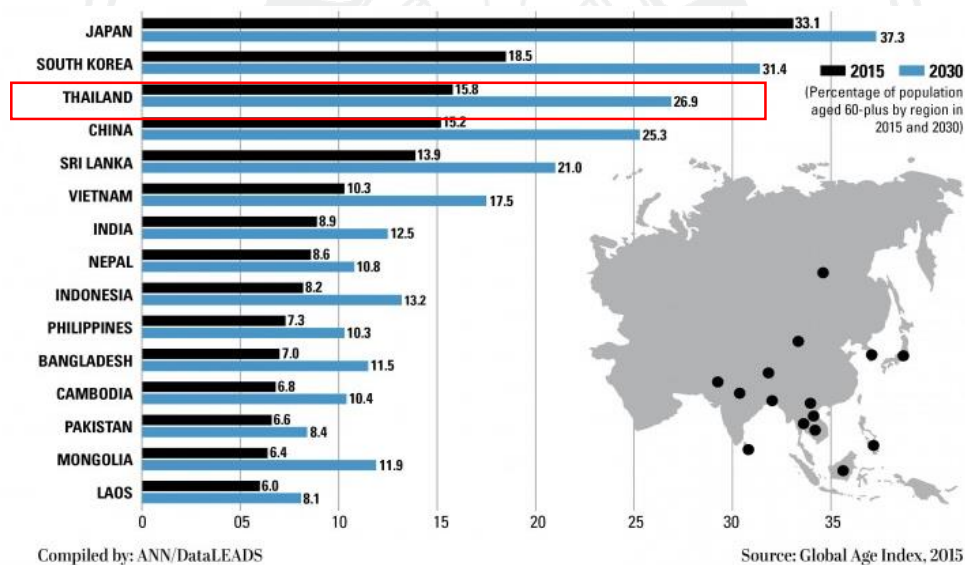


Figure 1.1 The proportion of people aged 60 and over in various Asian countries

Source: Global Age Index, 2015

In 2015 the population of elderly people in Thailand stood at 15.8 percent; it is estimated to increase to 26.9 percent of the total population by 2030 (Figure 1.1), meaning that more than one-fourth of the population will be elderly people.

Thus, among Asian countries, Thailand is expected to have the third highest proportion of elderly people per total population.

Specifically, as shown in Figure 1.2, the proportion of aged people in Thailand has been increasing over recent years. The elderly accounted for only 6.8 percent (4.01 million) in 1994, but by 2017 the number had risen to 11.31 million, accounting for 16.7 percent of the total population.

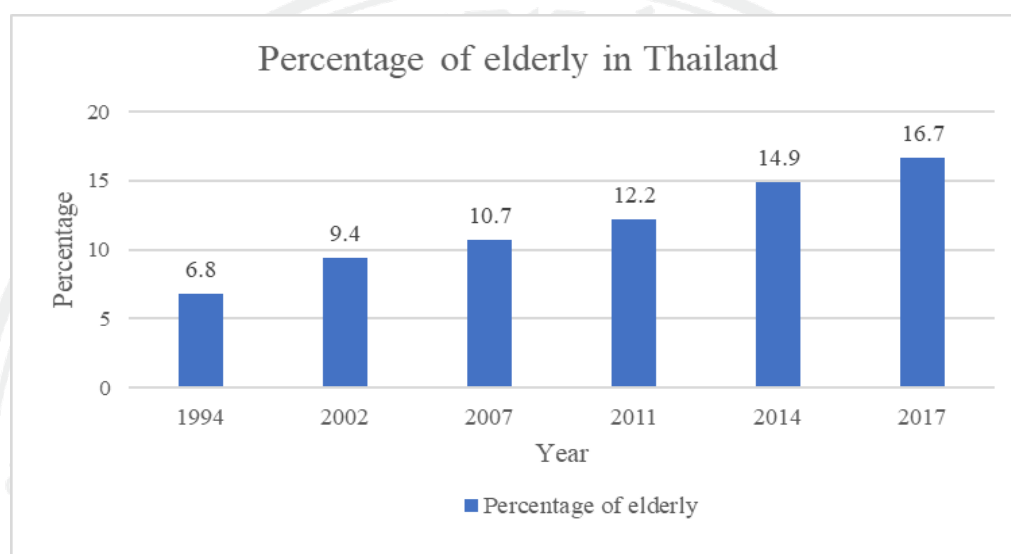


Figure 1.2 The percentage of elderly people in Thailand

Source: The National Statistical Office, 2017.

During its current transition period from an ageing society to an aged society, Thailand is faced with an increasing proportion of elderly people in the total population while the proportion of those in the labor force is rapidly declining. Therefore, the dependency ratio of Thailand will be unavoidably higher in the foreseeable future (Figure 1.3)

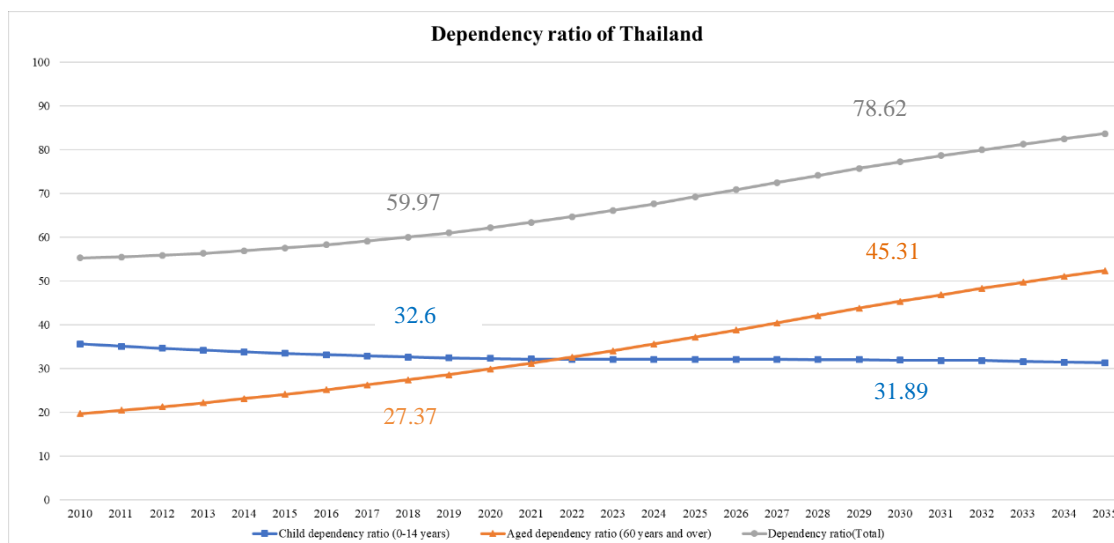


Figure 1.3 Dependency ratio of Thailand and projected ratios for 2020 onwards

Source: Office of the National Economics and Social Development Council, 2018

As projected in Figure 1.3 for 2018, the total dependency ratio is 59.97 while the child dependency ratio is 32.6 and the aged dependency ratio is 27.37, meaning that every 100 persons of the working-age population have to bear the burden of providing support for about 33 children and 27 seniors. For 2030, when Thailand becomes a full-fledged aged society, the projected aged dependency ratio is 45 while the child dependency ratio remains relatively stable. Therefore, it behaves Thai society to be prepared to deal with this situation because the change in demographic structure that gives rise to an aged society will bring challenges in many dimensions. The reduction in the number of productive workers will definitely affect economic growth, the pension system, and the quality of life of the elderly in Thailand. Thus, prudent and immediate measures and preparation are imperative to assure at least the decent well-being of the older population in the years to come.

### 1.1.2 The importance of preparation of the elderly

This section discusses problems of the elderly due to lack of preparation (in subsection 1.1.2.1) and the benefits of pre-retirement preparation (in subsection 1.1.2.2).

### 1.1.2.1 Problems due to lack of preparation

Problems to be addressed as the population continues to transition from an ageing to an aged society include:

1) A heavy burden on the public sector for support of elderly healthcare: To lessen this burden, older people should be counseled on nutrition, exercise, and how to avoid various health risks, as well as be given annual health check-ups.

2) Debt problems after retirement: After retirement, the majority of the elderly will receive less income compared to what they received previously. If elderly persons have not made plans for the future or begun saving for retirement, they may go into debt, especially in the case of illness or an accident.

3) A potential elderly homeless problem: If the elderly do not own their homes or have not made other preparations for their housing needs, they may end up becoming homeless.

4) Lack of elderly-friendly buildings and facilities: Given the dearth suitable, safe housing for the elderly, housing that does exist nevertheless needs to be comfortable and offer a safe environment for them.

5) Lack of social relationships: If older persons do not interact with society or socialize with others before they become elderly, their intellectual capabilities may suffer as they age, and they may also miss out on the happiness to be gained from leisure activities with others.

### 1.1.2.2 Benefits of pre-retirement preparation

Siripanich (2007) examined the impact of economic preparation, residential preparation, physical health preparation, caregiver preparation, mental preparation, and retirement activities preparation. Results show that knowledge or information about how to prepare people for retirement can reduce negative impacts and prevent retirement problems. According to Dutcher (1989), pre-retirement preparation was found to be positively correlated with retirement satisfaction and concluded that those who were prepared prior to retirement had a longer life expectancy and a better retirement attitude than those who were completely unprepared.

In addition, preparation in the public sector also benefits society. In their study of preparing for elderly well-being in Thailand and Singapore, Netramai, Kamolsuk, Intaprot, Lianyang, Kangsawad, and Sumananusorn (2014) focused on four main aspects: 1) economic preparation, 2) participation in social activities, 3) social and mental adjustment, and 4) learning behavior of the elderly. The study offers policy suggestions for how to provide for the elderly, such as supporting health care and ensuring a friendly environment, taking into account pensions, living allowance, and medical treatment.

Therefore, preparing for an elderly society is a crucial endeavor in order to respond to the phenomenon of an aged society and the challenges associated with it. Thus, the NSO suggests that the pre-retirement population (aged 50–59 years) should prepare themselves for their future as elderly citizens in order to avoid becoming a burden to their children. If such self-preparations for financial security, housing, and physical health are made now and during the next 20 years, it is still possible to create a satisfactory environment for the elderly that have self-prepared by that time. In addition, self-preparations can also decrease the government's fiscal burden for providing care to the elderly, such as the government allowance and health care budgeting.

### **1.1.3 National Plan for the Elderly in Thailand**

Thailand established the “National Committee of Senior Citizens (NCSC)” in 2002. The current policies and programs are related to the Second National Plan on the Elderly (NPE) (2002 – 2021). Its objectives are:

- 1) To enhance elderly well-being so that the elderly can lead lives that are a resource for society.
- 2) To adjust social attitudes and behaviors in order to increase the respect given to the elderly and to heighten the appreciation of the contributions the elderly can make to society.
- 3) To encourage all people's mindfulness about the need for preparation in order to achieve a pleasant, enjoyable quality of life as they age.
- 4) To encourage participation of every sector in the activities involving the elderly.

5) To define the frameworks and guidelines of good practice for all elderly. (The Ministry of Social Development and Human Security Thailand, 2009, p. 2)

In addition, this plan focuses on the development of policies and programs to support older persons, comprising 5 strategies are:

Strategy 1 – Preparation of the people for their quality ageing

Strategy 2 – Promotion and development for the elderly

Strategy 3 – Constructing social safeguards for the elderly

Strategy 4 – Developing a national comprehensive system for developing the personnel for the elderly involving missions

Strategy 5 – Processing, upgrading, and disseminating knowledge about the elderly and monitoring the national implementation of NPE (The Ministry of Social Development and Human Security Thailand, 2009, pp. 8–13)

The present study will specifically address the first strategy, namely, preparation of the people for their quality ageing. This preparation is very important for achieving a sustainable good quality of life for the elderly in the long run.

The results of some studies indicate that the overall preparation for the retirement of the pre-retirement population is at low and medium levels. For example, Yommana (2008), who sampled people aged 35–55, found that they had good consumption behavior and avoided risk factors at a medium level. On the other hand, Mungwattana (2011) and Seetangkham and Nilvarangkul (2017) found among groups they studied a low level of retirement preparation due to a lack of information access, suggesting that government provision of information was needed.

## **1.2 Statement of the problem**

Thailand's status as an aged society creates significant economic challenges. Thailand has faced rapid demographic changes, with a decreasing fertility rate and an increasing number of elderly. The effect of an aged society has prevented the Thai workforce from meeting the demands of the labor market.

In the era of an aged society, Thailand will face a higher dependency burden (high aged-dependency ratio). One strategy of the current National Plan on the Elderly of Thailand addresses the challenge of preparing the elderly for a good



quality of life in their remaining years. In addition, human capital—comprising knowledge, skills, and health status of a population—is the key for continued national development. For instance, gaining knowledge about self-preparation of the pre-retirement population is an important starting point for meeting the challenges of an aged society.

In light of the fact that Thailand is facing the problems associated with an ageing society, promoting investment in human capital is extremely crucial, particularly among the elderly or elderly-to-be, which can increase their level of preparation for their later years. Kumruangrit (2014) notes that human capital can determine the elderly's self-preparedness. So, support for boosting human capital can enhance preparedness for old age and help meet the challenges of maintaining financial security, good health after retirement, and a good quality of life. Human capital is intangible, thus measuring individual's human capital is of great difficulty.

However, human capital is intangible, thus measuring individual's human capital is of great difficulty. In addition, the Human Capital Index (HCI) in Thailand omitted some factors in human capital theory such as those noted by Kumruangrit (2014) that the HCI did not include the factor of skills derived from training and to assess health investments that boosted in human capital. Thus, constructing an individual Human Capital Index in accord with human capital theory is crucial for measuring individual human capital of the Thai population. And it is the accumulation of human capital that is key for handling the transition from an ageing society to an aged society.

Therefore, this study has two main objectives. Firstly, it aims to create a new instrument, namely, a Human Capital Index (HCI) that can be used to compare the human capital in different groups and during different years. Secondly, it aims to examine the components in the Human Capital Index that affect retirement preparation among the Thai pre-retirement population (aged 50–59) in order to arrive at a set of policy recommendations involving key HCI factors that can affect the successful preparation for retirement and old age in Thailand.

### **1.3 Research questions**

1.3.1 What are the different values of Human Capital Indices (HCIs) among different groups of pre-retirement Thai individuals during different years?

1.3.2 What are the components in the HCI that determine the retirement preparation of the pre-retirement population in Thailand?

### **1.4 Contribution of this research**

1.4.1 This study will construct the human capital index of each individual, which is consistent with human capital theory. For example, investments in health that contributed to human capital were determined. Such investments would be similar to an individual receiving a vaccine to build up immunity to a disease as well as being able to develop a health status measure more consistent with World Health Organization (WHO)'s healthy ageing concept and functional ability appropriate for the Thai context and data. Moreover, this research will proxy training by using the pre-retirement populations who joined an occupation group that provided training and that led to the creation of an occupation and generation of income for people in the community. Joining an occupation group represents skill development in the human capital of the pre-retirement population. Additionally, this study uses information of the International Standard Classification of Occupation (ISCO) for proxy skills of a population from their occupation to measure the human capital of the pre-retirement population.

1.4.2 This study uses secondary data from the NSO Survey of Older Persons in Thailand conducted in 2011, 2014, and 2017 to explore components in the Human Capital Index of each individual that affect the retirement preparation. Public and private sectors can use the findings from the study of preparation for an aged society by addressing human capital components that affect preparedness for retirement. The public sector can design public policy to support and encourage people to acquire useful human capital and prepare for old age, while the pre-retirement population should prepare themselves for quality ageing. This will enable people to have good quality of life when they are older.

## 1.5 Definitions of keywords in this research

**Pre-retirement population:** The population aged 50–59 years.

Atchley (1991) suggested that the appropriate time to prepare for retirement be made at least 10–15 years before retirement. Furthermore, survey data of the National Statistical Office of Thailand covers persons aged 50 years and over. This study will use people aged 50–59 years to study preparation before retirement of pre-retirement population.

**Ageing society:** According to the United Nations (UN), an ageing society is defined as any society that has a population over 60 years of age exceeding 10% or over 65 years of age exceeding 7% of the entire population. (United Nations, 2007)

**Aged society:** According to the UN, an aged society is defined as a society that has a population aged 60 years and over of 20% and aged 65 years and over of 14%.

**Child dependency ratio:** calculated from the population of children divided by the working age population and multiplied by 100.

**Age dependency ratio:** calculated from the elderly population divided by the working age population and multiplied by 100.

**Dependency ratio or total dependency ratio:** refers to children, the elderly, or both children and the elderly per 100 workers.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Human capital construction

This section consists of three subsections. Subsection 2.1.1 briefly discusses human capital theory and measures of human capital, which comprise the stock of skills, productive knowledge, and health status embodied in people. As health status is also an important part of human capital, subsection 2.1.2 explains the concept of functional ability based on World Health Organization (WHO) criteria in order to identify the crucial components of health status for constructing an individual's Human Capital Indices. Subsection 2.1.3 reviews the empirical studies of human capital, elderly indices, and Human Capital Index.

##### 2.1.1 Human capital theory

According to human capital theory, human capital, in simple terms, is the stock of knowledge and personal skills accumulated/embodyed in people that serve as the foundation for the productive capacity of the workforce—resulting from improved health, nutrition, education, and training, including experience that the population uses to increase production and provide services “that facilitate the creation of personal, social, and economic well-being” (OECD, 2001, p. 17).

Thomas W. Schultz (1971) put forward the hypothesis that speculation in human capital can increment national output separated from the general increment in workers' earnings. Following the lead of Becker (1992) utilized microeconomics to analyze different decision-making behaviors and investments in human capital related to education, training, therapeutic care, etc. that can improve labor quality and increase future returns. He notes that such investments in human capital can result in a better return in terms of wages and can also benefit families in terms of providing better information, and abilities for taking care of family individuals (Becker, 1992).

### 2.1.2 Functional ability according to the World Health Organization

Functional ability is the ability of persons to be able to do what is important to them, what they value, given their “intrinsic capacity” in the context of their health status, their particular environment (environmental characteristics), and the interactions between their health and environment. (WHO, 2015)

#### 2.1.2.1 Intrinsic capacity

Intrinsic capacity is inclusive of both physical and mental capacities. The current study will estimate intrinsic capacity by using the following indicators:

- 1) Movement functions, such as the ability to walk, eat, put on clothes, take a bath, wash face or brush teeth, go to the toilet, comb hair, put on shoes, get out of bed, squat, lift things weighing 5 kilograms (handgrip strength), and take a bus or boat alone
- 2) Sensory functions proxied by the ability to hear and see
- 3) Cognitive functions measured by the capacity to memorize and calculate
- 4) Immune function proxied by getting a vaccination
- 5) Urinary incontinence
- 6) Mental health proxied by using the level of happiness

#### 2.1.2.2 Environmental characteristics

Environmental characteristics include strong social networks and good access to health and social care as well as the ability to perform everyday functions by using instruments or a personal assistant to help with the activities of daily living (ADLs). Hence, the environmental characteristics consist of indicators such as

1) Having strong social networks, access to better health and social care services. These indicators are proxied by the personal visit of health provider or any volunteer to the home when the elderly get sick.

2) Having the ability to do activities by using instruments or a personal assistant when an individual requires assistance with ADLs. This indicator measures the ability to see clearly with a visual aid, hear clearly with an audio aid. Therefore, if older persons use assistive devices that compensate for their limitation of visibility, and hearing, then they can perform ADLs.

### 2.1.2.3 Interactions between individuals and relevant environmental characteristics.

The interactions between individuals and relevant environmental characteristics influence the functional ability of each individual. For example, older people might have limitations in an intrinsic capacity such as vision, but if they use an assistive device (such as glasses) or receive remediation (for example, an eye operation or medication), such an environmental factor can reduce their physical limitation. The factors of functional ability can be summarized into a framework as shown in Figure 2.1

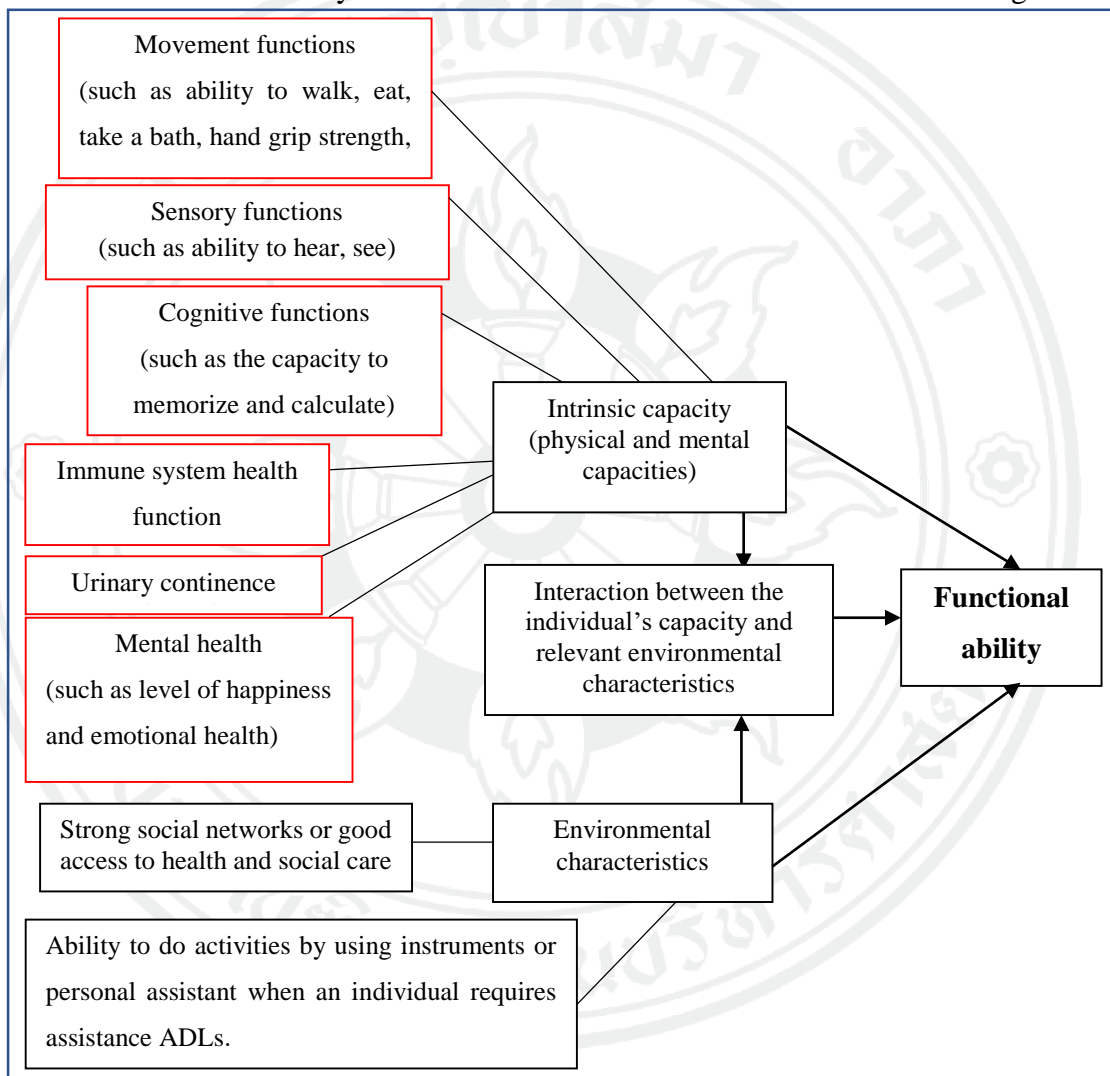


Figure 2.1 Components of Functional Ability

Source: WHO, 2015.

Based on the 2015 WHO World Report on Ageing and Health and available data on Thailand, this study aims to measure intrinsic capacity that represents the health

status of individuals, which includes the following indicators: movement functions, sensory functions, cognitive functions, immune function, urinary incontinence, and mental health. These indicators usually reflect the extent of physical and mental capacity of older persons. Hence, this study will use these indicators to represent health status, which is a key component of an individual's Human Capital Index.

### **2.1.3 Empirical Review of Human Capital Index**

This section contains three subsections. Subsection 2.1.3.1 briefly discusses previous empirical studies of the construction of ageing indices. Subsection 2.1.3.2, discusses previous empirical studies of the importance of human capital, which includes the impacts of human capital on economic growth and which demonstrates the benefits of human capital in terms of education, skill development, and health status. Since the first objective of this research is to measure the level of the human capital of the Thai pre-retirement population by establishing an individual Human Capital Index (HCI) that is more consistent with the human capital theory, subsection 2.1.3.3 reviews empirical studies on the creation of the HCI.

#### **2.1.3.1 Empirical studies of the construction of ageing indices**

Literature concerning the construction of ageing indices includes that of Yoon and Kolomer (2007), who, in their examination of the social values of the elderly (SVOP), determined that older persons benefited from utilizing knowledge, experiencing new things, having commitments to society, and having intergenerational relationships. Their study attempted to create an instrument for measuring the social values of older people and analyzed productive activities that older people engaged in. Such activities also made a contribution to society through utilizing knowledge, sharing experiences, and building relationships between generations, promoting age-integration of the neighborhood, and contribute to policymaking. However, SVOP ratings made by social work students seemed to be subjective. The measurement instrument should have been developed by analyzing a large and variegated sample. For Thailand, there is some research involving ageing indicators. For example, Thiamwong, Maneesriwongul, Malathum, Jitapunkul, Vorapongsathorn, and Stewart (2010) measured healthy ageing

in a Thai context by creating a multidimensional Healthy Ageing Instrument (HAI); consisting of 9 components, as follows:

- 1) Being self-sufficient and living simply
- 2) Managing stress
- 3) Having social relationships and support
- 4) Making merit and performing good deeds
- 5) Practicing self-care and self-awareness
- 6) Staying physically active
- 7) Staying cognitively active
- 8) Having social participation
- 9) Accepting ageing

However, the HAI was developed from information provided by older adults in only one southern province (Songkhla). Thus, it may not reflect the overall HAI in Thailand due to cultural differences and other area-specific factors. More recently, studies such as that conducted by Thanakwang, Isaramalai, and Hatthakit (2014) have attempted to develop a new instrument for describing active ageing among the elderly in Thailand using many dimensions. They aimed to develop a composite Active Ageing Scale for Thai Adults (AAS-Thai) and involved 500 participants from many regions of the country. The scales. AAS-Thai consisted of 7 factors of active ageing including:

- 1) Being self-reliant
- 2) Being actively engaged with society
- 3) Developing spiritual wisdom
- 4) Building up financial security
- 5) Maintaining a healthy lifestyle
- 6) Engaging in active learning
- 7) Strengthening family ties to ensure care in later life

However, since AAS-Thai did not standardize active ageing scales, it could not be applied to different societies.

The empirical studies cited above show the benefits of human capital that accrue to people with better knowledge and skills. This supports the notion that human capital is the main factor driving economic growth. Moreover, while many studies



attempt to measure the social values of older people, the components of healthy ageing, and to devise an active ageing scale for the elderly in order to analyze the social value and economic value of the elderly, each of their measurement instruments has some weaknesses (such as being too subjective and thus not appropriate for use across diverse cultures). Therefore, the present study will try to create an individual Human Capital Index by demonstrating the shortfall of the previous index and creating added value from previous indices, thus establishing an individual Human Capital Index that is more consistent with the human capital theory.

#### 2.1.3.2 Empirical studies of the importance of human capital

In related literature on the importance of human capital, Ciutiene and Railaite (2015) analyze the benefits of investment in human capital and show that human capital can be developed by providing education and training, particularly for an ageing population. The suggestion is that human capital is the most significant type of capital because it can lead to benefits for both individuals and society. Similarly, Olaniyan and Okemakinde (2008) demonstrate that education is a significant economic factor that can increase human resources and is a beneficial factor for economic growth. In other words, better educated people can, in turn, increase national output, which leads to economic growth.

However, the components of human capital include not only education and training but also the health status of each person. According to Manton et al. (2007), improved public health and health care for the elderly correlates with a reduction in disability among the elderly, which in turn can increase overall human capital. An improvement in physical and cognitive ability among the elderly, allowing them to continue working, would, in turn, stimulate growth of GDP. In addition, health status is also a key component in human capital. Findings from Manton et al. were born out by Russell et al. (2016) in their research on the health status of the elderly in Bangladesh. Recognizing that health status is an important component in human capital, they analyzed healthcare support for the elderly in both the public and private sectors. Results showed that strengthening human capital among the elderly could increase productivity and employment of citizens. And the benefits of better healthcare support also benefit the young, who can learn how to maintain good health by participating in

training while their health is still good. This can lead to a population of healthy, skilled young people, leading, in turn, to their productive employment.

Thus, Ciutiene and Railaite (2015), Olaniyan and Okemakinde (2008), Manton et al. (2007), and Russell et al. (2016) have all determined that components of human capital such as education, training, and health status are important factors in creating professional skills in a population. Hence, national economic growth can be supported if health care, training, and education for the elderly are taken into consideration as a way to manage the issue of an aged society and the accompanying decline in the number of workers.

However, human capital is intangible, thus measuring individual's human capital is of great difficulty. Hence, this study aims to measure the level of human capital of individual persons by constructing each individual's Human Capital Index (HCI). Several empirical studies on the creation of the HCI are presented in subsection 2.1.3.3.

#### 2.1.3.3 Empirical studies on the creation of the HCI

Hornstein, Luss, and Parker (2002) studied the Human Capital Index of a company and produced The Wyatt Company Human Capital Index (HCI). The Wyatt Company is a global consulting firm focused on human capital and financial management. Factors used to measure human resources included recruiting excellence, clear rewards and accountability, a collegial and flexible workplace, communications integrity, and prudent use of resources. Findings from Hornstein, Luss, and Parker (2002) show that the higher a company's HCI score, the higher its shareholder value. That means the better an organization is doing in managing its human capital, the better its returns for shareholders.

A country-level HCI study by Ederer, Schuler, and Willms (2007) created an HCI that assigned a level to each country, namely, "The European Human Capital Index". The index identifies four types of human capital and analyses how each contributes to the wealth of European citizens: 1) human capital endowment as measured by the cost of all types of education and training of each person; 2) human capital utilization as measured in terms of how much of the country's human capital stock is actually deployed; 3) human capital productivity as measured by dividing a country's overall consumption by all of the human capital employed in that country;

and 4) human capital as measured by demography and employment of people in that country. This last type looks at existing economic, demographic, and migratory trends to estimate the number of people who will be employed. Ederer et al. (2007) found that the key reason for the low human capital utilization in certain countries was their seriously high unemployment rates. However, the public sector should promote their human capital with full employment in order to increase the human capital of the country.

Moreover, The World Economic Forum (2017) also constructed a global Human Capital Index that measures the human capital of each country. The global Human Capital Index comprises four sub-indices: (1) capacity, which measures formal educational attainment; (2) development, which measures enrollment in occupational training programs; (3) deployment, which measures how many individuals are able to take part effectively within the workforce; and (4) know-how, which measures the current level of availability of skilled workers and employer's recognition of the ease or difficulty of filling vacancies. However, the result of the global Human Capital Index is reported at the country level, which represents the human capital potential profile of a country. It can be utilized as a tool to evaluate progress within countries.

In addition, Nagy (2016) identified the fundamental components of a Human Capital Index as education (with higher educational capital leading to increased productivity of labor), health (including physical health, cognition, and mental health), and economic, social, political, and critical environment. Besides, the study suggests that the Human Capital Index is among the set of tools that will capacitate better decision-making in direction and in the situation of an aged society in which the workforce continues to shrink, creating a greater burden for the next generation. Therefore, a Human Capital Index reveals several trends and challenges for the future for major economies.

## **2.2 The determinants of preparation for old age**

This section consists of subsection 2.2.1, which provides a brief summary of recent empirical studies on preparation for old age in a variety of dimensions, and subsection 2.2.2, which provides a review on determinants of the elderly's preparation,

in order to analyze the factors that could affect the retirement preparation of the pre-retirement population.

### **2.2.1 Empirical studies of the preparation for old age**

The analysis performed by Apouey (2018) proposed improving the understanding of preparation for old age in France in the following 9 dimensions:

- 1) General preparation
- 2) Savings preparation
- 3) Insurance preparation
- 4) Homeowner preparation
- 5) Home adaptation preparation
- 6) Social ties preparation
- 7) Diet preparation
- 8) Physical activity preparation
- 9) Intellectual skills preparation

From the 9 dimensions above, research employing unique data on French individuals aged 50 and over was carried out to analyze preparation for old age in France. The data contain preparations for old age information, particular planning activities in each domain, including risk and time attitudes, family and social charitableness, and anticipated incapacity and longevity.

Moreover, Kornadt and Rothermund (2013) also studied the preparation in 9 dimensions in Germany, but some of the dimensions are different from those in Apouey (2018). The dimensions in Kornadt and Rothermund (2013) are as follows:

- 1) Finances preparation
- 2) Emergencies and exceptional circumstances preparation
- 3) Mental and physical fitness preparation
- 4) Housing preparation
- 5) Looks and appearance preparation
- 6) Social relationships preparation
- 7) Health preparation
- 8) Leisure activities and lifestyle preparation

#### 9) Work and employment preparation

Their study aimed to examine the structure of preparations for age-related changes in each dimension and to test preparation intentions and activities that are organized by life domains. In addition, many studies investigated the effect of gender differences that influence the preparations in different aspects, and the result showed that males were more likely to be prepared than females. For example, Jacobs-Lawson, Hershey, and Neukam (2004) studied preparations of the elderly in America in 6 major domains, namely:

- 1) Housing
- 2) Leisure and recreation
- 3) Health maintenance
- 4) Social and interpersonal contact
- 5) Estate planning
- 6) Financial planning

Meanwhile, Noone, Alpass, and Stephens (2010) studied preparations in general, which involve informal planning and financial preparedness. Thus, some research covers preparation in specific dimensions but other focuses on broader dimensions. In Thailand, there exist a large number of studies about old age preparation, but most are on specific preparations in particular population groups.

For example, Seetangkham and Nilvarangkul (2018) analyzed the preparation of working age people in the following 6 dimensions:

- 1) Physical preparation
- 2) Psychological preparation
- 3) Social preparation
- 4) Financial preparation
- 5) Caregiver preparation
- 6) Housing preparation

Moreover, Monataraphadung and Siriwong (2016) studied preparations of the personnel of the Secretariat of the Senate in the following 5 dimensions:

- 1) Finance and property preparation
- 2) Housing preparation
- 3) Body preparation

4) Psychological preparation

5) Leisure time preparation

While most studies about old age preparation in Thailand are usually confined to specific groups, some dimensions investigated are common such as financial and housing preparations. Nevertheless, some studies on old age preparation in Thailand are not group-specific, such as the study by Yommana (2008) dealing with preparations for a good quality of life of the elderly in the 10–20 years prior to retirement in 5 dimensions including:

1) Physical health preparation

2) Mental health preparation

3) Financial preparation

4) Housing preparation

5) Hobby preparation

Kumruangrit (2014) studied preparations of people in Thailand aged 50–59 years in the following 5 dimensions:

1) Physical health preparation

2) Mental health preparation

3) Financial preparation

4) Housing preparation

5) Caregiver preparation

From the literature review above, a summary can be made of major preparation dimensions considered in various studies by grouping similar or overlapping dimensions into the same categories in addition to the commonly used dimensions. 15 major dimensions are identified in Table 2.1

Table 2.1 The summary of 15 major preparation dimensions

Dimension	Description
1) <b>Insurance</b>	The preparation for long-term care insurance.
2) <b>Homeowner</b>	Preparing the dwelling to prevent homelessness of the elderly.
3) <b>Home adaptation</b>	Improvement in the living environment to suit a person's age.
4) <b>Intellectual skills</b>	Preparation to maintain or develop intellectual skills.
5) <b>Emergencies and exceptional circumstances</b>	Preparation for emergencies or exceptional situations in old age (i.e., advanced healthcare directive).
6) <b>Mental health</b>	Preparation regarding mental health—to maintain mental health and control stress.
7) <b>Physical health</b>	Preparation regarding physical health—to maintain a healthy body, have good health habits in consumption, exercise, have an annual health check, and avoid risk factors such as cigarettes and alcohol.
8) <b>Looks and appearance</b>	Preparation for the appearance in old age (i.e., beauty products, clothing, diet, auxiliary devices).
9) <b>Social relationships</b>	Preparation for their social relationships in old age (i.e., networking, integration in social groups) that to maintain or develop social ties.
10) <b>Leisure activities and lifestyle</b>	Maintaining interaction with society, including participation in community

Dimension	Description
<b>11) Work and employment</b>	activities. To have a good relationship with family and all age groups in the community. Future work planning that can reflect economic security that includes sufficient income and stability of employment.
<b>12) Estate planning</b>	The preparation of tasks that serve to manage an individual's asset base in the event of their incapacitation or death.
<b>13) Financial planning</b>	Preparation to be financially secure such as savings plan in savings/gold/property for the elderly.
<b>14) Diet</b>	Elderly being careful about their nutrition.
<b>15) Caregiver</b>	Preparedness about who will take care of the elderly in the future.

Sources: Yommana et al., 2008.

Noone et.al, 2010.

Kornadt and Rothermund, 2013.

Kumruangrit. 2014.

Monataraphadung and Siriwong, 2016.

Apouey, 2018.

Seetangkham and Nilvarangkul, 2018.

Although it would be ideal to study all 15 dimensions listed in Table 2.1, this research will be confined to only 5 dimensions due to data unavailability in Thailand. For example, the dimensions of insurance, emergencies, and exceptional circumstances; were considered in a study of the French elderly population's preparation in a survey of the customers of Harmonie Mutuelle (HM) that operates as an insurance company. However, this dimension was not covered in the NSO Survey of Older Persons in Thailand, hence making it impossible to consider this issue.



The 5 preparation dimensions of this study are:

- 1) Housing (homeowner) preparation
- 2) Financial security preparation
- 3) Physical health preparation
- 4) Leisure activities and social relationship activities
- 5) Safe environment (home adaptation) preparation

(The details for each dimension and criteria used in this study will be subsequently given in Chapter 3).

### **2.2.2 Empirical studies of determinants of the preparation for old age**

The regression analysis performed by Apouey (2018) on the preparation for old age in France in many dimensions reveals that persons not living alone were more likely to engage in preparation for old age (especially in the housing domain), with family and social altruism playing an important role in preparation of old age. Females were more prepared for old age than males in housing, social life, and health domains. Moreover, positive relationships exist between income and particular preparations. Hence, this would mean that individuals with a high income would tend to have more capacity for preparation than people with a low income. An attitude such as family altruism, social altruism, would all have an effect on preparation for old age as well. Research on the influence of gender was supported by the findings of Jacob-Lawson et al. (2004). Using the hierarchical regression technique, their results revealed that men and women in the USA spent different amounts of time planning preparations for retirement. Women were found to spend less time thinking about retirement than men in the following dimensions: housing, leisure and recreation, health maintenance, social and interpersonal contact, and estate and financial planning.

Similarly, Noone et al. (2010) found a different gender effect in New Zealand, as women were more economically disadvantaged compared to men, and this negatively affected their financial preparation. In addition, not only gender, attitude, and income, but also age can affect old-age preparation. For example, evidence from a study by Kornadt and Rothermund (2013) shows that persons of different ages prepared for old age differently. The study defines the old (61–70 years old) as being in their third age, and the very old (71–80 years old), who experience age-related changes

expected near the end of life, are defined as being in their fourth age. It was found that those preparing for their third age focused on activities, leisure, work, fitness, and appearance. But those of the fourth age focused on emergencies, dependence/independence, housing, and financial arrangements. Thus, in substance, preparations for old age would differ according to different age spans in different life domains.

According to Apouey (2018), Jacob-Lawson et al. (2004), Noone et al. (2010), and Kornadt and Rothermund (2013), there have been multidimensional studies on the preparation of the elderly conducted in different countries. There have shown to be many aspects that could influence old age in terms of preparations, in both general and specific dimensions. The present research aims to find factors explaining the preparation behavior of the pre-retirement population in a Thai context.

For Kumrungrit (2014) the Human Capital Index refers to knowledge, the ability to learn from studying and gain skills and experience from working, as well the physical and mental health of each person. The result shows that the Human Capital Index has a positive effect on physical health, mental health, financial status, housing, and caregiver preparation. Moreover, Yommana (2008) studied preparations of individuals in the 10–20 years prior to retirement in Thailand. Results show that education level, which is one component in the HCI of this study, has a positive effect on physical health preparation.

The literature review above finds that the majority of empirical findings acknowledge that many countries are experiencing ageing societies, as well as there being many dimensions of preparation for the elderly that need to be considered in order to ensure a sustainable good quality of life for the elderly. In addition, Thailand has become an aged society, yet several research results indicate only low and middle levels of preparation for old age. There are many dimensions of elderly preparation that need to be assessed to understand the related problems in Thailand. But this is difficult given the shortage of useful information about healthcare, financial preparation, etc. Hence, this study will attempt to identify the factors in the individuals' Human Capital Index that affect the retirement preparation of the pre-retirement population.

It is hoped that empirical findings from this research can be utilized as a basis for developing and proposing policy recommendations to enable and promote the Thai

population to make retirement preparations in every dimension, in order to help Thailand meet the challenges posed by an aged society as well to increase the quality life of the Thai elderly.



## CHAPTER 3

### DATA AND METHODOLOGY

This chapter comprises of two sections. Section 3.1 describes HCI construction are contains subsection 3.1.1, which explains the data used and the sample group of HCI construction, and section 3.1.2, which explains the construction of an individual's Human Capital Index (HCI) and the components of HCI that are the variables of interest in this study. Section 3.2 discusses the determinants of retirement preparation, which consist of 7 subsections covering all variables of this research. Subsection 3.2.1 describes the data source and sample group of determinants of retirement preparations. Subsection 3.2.2 discusses the dimensions of retirement preparation. Subsection 3.2.3 is the explanation and the criteria for dependent variables used in this research. Subsection 3.2.4 explains the policy variables of this study, and subsection 3.2.5 provides the specific variables of each model, based on previous empirical studies. Subsection 3.2.6 explains the research hypothesis of the current study, related to the variables and expected signs for this study. Lastly, subsection 3.2.7 explains the methodology of 5 econometric models of this study.

#### **3.1 HCI construction**

##### **3.1.1 Data source and sample group of HCI construction**

This study aims to create a new instrument, namely, an individual's Human Capital Index (HCI) that can be used to compare the human capital in different groups and during different years. Thus, this study uses secondary data from the National Statistical Office (NSO)'s three reports on the Survey of Older Persons in Thailand (conducted in years 2011, 2014, and 2017). The sample group comprises those older persons aged 50 years and over who responded to the NSO surveys.

### 3.1.2 Construction of individual's Human Capital Index (HCI)

The individual Human Capital Indices (HCIs) in the present study is a composite index comprising three main components: (1) a knowledge index, (2) skills and ability index, and (3) a health status index (based on intrinsic capacity in functional ability). Each of the three indices is composed of sub-components as shown in Figure 3.1

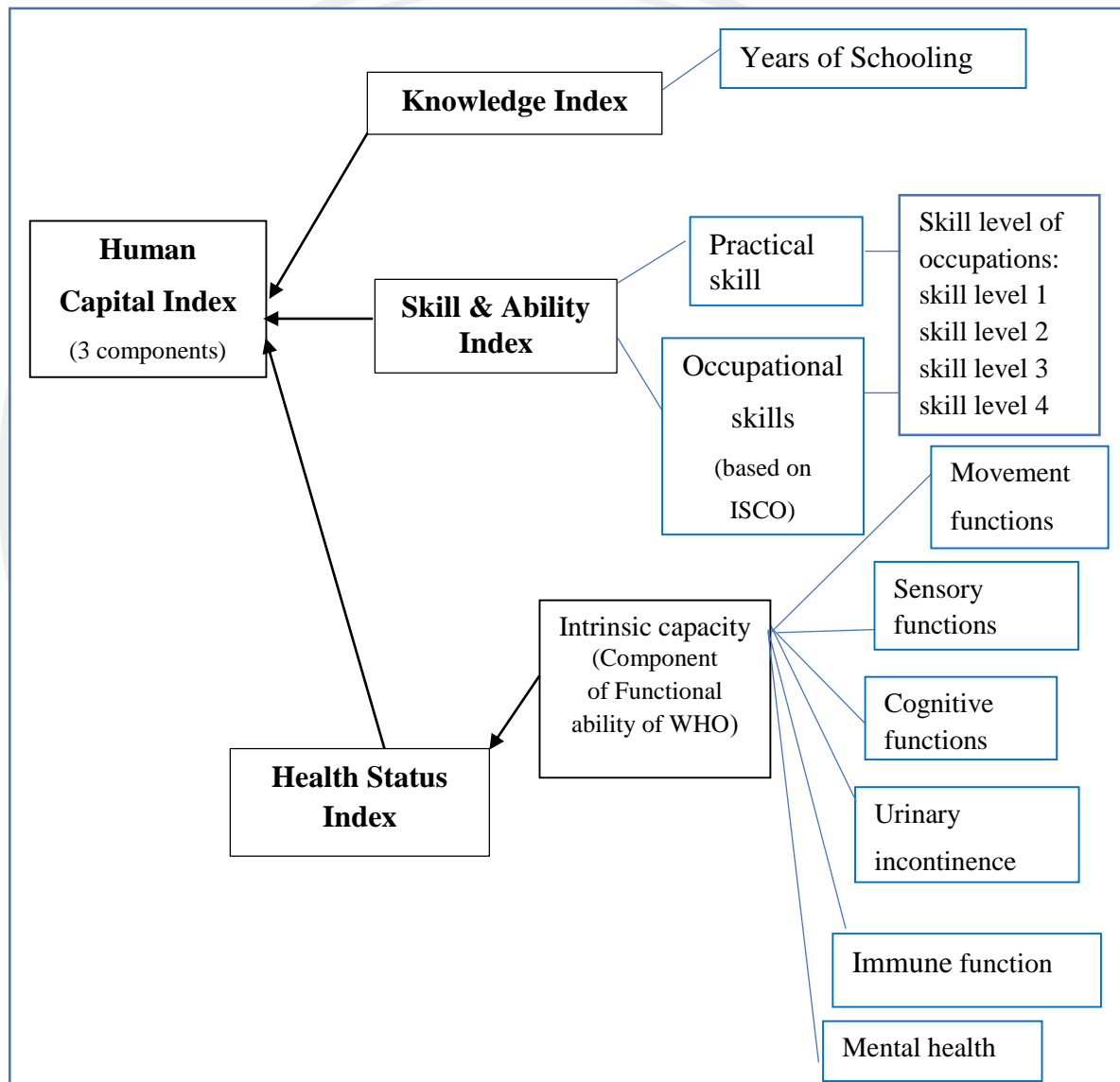


Figure 3.1 Components of Human Capital Index (HCI)

Sources: Kumreungritt, 2011.

ILO, 2012.

Thanakwang et al., 2014.

WHO, 2015.

The explanation of Figure 3.1 is as follows:

**Knowledge Index:** This index comprises one indicator, namely, the years of schooling attainment of each person, which represents the knowledge accumulated and embodied for each person.

**Skill & Ability index:** This index contains two indicators.

1) Skill level of occupations based on the International Standard Classification Occupation (ISCO) that classify occupations into four groups. Then, they are measured on a scale ranging from 1 to 4.

2) Practical skill proxied by individual joining an occupation group (join = 1, not join = 0)

**Health Status index:** This index consists of 6 indicators;

1) Movement functions associated with musculoskeletal function, proxied by activities of daily living (ADLs) (WHO, 2005).

2) Sensory functions proxied by the ability to see and hear due to ageing are frequently associated with declines in both vision and hearing (WHO, 2005). Ability to see and hear = 1, otherwise = 0.

3) Cognitive functions proxied by memory, capacity to calculate.

Have cognitive functions = 1, otherwise = 0.

4) Urinary incontinence proxied by individual having urinary incontinence = 1, otherwise = 0.

5) Immune function proxied by individual having gotten a vaccination that is capable to respond to new infections (WHO, 2005). Got vaccination = 1, otherwise = 0.

6) The mental health, which measures the level of happiness (WHO, 2005).

Score from 0 to 10.

To calculate an individual's Human Capital Index, after a score was collected for each indicator of the knowledge index, the skills and ability index, and the health status index, a result was tallied using the obtained scores of all indicators.

Results were combined to calculate the overall score of each dimension.

The formula for calculation is based on Kumruangrit (2014) as follows:

$$\text{Overall score of each dimension} = \frac{X_1}{M_1} + \frac{X_2}{M_2} + \frac{X_3}{M_3} + \dots + \frac{X_n}{M_n} \quad (1)$$

Where  $X_i$  is the score of each indicator for an individual

$M_i$  is the maximum answer score of each indicator

Once the overall score of each dimension is obtained, the next step is to create an index for each dimension according to the formula of HDI of UNDP

$$\text{Index value} = \frac{\text{Overall score of each dimension} - \text{Minimum score}}{\text{Maximum score} - \text{Minimum score}} \quad (2)$$

For example, the skill index contains two indicators (occupational skill and practical skill). Suppose one person gets a score of 1 in the first indicator (occupational skill) and 1 in the second indicator (practical skill). The maximum score of the first indicator is 4 and the maximum score of second indicator is 1. Substituting in equation (1) will get:

$$\text{Overall score in skill dimension} = \frac{1}{4} + \frac{1}{1}$$

$$\text{Overall score in skill dimension} = 1.25$$

After we get the overall score of skill dimension, the next step is finding the skill and ability index. (That have a value between 0 to 1).

Substitute with regard to equation (2) as follows:

$$\text{Skill and Ability Index} = \frac{1.25 - 0}{2 - 0}$$

Where the maximum score of skill and ability index is 2

The minimum score of skill and ability index is 0

Consequently,

$$\text{Skill and Ability Index} = 0.625$$

In the next part, individual Human Capital Index (HCI) is constructed by combining the equally weighted index of each dimension as in the following formula (based on HDI of UNDP, and consistent with the Global Human Capital Index).

Thus,

$$\text{HCI} = \frac{1}{3}(\text{Knowledge Index}) + \frac{1}{3}(\text{Skill and Ability Index}) + \frac{1}{3}(\text{Health status Index}) \quad (3)$$

HCI ranges from 0.00 – 1.00 with high value representing high level of human capital. The next step will analyze the values of HCI into 5 intervals and classify them into three classes—Bottom 40%, Middle, and Top 40%. The categorization of the HCIs into the three classes is shown in Table 3.1.

Table 3.1 Categorization of HCIs

Intervals of HCIs	Value of each interval	Three classes
1 <sup>st</sup>	0.000–0.199	Bottom 40%
2 <sup>nd</sup>	0.200–0.399	
3 <sup>rd</sup>	0.400–0.599	Middle
4 <sup>th</sup>	0.600–0.799	Top 40%
5 <sup>th</sup>	0.800–1.000	

This study will compare the values of the Human Capital Index of individuals in different groups, such as those from different regions, different genders, and those surveyed in different survey years (2011, 2014, and 2017).

## 3.2 Determinants of retirement preparation

### 3.2.1 Data source and sample group of determinants of retirement preparations

This study aims to examine the components in the Human Capital Index that affect retirement preparation among the Thai pre-retirement population (aged 50–59). Hence, the study uses those who were respondents to the NSO Survey of Older Persons in Thailand in 2011, 2014, and 2017. Furthermore, this study also uses data such as the number of doctors per 1,000 population from the Ministry of Public Health, in order to study the effect of policy variables on retirement preparation among the Thai pre-retirement population.



### 3.2.2 The dimension of retirement preparation (dependent variables)

Table 3.2 The 15 major preparation dimensions of previous studies

Preparation Dimensions	Empirical Studies	Measurement Instruments
1) Insurance	Apouey, 2018;	Dummy variable
2) Homeowner	Jacobs-Lawson et al., 2004. Yommana, 2008; Kumruangrit, 2014; Apouey, 2018. Kornadt and Rothermund, 2013; Monataraphadung and Siritwong, 2016; Seetangkham and Nilvarangkul, 2018.	7-point Likert-type format Dummy variable 4-point rating scale Descriptive analysis
3) Home adaptation	Apouey, 2018.	Dummy variable
4) Intellectual skills	Apouey, 2018.	Dummy variable
5) Emergencies and exceptional circumstances	Kornadt and Rothermund, 2013.	4-point rating scale
6) Mental health	Yommana, 2008; Kumruangrit, 2014; Apouey, 2018. Kornadt and Rothermund, 2013.	Dummy variable 4-point rating scale
7) Physical health	Kornadt and Rothermund, 2013. Monataraphadung and Siritwong, 2016. Yommana, 2008;	4-point rating scale 7-point Likert-type format Dummy variable

<b>Preparation Dimensions</b>	<b>Empirical Studies</b>	<b>Measurement Instruments</b>
	Kumruangrit, 2014.	
<b>8) Diet</b>	Apouey, 2018.	Dummy variable
<b>9) Looks and appearance</b>	Kornadt and Rothermund, 2013.	4-point rating scale
<b>10) Social relationships</b>	Yommana, 2008; Apouey, 2018.	Dummy variable
	Jacobs-Lawson et al., 2004.	7-point Likert-type format
<b>11) Leisure activities and lifestyle</b>	Apouey, 2018.	Dummy variable
<b>12) Work and employment</b>	Kornadt and Rothermund, 2013.	4-point rating scale
<b>13) Estate planning</b>	Jacobs-Lawson et al., 2004.	7-point Likert-type format
<b>14) Financial planning</b>	Jacobs-Lawson et al., 2004.	7-point Likert-type format
	Noone et al., 2010.	4-point rating scale
	Yommana, 2008; Kumruangrit, 2014; Apouey, 2018.	Dummy variable
<b>15) Caregiver</b>	Kumruangrit, 2014.	Dummy variable
	Seetangkham and Nilvarangkul, 2018.	Descriptive analysis

Sources: Yommana et al., 2008.

Noone et.al, 2010.

Kornadt and Rothermund, 2013.

Kumruangrit, 2014.

Monataraphadung and Siriwong, 2016.

Apouey, 2018.

Seetangkham and Nilvarangkul, 2018.

According to the 15 preparation dimensions given in Table 3.2, which include a variety of measurement instruments, and based on previous empirical analysis, four methods can be seen: (1) measuring by creating a dummy, (2) using items on a 4-point rating scale from not at all (1 point) to a lot (4 points), (3) using a 7-point Likert-type format (not at all worried = 1, extremely worried = 7), and (4) descriptive analysis. The explanation for the methodology of previous studies and the methodology of this study are given below.

Only one study (Apouey, 2018) examined insurance preparation, measuring it by creating a dummy for the answer being positive. The survey asked individuals, “Have you bought long-term care insurance?” However, this dimension is not covered in the NSO’s Survey of Older Persons in Thailand, hence making it impossible to consider this issue in the present study.

Homeowner preparation refers to preparing a dwelling to live in in the future. Apouey (2018), Jacobs-Lawson et al. (2004), Yommana (2008), Kornadt and Rothermund (2013), Kumruangrit (2014), Mungwattana (2016), Monataraphadung and Siriwong (2016), Seetangkham and Nilvarangkul (2018) address this dimension. However, Apouey (2018) refers to this dimension as homeowner preparation, and measures it by creating a dummy for a positive answer as to whether homeowner preparation had been carried out. The survey asked individuals, “Are you a homeowner?” On the other hand, Jacobs-Lawson et al. (2004), Kornadt and Rothermund (2013), Seetangkham and Nilvarangkul (2018), Monataraphadung and Siriwong (2016), Yommana (2008), Kumruangrit (2014), and Mungwattana (2016) refer to the preparation of a dwelling for future residence as “housing preparation.” Yommana (2008) and Kumruangrit (2014) create a dummy for the answer as positive for housing preparation. But Jacobs-Lawson et al. (2004) analyze housing preparation by using a 7-point Likert-type format (never = 1 to always = 7). Similarly, Kornadt and Rothermund (2013) measure this dimension using items on a 4-point rating scale from not at all prepared in housing (1 point) to a lot prepared in housing (4 points). Additionally, Monataraphadung and Siriwong (2016) and Seetangkham and Nilvarangkul (2018) measure housing preparation using an interview method and summarize the results in descriptive terms. Hence, this current study will consider housing preparation as individuals preparing a dwelling place to prevent future

homelessness. Criteria will be based on data availability for classifying individuals prepared in this regard. Individuals must plan and prepare for their future housing, measured by creating a dummy for a positive answer to the question.

Only one study (Apouey, 2018) studied home adaptation preparation, which refers to improvement in the living environment to suit a person's age, by creating a dummy variable for a positive answer to the question, "Have you adapted your home for old age?" However, the NSO's Survey of Older Persons in Thailand has many indicators to measure whether individuals have adapted their home to improve the living environment to suit a person's age. Hence, safe environment preparation in this study will be measured using rating scores ranging from 0 to 4, since this dimension has four indicators. One point for each indicator is given if the answer to "had prepared" is affirmative. For convenience of interpretation, the score of this dimension will then be converted into an index ranging from 0 to 1 with a higher value corresponding to a greater extent of preparation. The details on index construction will be provided in section 3.2.3. (The explanation and criteria of the dependent variables). This method is consistent with safe environment preparation for the elderly in the Thai context and consistent with data availability from the NSO survey.

The dimensions of intellectual skills, social relationships, and leisure activities and lifestyle preparation have overlapping content. These dimensions refer to individuals preparing activities or interactions with society, including participation in the community to maintain or develop intellectual skills and having a good relationship with family and all age groups in the community. Apouey (2018) measured intellectual skills and leisure activities and lifestyle preparation by creating a dummy for a positive answer. In the same way, Yommana (2008) analyzed social relationships preparation by creating a dummy variable for a positive answer as well. However, Jacobs-Lawson et al. (2004) analyzed social relationships preparation by using a 7-point Likert-type format (never = 1 to always = 7). Hence, the current study of leisure activities and social relationship activities preparation uses NSO survey data and sets criteria in accordance with the Thai context by using a rating score. Thus, scores for leisure and social relationship activities preparation can range from 0 to 5, depending on the activities that individuals are interested in and have aptitude for, in order to have good relationships within the family and all age groups in the community, which can develop intellectual

abilities and increase happiness from leisure activities. For convenience of interpretation, the score of this dimension will then be converted into an index ranging from 0 to 1 with a higher value corresponding to a greater extent of leisure activities and social relationship activities preparation.

In addition, the dimensions of exceptional circumstances, looks and appearance, work and employment preparation, as studied by Kornadt and Rothermund (2013), are measured by a 4-point rating scale ranging from not at all (1 point) to a lot (4 points). However, exceptional circumstances as well as looks and appearance dimensions were not covered in the NSO Survey of Older Persons in Thailand, and the dimension of work and employment was not included in earlier surveys (NSO Surveys in years 2011 and 2014) because in the Thai context the general retirement age is 60 years old. But, this study used a sample group aged 50–59 years, hence, making it impossible to consider this issue.

The dimension of mental health preparation refers to preparation regarding mental health in order to maintain mental health and control stress. Kornadt and Rothermund (2013) assessed preparation in this dimension by using a 4-point scale ranging from not at all (1 point) to a lot (4 points). However, Yommana (2008), Kumraungrit (2014), and Apouey (2018) created a dummy variable in this instance. But, the dimension of mental health is also not considered in this study because although the data was available in the 2011 survey, it was unavailable in the years 2014 and 2017.

The dimension of physical health refers to preparation regarding physical health to maintain a healthy body and have good health habits in terms of consumption, exercise, having an annual health check, and avoiding risk factors such as cigarettes and alcohol. To determine physical health preparation, Kornadt and Rothermund (2013) used a 4-point rating scale (from not at all to a lot). Similarly, Monataraphadung and Siriwong (2016) measured physical health preparation by using a 7-point Likert-type format (never = 1 to always = 7). However, Yommana (2008) and Kumruangrit (2014), used in their study a dummy variable for positive answer as to whether physical health preparation had been carried out. The present study on physical health preparation is based on data availability and the Thai context. Appropriate criteria are used for the Thai context and rating scores ranging from 0 to 6 are used. For convenience of

interpretation, the score of this dimension will then be converted into an index ranging from 0 to 1 with a higher value corresponding to a greater extent of preparation.

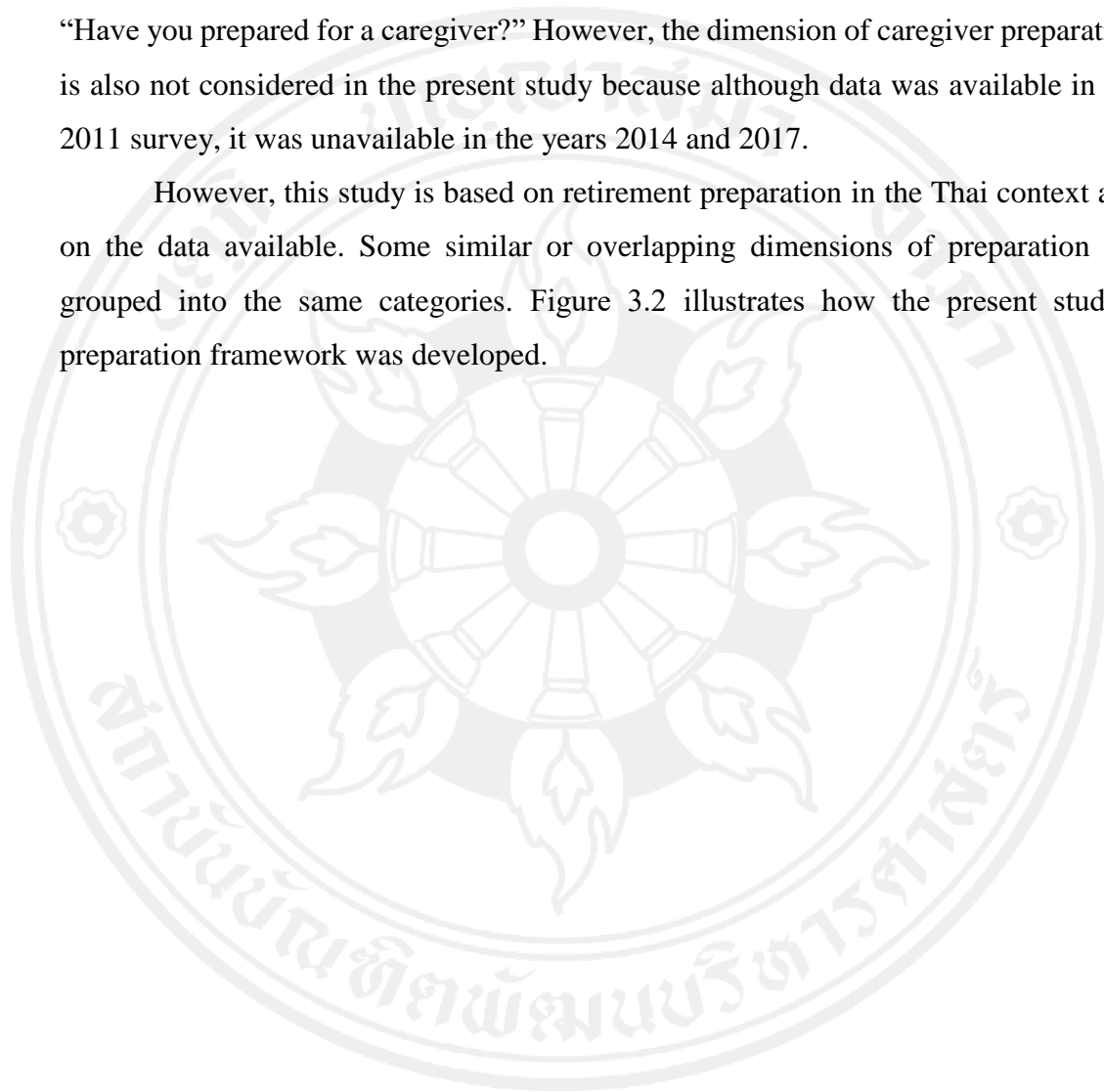
Additionally, Apouey (2018) refers to diet preparation to determine if people are conscientious about their diet and measures this via a dummy variable for a positive answer. Since diet preparation is subset of physical health preparation, this study will include this dimension along with other indicators of physical health preparation dimension, namely: regular consumption of vegetables or fruits, drinking at least 8 glasses of water daily, and avoidance of alcohol.

Examining another dimension of preparation for old age, Jacobs-Lawson et al. (2004) refer to estate planning as comprising tasks that serve to manage an individual's asset base in the event of their incapacitation or death. Their measurement used a 7-point Likert-type format (never = 1 to always = 7). However, this dimension was not covered in the NSO Survey of Older Persons in Thailand, hence making it impossible to consider this issue.

The dimension of financial planning is about preparation to be financially secure such as having a savings plan in savings/gold/property for retirement. Previous studies used different measurements as follows: Jacobs-Lawson et al. (2004) used a 7-point Likert-type format (not at all worried about financial planning = 1, extremely worried about financial planning = 7). Similarly, Noone et al. (2010) used a 4-point scale ranging from “hardly at all” for financial preparedness (1 point) to “a lot” (4 points), when the survey asked individuals, “How much have you thought about retirement?” Yommana (2008), Kumraungrit (2014), and Apouey (2018) created a dummy variable for a positive answer as to whether financial planning had been carried out. Noone et al. (2010), Monataraphadung and Siriwong (2016), and Seetangkham and Nilvarangkul (2018) assessed financial preparation by including property preparation such as assets, funds, etc. These studies used both descriptive analyses. The present study gauges financial security that can come in many forms, such as savings plans for cash, saving accounts, gold, and property. This study will create a dummy variable for a positive answer regarding having such assets in order to determine whether individuals are prepared in this regard since the available data in Thailand cannot determine which level is enough for financial security after the retirement of each person.

Lastly, Kumruangrit (2014) and Seetangkham and Nilvarangkul (2018) refer to caregiver preparation in terms of having someone to take care of the elderly in the future. Kumruangrit (2014) measured this preparation by creating a dummy variable for a positive answer on caregiver preparation. Seetangkham and Nilvarangkul (2018) used qualitative analysis after interviewing respondents. The survey asked individuals, “Have you prepared for a caregiver?” However, the dimension of caregiver preparation is also not considered in the present study because although data was available in the 2011 survey, it was unavailable in the years 2014 and 2017.

However, this study is based on retirement preparation in the Thai context and on the data available. Some similar or overlapping dimensions of preparation are grouped into the same categories. Figure 3.2 illustrates how the present study’s preparation framework was developed.



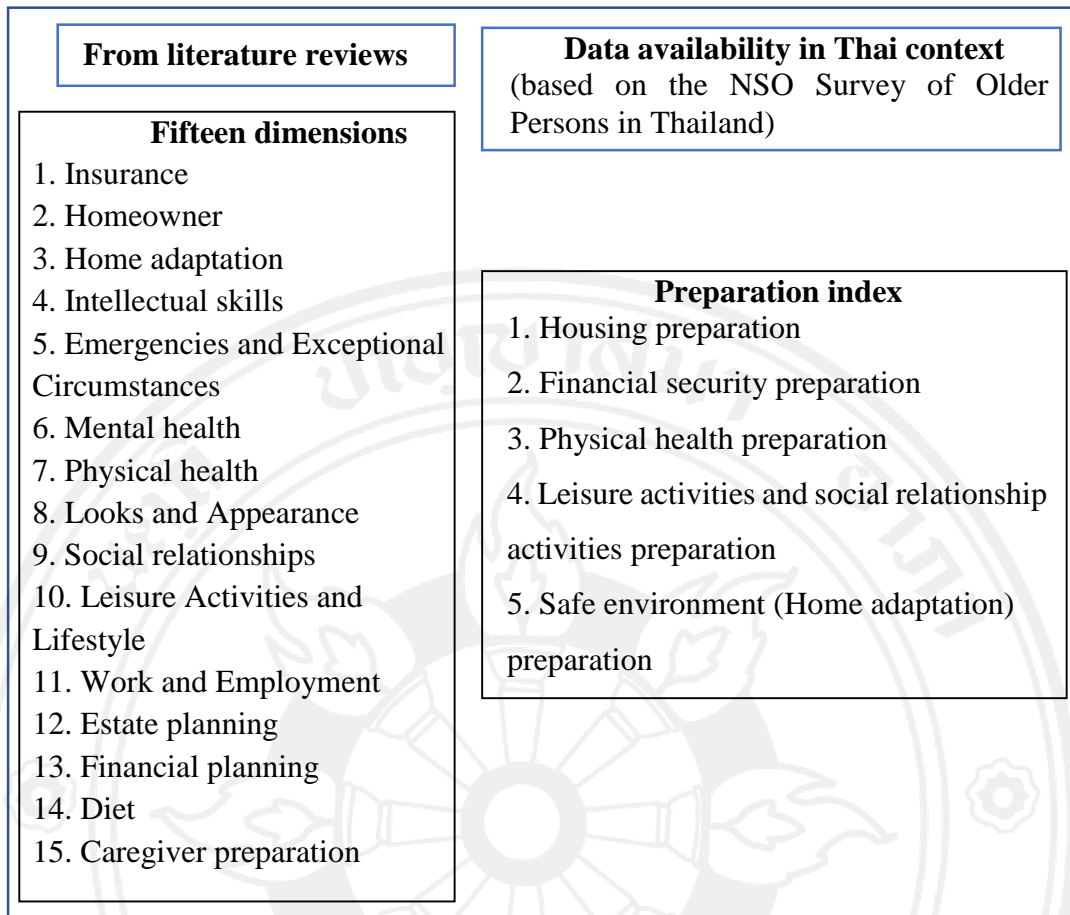


Figure 3.2 Dimensions of preparation

Source: Author

According to Figure 3.2, some dimensions covered in the literature review are omitted or combined with others in this study. As a result, this research will be confined to 5 dimensions: (1) housing, (2) financial security, (3) physical health, (4) leisure activities and social relationship activities, and (5) safe environment (home adaptation) preparation.

The explanation and the criteria for each dimension of preparation, which are crucial to examine in this study, are provided below.

### 3.2.3 The explanation and criteria of the dependent variables

The explanation of each preparation dimension and criteria for classifying individuals are explained in the following subsection:



### 3.2.3.1 Housing preparation (House)

Housing preparation means individuals preparing a dwelling place to prevent homelessness in their old age. Hence, the criteria for classifying individuals prepared in this regard involve individuals planning and preparing for their future housing needs, meaning that they or their spouse must be the owner of the house they live in.

### 3.2.3.2 Financial security preparation (Finsec)

Financial security can come in many forms, such as savings plans for cash, saving accounts, gold, and property. Since after retirement the majority of the elderly will receive less income compared to what they received previously, they should have some savings for spending in case of illness/accidents, and this can help avoid debt problems after retirement. Therefore, the criteria in order to qualify individuals as being prepared in terms of financial security include their having savings/assets (e.g. bonds, car, house, land, gold, other funds, etc.) to ensure their financial security.

### 3.2.3.3 Physical health preparation index (Phys)

Physical health preparation means individuals having good habits in consumption, exercise, annual health check-ups, and avoiding risk factors such as cigarettes, alcohol. Thus, the criteria for classifying individuals being prepared in terms of physical health requires 6 indicators: (1) frequent/regular exercise, (2) frequent/regular consumption of vegetables or fruits, (3) drinking at least eight glasses of water daily, (4) avoidance of alcohol, (5) avoidance of smoking, and (6) annual health checkups. The scores for physical health preparation will range from 0 to 6. However, for convenience of interpretation, the score will be rescaled to range from 0 to 1

For example, if the person regularly exercises, consumes vegetables and drinks at least 8 glasses of water daily, he/she will get a score of 3. Where the maximum score of this dimension is 6

Consequently,

$$\text{Physical health index} = \frac{3}{6} \text{ or } 0.5$$

Hence, the index will have a value between 0 to 1.

### 3.2.3.4 Leisure and social relationship activities preparation index (Leisoc)

Individuals have to prepare activities or interactions with society, including participation in the community, depending on the interests and aptitude of each person, in order to have good relationships within the family and all age groups in the community, which can develop intellectual abilities and increase happiness from leisure activities. For individuals to qualify as prepared in this domain, they must participate in activities of a club or a group, regardless of whether they are a member. Such groups include elderly activity clubs, funeral societies, housewives' groups, cooperative/savings groups, and village scout organizations. Thus, scores for leisure and social relationship activities preparation can range from 0 to 5. For convenience of interpretation, the score will be rescaled to range from 0 to 1 similar to physical health preparation (above).

#### 3.2.3.5 Safe environment (home adaptation) preparation index (Safe)

Individuals have to prepare the house in which they live to be suitable, comfortable, and safe. For example, the improvement of older persons' houses to make them safer would include installing handrails in the toilet/bedroom for convenience and to reduce accidents. The criteria in order to qualify as prepared in terms of home safety, individuals have to plan and prepare to make their environment as safe as possible. Their house must be adapted to include all the following: (1) construction materials consisting of cement, brick, or wood, (2) handrails in the bedroom, (3) handrails in the bathroom, and (4) a toilet inside the house. For convenience of interpretation, the score will be rescaled to range from 0 to 1 similar to the one used for physical health preparation (above).

#### 3.2.3.6 Overall Preparation index

This subsection explains the construction and calculation of the overall preparation index. The overall preparation index consists of 5 dimensions (housing, financial security, physical health, leisure and social relationship activities, and safe environment preparation). Therefore, the overall preparation index can be computed based on the 5 dimensions determined by this study and summarized in Figure 3.3

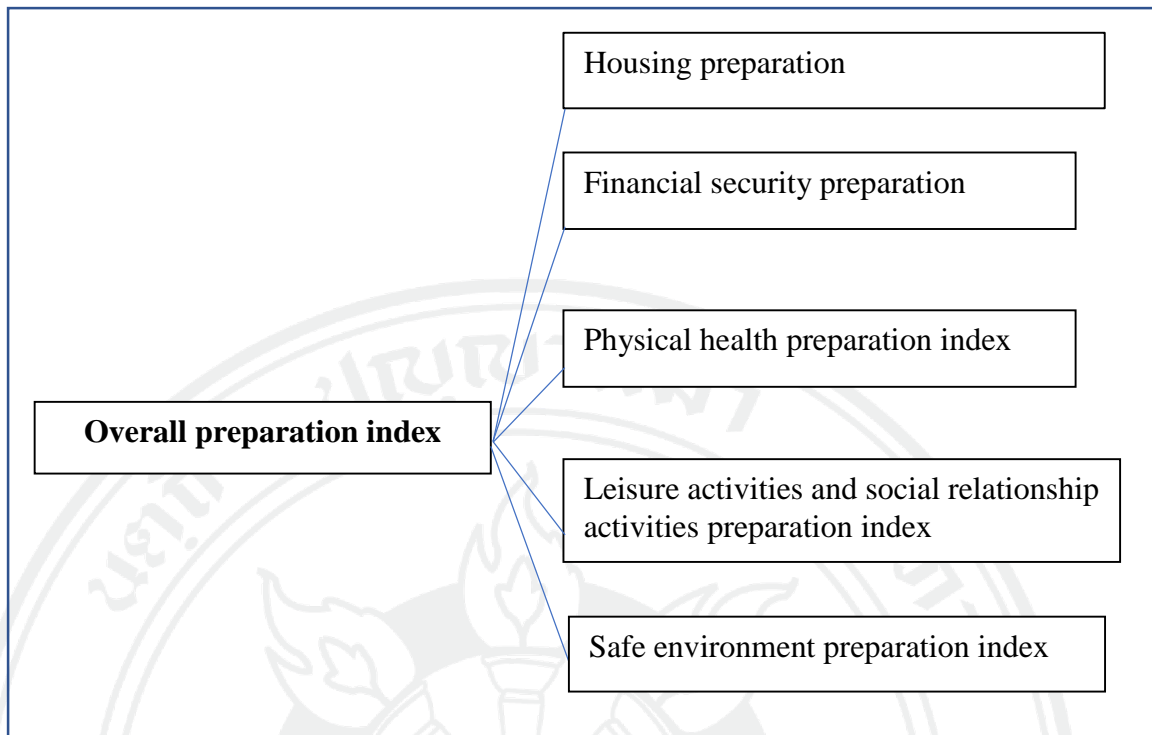


Figure 3.3 Summary of preparation index

Source: Author

In addition, since each dimension is considered equally important, the weight assigned to each dimension is equal. The calculation of the overall preparation index identified is as follows:

$$\text{Overall preparation index} = \frac{1}{5}(\text{House}) + \frac{1}{5}(\text{Finsec}) + \frac{1}{5}(\text{Phys}) + \frac{1}{5}(\text{Leisoc}) + \frac{1}{5}(\text{Safe}) \quad (4)$$

The highest score of preparation in each dimension is 1, and the lowest is 0. Thus the highest and lowest score of the overall preparation index will be 1 and 0 respectively.

### 3.2.4 Policy variables

Certain government policies also influence individuals' retirement preparation. Three policy-related variables are thus included in the relevant models, as follows:

- 1) Benefits from government health services (e.g., elderly card, health card, social security card, government or pensioner welfare, state enterprise welfare).
- 2) Health service or healthcare visits (free or almost free of charge) provided by the government by health personnel or healthcare services by volunteers for the elderly at home.

3) The number of doctors per 1,000 population in each province.

Therefore, these three variables will be the policy variables of the second model (financial security preparation), third model (physical health preparation), fifth model (safe environment preparation) of this study, and sixth model (overall preparation index). The benefits from government health services, public helpers (e.g., health personnel, care by volunteers for the elderly at home, etc.), and the provision an adequate number of doctors in public hospitals per 1,000 population in each province can help in cost reduction for healthcare and encourage physical health preparation, including the preparation for a safe environment and overall preparation (preparation index).

### **3.2.5 The specific variable of each model**

This part will explain the specific variable of each model based on the literature review and hypothesis of this research since previous research refers to specific variables that affect different dimensions of preparation. Hence, this study will include specific variables of each model as independent variables.

1) Working hours variable: Luoh and Herzog (2002) found that working as volunteers or paid workers over 100 annual hours (self-reported) related to poor health and deaths among the elderly. Hence, this research will include working hours as a specific variable of the third model (physical health preparation) because people who work for longer hours have less probability to prepare themselves for their old age in the dimension of physical health preparation. On the other hand, people who work for long hours should have a high tendency to prepare for their old age in terms of financial security preparation (second model).

2) Labor market status (formal/informal job): Apouey (2018) found that the informal labor force has better preparation in terms of physical activity and intellectual skills than the officially employed labor force. This research will use formal job as a base group and compare workers with formal jobs to those with informal jobs. People who work in the informal labor force should have a low tendency to prepare for their old age in the dimension of physical health preparation and financial security preparation since informal jobs often relate to tough tasks and high risk, for which the compensation is low. Therefore, this study will use labor market status variable as a

specific variable in the second model (financial security preparation), third model (physical health preparation), and fourth model (leisure activities and social relationship activities preparation).

3) Social network: Thanakwang and Soonthorndhada (2011) refer to social support networks in terms of family and friendship networks that have a directly positive impact on promoting healthy aging. Consequently, this research will use the social network variable as a proxy by including data for each individual who joins village/community activities (e.g., Elderly Day, Songkran Day, ritual ceremonies, etc.) as a specific variable in the third model (physical health preparation) and fourth model (leisure activities and social relationship activities preparation).

4) Family altruism refers to estimated or proxy by money received and money given within the family. Apouey (2018) found that people who have family altruism tend to have a high probability of preparing for their old age in the dimension of general preparation and social preparation. As a result, this research will use family altruism as a specific variable in the second model (financial security preparation) and fourth model (leisure activities and social relationship activities preparation).

5) Myopia: proxy by an older person not needing someone to help in performing daily living activities because the person doesn't think that they could ever be disabled. Apouey (2018) found that myopia negatively affects the general preparation, saving preparation, home adaptation preparation, and social relationships preparation. So, this research will use myopia as a specific variable for the second model (financial security preparation), fourth model (leisure activities and social relationship activities preparation), and fifth model (safe environment preparation).

6) Caregiver: this study has a sub-hypothesis regarding people who have caretakers or have a greater number of children and who tend to have less probability for preparing for their old age in the dimension of housing (homeownership), because they will expect to live with their child or the caretaker and do not think about owning a house. Thus, this research will use caregiver/caretaker as a specific variable in the first model (housing/being a homeowner preparation) and the fifth model (safe environment preparation).

The definitions of all variables are those used in the previous empirical studies that studied similar dimensions or used the same variables. The expected sign (+ or -) based on the hypothesis of this research is also provided in Table 3.3

Table 3.3 Summary of dependent and independent variables

<b>Variables</b>	<b>Definition</b>	<b>Empirical Studies</b>	<b>Expected Sign</b>
<b>Dependent variables</b>			
<b>Housing preparation (House)</b>	An individual prepared for housing (homeowner) = 1, the individual not prepared for housing = 0	Kumruangrit, 2014; Apouey, 2018.	
<b>Financial security preparation (Finsec)</b>	An individual prepared for financial security by savings in any form (money, assets, gold etc.) = 1, the individual not saved in any form = 0	Jacobs-Lawson et al., 2004; Kornadt and Rothermund, 2013.	
<b>Physical health preparation index (Phys)</b>	An individual prepared for physical health <i>The index value of this dimension ranges from 0 to 1.</i>	Jacobs-Lawson et al., 2004; Kornadt and Rothermund, 2013.	
<b>Leisure activities and social relationship activities index (Leisoc)</b>	An individual prepared for leisure activities and social relationship activities <i>The index value of this dimension ranges from 0 to 1.</i>	Jacobs-Lawson et al., 2004; Kornadt and Rothermund, 2013.	
<b>Safe environment preparation index (Safe)</b>	An individual prepared for a safe environment (home adaptation). <i>The index value of this dimension ranges from 0 to 1.</i>	Seetangkham and Nilvarangkul, 2018 and data availability in Thai context.	

Variables	Definition	Empirical Studies	Expected Sign
<b>Preparation index</b> (Prep_inx)	This index consists of 5 preparation dimensions, which indicate overall retirement preparation of each person. <i>The value of this index ranges from 0 to 1.</i>	Kumruangrit, 2014	
<b>Independent variable</b>			
<b>Low_Sec</b> (Lower_Sec)	A dummy variable referring to an individual with education attainment lower than secondary school i.e., those with primary education or no education at all. ( <i>Secondary school = based group</i> ).	Human capital theory; Jacobs-Lawson, et al., 2004; Yommana, 2008; Kornadt and Rothermund, 2013; Kumruangrit, 2014; Monataraphadung and Siriwong, 2016.	-
<b>High_Sec</b> (Upper_Sec)	A dummy variable referring to an individual with education attainment higher than secondary school i.e., those with diploma degree, bachelor's degree or above. ( <i>Secondary school = based group</i> ).	Human capital theory; Jacobs-Lawson, et al., 2004; Yommana, 2008; Kornadt and Rothermund, 2013; Kumruangrit, 2014; Monataraphadung and Siriwong, 2016.	+
<b>Occ_skill_Lv2</b>	A dummy variable for occupational skill level 2, which involves the performance of tasks such as operating	ISCO-08; Human capital theory.	

Variables	Definition	Empirical Studies	Expected Sign
<b>Occ_skill_Lv3</b>	<p>machinery and electronic equipment—for example, building electricians and motor vehicle mechanics, etc. (Occupational skill level 1, which involves simple performance or manual tasks = based group.)</p> <p>A dummy variable for occupational skill level 3 which involves performance of complex technical and practical tasks that require an extensive body of factual knowledge—for example, to carry out specific projects, perform technical functions in support of professionals, or manage a shop (Occupational skill level 1 = based group).</p>	ISCO-08; Human capital theory.	
<b>Occ_skill_Lv4</b>	<p>A dummy variable for occupational skill level 4 which involves complex problem-solving, decision-making, creativity, and factual knowledge in a specialized field, such as needed by school teachers, medical practitioners, nurses, etc. (Occupational skill level 1 = based group).</p>	ISCO-08; Human capital theory.	
<b>Health status index (Health_inx)</b>	<p>This index consists of 6 indicators;</p> <p>1) Movement functions associated with musculoskeletal function, proxied by activities of daily living (ADLs) (WHO, 2005). <i>Score ranking from 0 to 26.</i></p> <p>2) Sensory functions proxied by the ability to see and hear due to ageing are frequently associated with declines in both vision and hearing (WHO, 2005). <i>Ability to see and hear=1, otherwise =0</i></p> <p>3) Cognitive functions proxied by memory, capacity to calculate.</p>	Kumruangrit, 2014; WHO's Functional ability, 2015; Human capital theory.	+



Variables	Definition	Empirical Studies	Expected Sign
	<p><i>Have cognitive functions =1, otherwise =0.</i></p> <p>4) Urinary incontinence proxied by <i>individual having urinary incontinence =1, otherwise = 0.</i></p> <p>5) Immune function proxied by individual having gotten a vaccination that is capable to respond to new infections (WHO, 2005). <i>Got vaccination=1, otherwise =0.</i></p> <p>6) Mental health, which measures the level of happiness (WHO, 2005). <i>Score from 0 to 10.</i></p>		
<b>Control variables</b>			
<b>Female</b>	Gender of each person <i>female =1, male =0 (based group)</i>	Jacobs-Lawson et al., 2004; Yommana, 2008; Noone et al., 2010; Mungwattana, 2016; Seetangkham and Nilvarangkul, 2018.	-
<b>Age</b>	Age of each person <i>between 50–59 years.</i>	Jacobs-Lawson et al., 2004; Yommana; 2008; Kornadt and Rothermund, 2013; Kumruangrit, 2014; Mungwattana, 2016; Monataraphadung and Siriwong,	+

Variables	Definition	Empirical Studies	Expected Sign
<b>Single</b>	Marital status of the person of single status <i>single = 1 , otherwise = 0 (Married = based group)</i>	2016; Apouey, 2018; Seetangkham and Nilvarangkul, 2018; Jacobs-Lawson et al., 2004; Yommana, 2008; Kumruangrit, 2014; Mungwattana, 2016; Apouey, 2018.	-
<b>Divorced</b>	Marital status of the person of divorced status <i>divorced = 1 otherwise = 0 (Married = based group)</i>	Jacobs-Lawson et al., 2004; Yommana, 2008; Kumruangrit, 2014; Mungwattana, 2016; Apouey, 2018.	-
<b>Num_child</b>	Number of children (unit is person)	Yommana, 2008; Kumruangrit, 2014; Mungwattana, 2016.	+
<b>Urban</b>	A dummy variable to identify that a person resides in urban area <i>Urban = 1, Rural = 0 (based group)</i>	Kumruangrit, 2014	+
<b>Avg_ann_inc</b>	Average annual income from all sources of each person (unit is ten thousand baht per year)	Jacobs-Lawson, et al., 2004; Noone et al., 2010;	+

<b>Variables</b>	<b>Definition</b>	<b>Empirical Studies</b>	<b>Expected Sign</b>
		Kornadt and Rothermund, 2013; Kumruangrit, 2014; Apouey, 2018.	
<b>Village_loud</b>	A dummy variable to identify that a person receives useful information through village loudspeakers <i>Receive = 1, not receive = 0</i> <i>(leader=based group)</i>	Kumruangrit, 2014	+
<b>Radio</b>	A dummy variable to identify that a person receives useful information through radio <i>Receive = 1, not receive = 0</i> <i>(leader=based group)</i>	Kumruangrit, 2014	+
<b>TV</b>	A dummy variable to identify that a person receives useful information through television <i>Receive = 1, not receive = 0</i> <i>(leader=based group)</i>	Kumruangrit, 2014	+
<b>Print media</b>	A dummy variable to identify that a person receives useful information through newspapers/brochures/posters. <i>Receive = 1, not receive = 0</i> <i>(leader=based group)</i>	Kumruangrit, 2014	+
<b>Internet</b>	A dummy variable to identify that a person receives useful information through the Internet <i>Receive = 1, not receive = 0</i> <i>(leader=based group)</i>	Kumruangrit, 2014	+
<b>Alone</b>	An individual who living alone. <i>alone = 1, Otherwise = 0</i>	Apouey, 2018	-
<b>North</b>	A dummy variable to identify that a person resides in the North. <i>North = 1, Otherwise = 0</i> <i>(BKK = based group)</i>	Kumruangrit, 2014	-

<b>Variables</b>	<b>Definition</b>	<b>Empirical Studies</b>	<b>Expected Sign</b>
<b>South</b>	A dummy variable to identify that a person resides in the South. <i>South = 1, Otherwise = 0</i> (BKK = based group)	Kumruangrit, 2014	-
<b>Central</b>	A dummy variable to identify that a person resides in the central <i>Central = 1, Otherwise = 0</i> (BKK = based group)	Kumruangrit, 2014	-
<b>Northeast</b>	A dummy variable to identify that a person resides in the Northeast. <i>Northeast = 1, Otherwise = 0</i> (BKK = based group)	Kumruangrit, 2014	-
<b>Policy variables</b>			
<b>Benefits</b>	The benefits from government health service (e.g. elderly card, health card, social security card, government or pensioner welfare, state enterprise welfare) <i>Receive = 1, not receive = 0</i>	Data availability in Thai context	+ with second and third model
<b>Pub_helper</b>	Receive health service or other help (free/almost free of charge) from the government in care or visit by health personnel, or care by the volunteer for the elderly at home <i>Receive = 1, not receive health service or other help = 0</i>	Data availability in Thai context	+ with second, third, and fourth model
<b>Num_doctor</b>	Number of doctors per 1,000 population of each province	Data availability in Thai context	+ with second and third model
<b>Specific variable for each model</b>			
<b>Working_hours</b>	Number of working hours per day – hour(s) per day	Luoh and Herzog, 2002	- with first model, but + with second model

<b>Variables</b>	<b>Definition</b>	<b>Empirical Studies</b>	<b>Expected Sign</b>
<b>Informal_sec</b>	Labor market status (formal/informal job) <i>Informal job = 1, formal job = 0 (based group)</i>	Apouey, 2018	- with first model, second and fourth model
<b>Soc_network</b>	An individual who joins village/community activities (e.g. Elderly Day, Songkran Day, ritual ceremonies, etc.) <i>Join = 1, not join = 0</i>	Thanakwang and Soonthorndhada, 2011	+ with third and fourth model
<b>Money_received</b>	An individual who has received money from the family member within one year that represents family altruism <i>Receive = 1, not receive = 0</i>	Apouey, 2018	+ with second model
<b>Money_give</b>	Individual who has given money to a family member within one year that represents family altruism <i>Give = 1, not give = 0</i>	Apouey, 2018	+ with second and fourth model
<b>Myopia</b>	An individual who doesn't need someone to help in doing daily living activities = 1, otherwise = 0	Apouey, 2018	- with second, fourth and fifth model
<b>Caregiver</b>	An individual who has caregiver = 1, individual has no caregiver = 0	Yommana, 2008	- with first and fifth model

**Note:** + represents this study's expectation that the independent variable has positive effect with the dependent variables of all models.

- represents this study's expectation that the independent variable has negative effect with the dependent variables of all models

### 3.2.6 Research Hypothesis

In accordance with literature reviews that indicate some other factors that affect the preparation of the elderly, the present study includes age, average annual income, region, gender and various other factors in order to study preparation of the pre-retirement population. Additionally, we will also shed light on human capital factors to better explain the following reasoning and hypotheses.

#### 3.2.6.1 Main Hypothesis.

Given the importance of human capital, people who possess a high level of individual human capital can be expected to have a good opportunity for preparing for their old age.

#### 3.2.6.2 Sub-Hypothesis

1) A high education level is expected to have a positive effect on old age preparation. So, persons who have a high level of education (a high level in terms of knowledge index) should have a high level of preparation for their old age.

2) People who received training from an occupation group will have a higher human capital in terms of skill index and thus should have a higher tendency to generate income and prepare more than those who did not get training.

3) Highly occupationally skilled workers, depending upon the occupation of each person, are expected to have a higher probability of being prepared for their old age.

4) People who enjoy better health status, including proper movement function and good cognitive and sensory functions, enjoy a better chance to prepare for old age because of their less limitation to work or perform various activities.

5) Females generally have a lower tendency to prepare for their old age than do males because females in traditional Thai culture are housewives and take care of their homes, and females are less likely to work outside the home. Therefore, the probability of females preparing themselves for their old age is less compared to males.

6) Older people have a higher tendency to prepare themselves for old age than do younger people. Many studies have found that young people will think about retirement as something still very far away, while older persons realize the importance of preparing and thus prepare more.

7) Married people might prepare for old age more than those who are single or divorced because they have to take their families into consideration and prepare themselves for life as elderly family members when they retire.

8) People with more children will be less prepared than those who have fewer children. Families with a large number of children face more financial burdens, so they have a low probability to prepare themselves for the financial and other aspects of life in the future.

9) People living in urban areas have the probability to prepare themselves for old age more than those who live in rural areas since they have relatively better access to information. Moreover, people living in urban areas face higher living costs as compared to those living in rural areas and therefore realize that they should prepare themselves well for a better future.

10) People living in the North, South, Central, and Northeast (other than Bangkok) sections of the country have less probability to prepare for old age compared to those who live in Bangkok because Bangkok is the capital and has improved facilities, and more information about preparation for old age compared to those regions far from the capital.

11) People with a high average income can be expected to prepare more for their old age than those with less income because preparation in each dimension has some cost.

12) Access to channels providing information should influence the preparation for ageing. Those who receive information about preparation for old age from multiple channels (radio, television, print media, the Internet, village loudspeakers) have a better probability to prepare for old age than those who do not have access to such channels of information.

13) People who live alone can be expected to have the probability to prepare for old age more than those living with their families in a household because people who live alone have to take care themselves when they are retired, and they are used to caring for themselves.

14) People who have caregivers or more children tend to have less probability of preparing for their old age in terms of housing (being a homeowner)

since they would also expect to live with the caregiver in the caregiver's house thus do not think about the need to be a homeowner.

### **3.3 Research Methodology**

This section explains the methodology of this study, which including illustrates all dependent and independent variables in 6 econometric models of this study. This study uses the logit, probit regression, and the Ordinary Least Square (OLS) as the estimating approaches in order to study determinants of retirement preparation. Dependent variables of this study comprise 6 dimensions of preparation: housing, financial security, physical health, leisure activities and social relationship activities, safe environment, and the overall preparation index. One of the potential determinants of retirement preparation is the human capital level. The present study investigates the effects of three components of human capital. The important control variables of this study cover policy variables such as the number of doctors in public hospitals per 1,000 persons and benefits from government health services, e.g., elderly card, health card, etc. Specific variables of each model, such as caregiver variable that use in the model of housing preparation, and working hours variable that use in the model of financial security preparation. This study also includes other variables such as age, average annual income, number of children, etc. as control variables of this study.

Hence, the overall analytical framework of determinants of retirement preparation is shown in Figure 3.4.



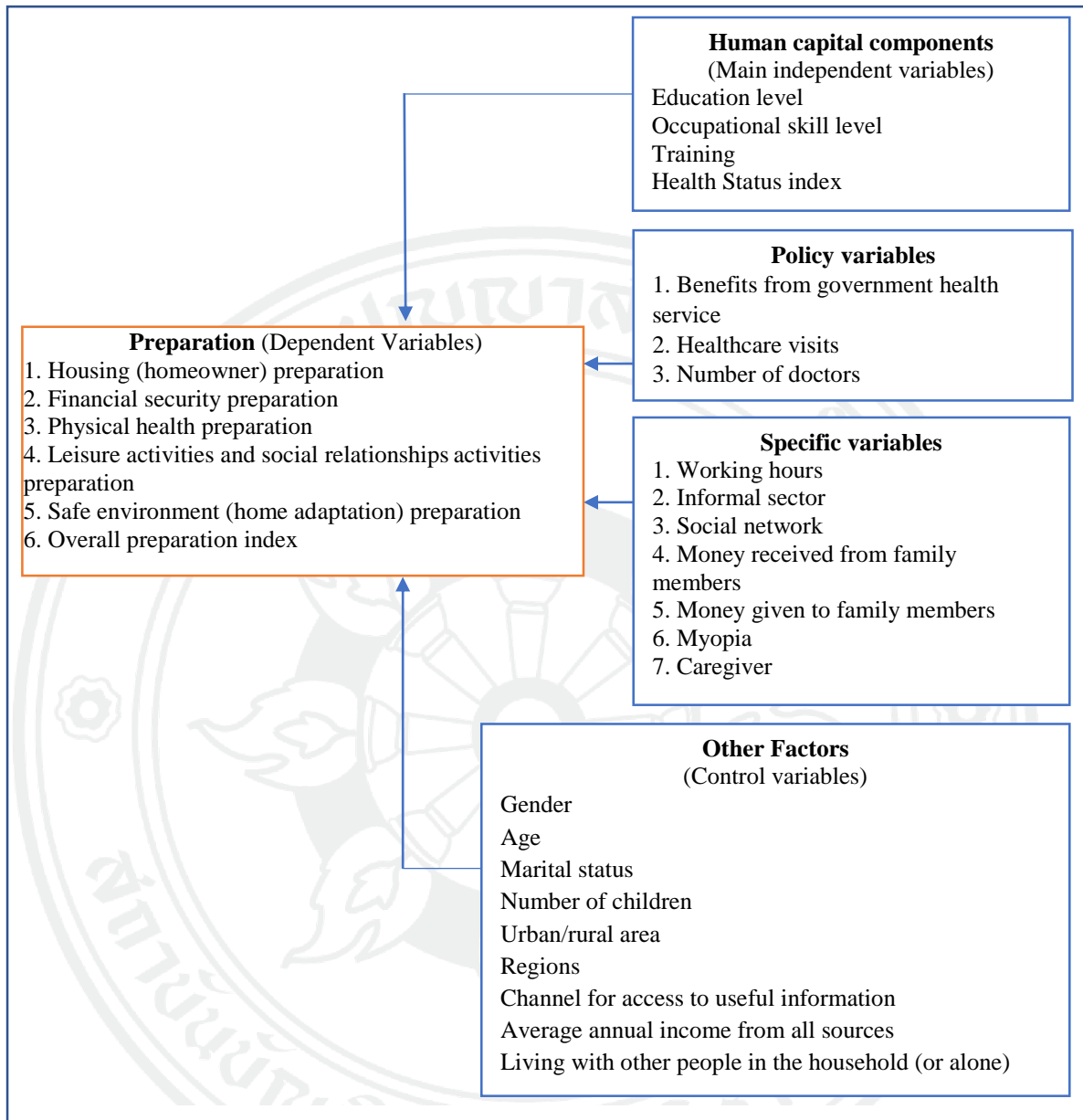


Figure 3.4 An analytical framework of determinants of retirement preparation

Source: Author

According to the analytical framework presented in Figure 3.4, the dependent variables in the first (housing preparation) and second (financial security preparation) model are a binary dependent variable (the dependent variable of each model is prepared ( $Y=1$ ) or not prepared ( $Y=0$ )). However, the linear regression model, such as Ordinary Least Square (OLS) is based on an assumption that the dependent variable

is continuous, with errors that are normally distributed. Hence, if the dependent variable of this study is binary this assumption is violated, and that might cause our inferences to be invalid. In addition, the problem that might occur when using OLS with a binary dependent variable are that predicted values may be out of range, and the conditional variance is not constant (heteroscedasticity). (Bartlett, 2015)

However, we can use the logit and probit regressions, which are used when any value of the linear predictor is transformed to a valid predicted probability that has a value between 0 and 1 when the dependent variable is binary (Jones, 2001).

Therefore, the present research uses both logit and probit regressions to study two preparation dimensions—the first model (housing preparation) and the second model (financial security preparation)—because logit and probit regressions are the standard methods for regression analysis of binary dependent variable in many fields. Logit regression is suitable for analyzing the distribution of the error term has a logistics distribution. Probit regression is suitable for analyzing the distribution of the error term has a normal distribution.

Logit and probit regressions are used to ascertain the probability of an event, captured in binary format (i.e., 0 or 1), when given any independent variables (X). The equation can be written as:

$$P(Y=1)|X \quad (5)$$

If the dependent variable (Y) is coded to zero or one, equation (5) expresses the probability of Y=1 given any independent variable (X).

Both logit and probit regressions are useful for situations where there is the possibility of predicting whether there is preparation or lack of preparation of an outcome, based on the values of a set of independent variables. Furthermore, logit and probit regressions can estimate the probability of an outcome with the dependent variable is a binary dependent variable. Hence, the current study will use logit and probit regressions to study the determinants of housing preparation and financial security preparation. Consequently, the equation to estimate determinants of the probability of housing preparation (house) as present in equation (5), and financial security preparation (finsec) as present in equation (6) are as follows:

$$Pr(house)_{it} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon \quad (5)$$

$$Pr(Finsec)_{it} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon \quad (6)$$

Pr (house) is the probability that an individual had prepared housing,

Pr (finsec) is the probability that an individual had prepared in financial security,

$\beta_i$  is the coefficient of each independent variable (when  $i=1, 2, \dots, n$ ),

$X_i$  is an independent variable of each model (can be continuous or binary variable) (when  $i=1, 2, \dots, n$ ),

and  $\varepsilon$  is an error term.

Additionally, the present study uses the logit and probit models in order to analyze the probability change of  $Y$ , which is in the probability scale, but coefficients are estimated in the odds scale (log odds unit) when the odds that  $Y = 1$  is given by  $p/(1-p)$ , where  $p$  = the probability that  $Y = 1$  (UCLA, 2016).

The odds of this study is the probability of prepared/1-probability of prepared, and log odds come from the logarithm of the odds. The result of logistic regression before the marginal effect will be this format:

$$\text{Log} (p/1-p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (7)$$

Where  $p$  is the probability that an individual was prepared in that dimension.

$X_i$  is the independent variable of each model (when  $i=1, 2, \dots, n$ )

$\beta_i$  is the coefficient of each independent variable (when  $i=1, 2, \dots, n$ )

The interpretation coefficient of each independent variable will be a one-unit increase in the independent variable, such as an increase in  $X_1$  one unit. We expect that the dependent variable will increase  $= \beta$  in the log odds unit, holding other independent variables in the model constant. However, these coefficients are in log odds units, which are often difficult to interpret and can be misleading (Bruin, 2006 ).

However, the aim here is to understand the probability scale, not as a log odds unit because it is “conditional on covariate values, the probability must be bounded between 0 and 1” (Perrailon, 2019).

Hence, this research will not report coefficients of logit regression, since using coefficients before calculating the marginal effect that is used to estimate in the log odds unit is not the way of presenting results in probabilities. Thus, the interpretation of the result of the logit regression model (cf. Chapter 4, Table 4.4) of this study will

report only the marginal effect in order to explain the probability change of Y when X is increased by 1 unit, holding other variables constant.

Apart from this, for the third to the sixth models of this research—physical health preparation, leisure activities and social relationship activities preparation, safe environment preparation, and overall preparation index— an Ordinary Least Squares (OLS) estimation will be employed in order to ensure that the coefficients of the regression are unbiased estimators of the real values of constant and coefficients because these four models have dependent variables that are quantitative variables. The assumption of these four models are linear in their parameters, with no multicollinearity and homoskedasticity of errors. This is in accord with the Gauss-Markov Theorem, under some assumptions of the linear regression model, namely, linearity in parameters, no perfect multicollinearity, and constant variance in the error term (no heteroscedasticity). (Deming, 2019)

The OLS assumption on linearity in parameters in the third to fifth models of this study are physical health preparation (phys), leisure activities and social relationship activities preparation (Leisoc), safe environment preparation (safe), and overall preparation index (Prep\_inx) which are shown in equations (8), (9), (10), and (11), respectively, which are linear regressions that use the general linear equation as follow;

$$\begin{aligned}
 Phys_{it} = & \beta_0 + \beta_1 Low\_sec_{it} + \beta_2 High\_sec_{it} + \beta_3 Occ\_Skill\_Lv2_{it} + \\
 & \beta_4 Occ\_Skill\_Lv3_{it} + \beta_5 Occ\_Skill\_Lv4_{it} + \beta_6 Training_{it} + \\
 & \beta_7 Health\_index_{it} + \beta_8 female_{it} + \beta_9 Age_{it} + \beta_{10} single_{it} + \\
 & \beta_{11} divorced_{it} + \beta_{12} Num\_child_{it} + \beta_{13} Urban_{it} + \beta_{14} North_{it} + \\
 & \beta_{15} South_{it} + \beta_{16} Center_{it} + \beta_{17} Nort\_East_{it} + \beta_{18} Avg\_annual\_inc_{it} + \\
 & \beta_{19} Alone_{it} + \beta_{20} village\_loud_{it} + \beta_{21} Radio_{it} + \beta_{22} TV_{it} + \\
 & \beta_{23} Print\_media_{it} + \beta_{24} Internet_{it} + \beta_{25} Benefits_{it} + \\
 & \beta_{26} Pub\_helpers_{it} + \beta_{27} Num\_doctor_{it} + \beta_{28} Working\_hours_{it} + \\
 & \beta_{29} informal_{it} + \beta_{30} social\_network + \varepsilon_{it}
 \end{aligned} \tag{8}$$

$$\begin{aligned}
 Leisoc_{it} = & \beta_0 + \beta_1 Low\_sec_{it} + \beta_2 High\_sec_{it} + \beta_3 Occ\_Skill\_Lv2_{it} + \\
 & \beta_4 Occ\_Skill\_Lv3_{it} + \beta_5 Occ\_Skill\_Lv4_{it} + \beta_6 Training_{it} + \\
 & \beta_7 Health\_index_{it} + \beta_8 female_{it} + \beta_9 Age_{it} + \beta_{10} single_{it} + \\
 & \beta_{11} divorced_{it} + \beta_{12} Num\_child_{it} + \beta_{13} Urban_{it} + \beta_{14} North_{it} + \\
 & \beta_{15} South_{it} + \beta_{16} Center_{it} + \beta_{17} Nort\_East_{it} + \beta_{18} Avg\_ann\_inc_{it} + \\
 & \beta_{19} Alone_{it} + \beta_{20} village\_loud_{it} + \beta_{21} Radio_{it} + \beta_{22} TV_{it} + \\
 & \beta_{23} Print\_media_{it} + \beta_{24} Internet_{it} + \beta_{25} informal_{it} + \\
 & \beta_{26} soc\_network + \beta_{27} money\_receive_{it} + \beta_{28} money\_give_{it} + \\
 & \beta_{29} myopia_{it} + \varepsilon_{it}
 \end{aligned} \tag{9}$$

$$\begin{aligned}
Safe_{it} = & \beta_0 + \beta_1 Low\_sec_{it} + \beta_2 High\_sec_{it} + \beta_3 Occ\_Skill\_Lv2_{it} + \\
& \beta_4 Occ\_Skill\_Lv3_{it} + \beta_5 Occ\_Skill\_Lv4_{it} + \beta_6 Training_{it} + \\
& \beta_7 Health\_index_{it} + \beta_8 female_{it} + \beta_9 Age_{it} + \beta_{10} single_{it} + \\
& \beta_{11} divorced_{it} + \beta_{12} Num\_child_{it} + \beta_{13} Urban_{it} + \beta_{14} North_{it} + \\
& \beta_{15} South_{it} + \beta_{16} Center_{it} + \beta_{17} Nort\_East_{it} + \beta_{18} Avg\_annual\_inc_{it} + \\
& \beta_{19} Alone_{it} + \beta_{20} village\_loud_{it} + \beta_{21} Radio_{it} + \beta_{22} TV_{it} + \\
& \beta_{23} Print\_media_{it} + \beta_{24} Internet_{it} + \beta_{25} Benefits_{it} + \\
& \beta_{26} Pub\_helpers_{it} + \beta_{27} Num\_doctor_{it} + \beta_{28} myopia_{it} + \beta_{29} myopia_{it} + \\
& \beta_{30} Care\_giver_{it} + \varepsilon_{it}
\end{aligned} \tag{10}$$

$$\begin{aligned}
Prep\_inx_{it} = & \beta_0 + \beta_1 Low\_sec_{it} + \beta_2 High\_sec_{it} + \beta_3 Occ\_Skill\_Lv2_{it} + \\
& \beta_4 Occ\_Skill\_Lv3_{it} + \beta_5 Occ\_Skill\_Lv4_{it} + \beta_6 Training_{it} + \\
& \beta_7 Health\_index_{it} + \beta_8 female_{it} + \beta_9 Age_{it} + \beta_{10} single_{it} + \\
& \beta_{11} divorced_{it} + \beta_{12} Num\_child_{it} + \beta_{13} Urban_{it} + \beta_{14} North_{it} + \\
& \beta_{15} South_{it} + \beta_{16} Center_{it} + \beta_{17} Nort\_East_{it} + \beta_{18} Avg\_ann\_inc_{it} + \\
& \beta_{19} Alone_{it} + \beta_{20} village\_loud_{it} + \beta_{21} Radio_{it} + \beta_{22} TV_{it} + \\
& \beta_{23} Print\_media_{it} + \beta_{24} Internet_{it} + \beta_{25} Benefits_{it} + \\
& \beta_{26} Pub\_helpers_{it} + \beta_{27} Num\_doctor_{it} + \beta_{28} informal_{it} + \\
& \beta_{29} Working\_hours_{it} + \beta_{30} soc\_network + \beta_{31} money\_receive_{it} + \\
& \beta_{32} money\_give_{it} + \beta_{33} myopia_{it} + \beta_{34} Care\_giver_{it} + \varepsilon_{it}
\end{aligned} \tag{11}$$

In addition, with regard to the assumption of no perfect multicollinearity, the OLS estimator requires that the independent variables have no perfect multicollinearity. The multicollinearity of the independent variable of this study (see Appendix C, Table C1). This indicates that the independent variables of this study have no multicollinearity problem (the value of correlation is less than 0.8)

Furthermore, OLS is optimal in the linear unbiased estimators when the errors are homoscedastic. Since this study uses cross-sectional data that could create a problem of heteroscedasticity which would make the variance not constant, the estimator would not have minimum variance and would thus be inefficient. Since OLS calculates the t-values and F-values using an underestimated amount of variance, this can lead to results that are apparently not significant (producing p-values that tend to be smaller than they should be). Hence, this study will tests heteroscedasticity by using the Breusch-Pagan or the Cook-Weisberg test (see Appendix C, Table C2 to C6). However, if the problem of heteroscedasticity occurs, there are various techniques to solve this problem. This study will use the robust standard errors technique in order to obtain unbiased standard errors of OLS coefficients under heteroscedasticity.

Hence, this study will report the coefficient and robust standard error of each independent variable. Linear regression coefficients represent the average change in the dependent variable for one unit of change in the independent variable while holding other independent variables in the model constant. Therefore, the interpretation of OLS by using coefficient in order to explain when holding all other variables constant, with a unit change in the independent variable of interest (X), the dependent variable (Y) is expected to increase or decrease by some value, on average. That represents the magnitude of the effect of a change in the independent variable (X) on the dependent variable (Y).

In addition, this study also rescales health status index (component in the Human Capital Index), changing scores from 0–1, to 0–100 for convenience of interpretation. For example, the interpretation for the logit model is affected when the health status index score increases by one, which increases or decreases the probability of being prepared in housing by a particular value (%). However, the interpretation for OLS is affected when the health status index increases by one, affecting the increase or decrease in physical health preparation by a particular value (score).

Additionally, independent variables of this research will include Human Capital Index components, policy variables, specific variables of each model, and other variables as control variables. Hence, a summary of all variables added to this study in 6 dimensions of retirement preparation is provided in Table 3.4

Table 3.4 Summary of all variables in each model

Variables	Model 1 (House)	Model 2 (Finsec)	Model 3 (Phys)	Model 4 (Leisoc)	Model 5 (Safe)	Model 6 (Prep_Inx)
<b>Human capital components</b>						
Low_sec	✓	✓	✓	✓	✓	✓
High_sec	✓	✓	✓	✓	✓	✓
Occ_Skill_Lv2	✓	✓	✓	✓	✓	✓
Occ_Skill_Lv3	✓	✓	✓	✓	✓	✓
Occ_Skill_Lv4	✓	✓	✓	✓	✓	✓
Health status index	✓	✓	✓	✓	✓	✓

Variables	Model 1 (House)	Model 2 (Finsec)	Model 3 (Phys)	Model 4 (Leisoc)	Model 5 (Safe)	Model 6 (Prep_Inx)
<b>Control variables</b>						
Female	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓
Single	✓	✓	✓	✓	✓	✓
Divorced	✓	✓	✓	✓	✓	✓
Num_child	✓	✓	✓	✓	✓	✓
Urban	✓	✓	✓	✓	✓	✓
Avg_ann_inc	✓	✓	✓	✓	✓	✓
Village_loud	✓	✓	✓	✓	✓	✓
Radio	✓	✓	✓	✓	✓	✓
TV	✓	✓	✓	✓	✓	✓
Print media	✓	✓	✓	✓	✓	✓
Internet	✓	✓	✓	✓	✓	✓
Alone	✓	✓	✓	✓	✓	✓
North	✓	✓	✓	✓	✓	✓
South	✓	✓	✓	✓	✓	✓
Central	✓	✓	✓	✓	✓	✓
North_East	✓	✓	✓	✓	✓	✓
<b>Policy variables</b>						
Benefits		✓	✓		✓	✓
Pub_helper		✓	✓		✓	✓
Num_doctor		✓	✓		✓	✓
<b>Specifics Variables</b>						
Working_hours		✓	✓			✓
Informal		✓	✓	✓		✓
Social_network			✓	✓		✓
Money_received		✓	✓	✓		✓
Money_give		✓	✓	✓		✓
Myopia		✓		✓	✓	✓
Caregiver	✓				✓	✓

**Note:** ✓ represents the variable added in the model

In addition, the descriptive statistics—the number of observations (Obs.), mean, standard deviation (Std.Dev) of data in the three survey phases—are provided in Table 3.5

Table 3.5 Descriptive Statistics of all variables in the three surveys (in 2011, 2014, and 2017)

Variables	Obs.			Mean			Std. Dev			Max			Min		
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
<b>Dependent variables</b>															
Housing preparation (house)	28, 667	31, 199	30, 104	0.80	0.83	0.82	0.40	0.37	0.38	1	1	1	0	0	0
Financial security preparation (finsec)	28, 667	31, 199	30, 104	0.38	0.84	0.80	0.49	0.37	0.40	1	1	1	0	0	0
Physical health preparation index (phys)	28, 665	31, 192	29, 786	0.74	0.76	0.76	0.18	0.17	0.16	1	1	1	0	0	0
Leisure activities and social relationship activities index (leisoc)	28, 667	31, 199	30, 104	0.15	0.24	0.18	0.27	0.29	0.29	1	1	1	0	0	0
Safe environment preparation index (safe)	28, 666	31, 199	30, 104	0.32	0.42	0.42	0.19	0.17	0.18	1	1	1	0	0	0
Overall Ppreparation index (Prep_inx)	28, 665	31, 199	30, 104	0.55	0.65	0.63	0.16	0.14	0.15	1	1	1	0	0	0
<b>Independent variables</b>															
Lower_sec	28, 667	31, 199	30, 104	0.71	0.72	0.78	0.45	0.45	0.41	1	1	1	0	0	0



Variables	Obs.		Mean			Std. Dev			Max			Min			
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
High_sec	28,667	31,199	30,104	0.22	0.21	0.13	0.41	0.41	0.33	1	1	1	0	0	0
Occ_skill_Lv2	28,667	31,199	30,104	0.27	0.23	0.22	0.44	0.42	0.43	1	1	1	0	0	0
Occ_skill_Lv3	28,667	31,199	30,104	0.41	0.43	0.42	0.49	0.50	0.49	1	1	1	0	0	0
Occ_skill_Lv4	28,667	31,199	30,104	0.10	0.10	0.09	0.29	0.30	0.30	1	1	1	0	0	0
Health status index	21,498	30,733	30,100	0.78	0.77	0.77	0.08	0.10	0.10	100	100	100	0	0	0
Age	28,667	31,199	30,104	54.41	54.61	54.62	2.79	2.80	2.76	59	59	59	50	50	50
Female	28,667	31,199	30,104	0.55	0.54	0.55	0.50	0.50	0.50	1	1	1	0	0	0
Single	28,667	31,199	30,100	0.07	0.06	0.07	0.25	0.24	0.25	1	1	1	0	0	0
Divorced	28,667	31,199	30,100	0.14	0.13	0.14	0.35	0.34	0.34	1	1	1	0	0	0
Num_child	28,667	31,199	30,104	1.66	2.12	1.97	1.40	1.27	1.19	9	11	10	0	0	0
Urban	28,667	31,199	30,104	0.59	0.54	0.54	0.49	0.50	0.50	1	1	1	0	0	0
Northern	28,667	31,199	30,104	0.25	0.26	0.26	0.43	0.44	0.44	1	1	1	0	0	0
Southern	28,667	31,199	30,104	0.13	0.14	0.15	0.34	0.35	0.35	1	1	1	0	0	0
Central	28,667	31,199	30,104	0.31	0.28	0.27	0.46	0.45	0.45	1	1	1	0	0	0
Northeast	28,667	31,199	30,104	0.26	0.28	0.28	0.44	0.45	0.45	1	1	1	0	0	0
Avg_ann_inc	28,284	31,198	29,989	114,346	139,110	128,685	139,34	142,233	137,917	600,	600,	600,	0	0	0
				.7	.8	.7	6.0	.5	.5	000	000	000			
Alone	26,871	29,210	30,079	0.01	0.02	0.08	0.03	0.04	0.27	1	1	1	0	0	0
Village_loud	28,667	30,548	29,807	0.39	0.49	0.44	0.49	0.50	0.50	1	1	1	0	0	0

Variables	Obs.			Mean			Std. Dev			Max			Min		
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
TV	28,664	30,563	29,769	0.56	0.66	0.67	0.50	0.47	0.47	1	1	1	1	1	0
Print media	28,667	31,199	30,104	0.23	0.27	0.22	0.42	0.44	0.42	1	1	1	1	1	0
Internet	28,658	30,203	29,462	0.05	0.07	0.11	0.22	0.25	0.31	1	1	1	1	1	0
Public_helper	28,667	31,199	30,104	0.24	0.54	0.33	0.43	0.50	0.47	1	1	1	1	1	0
Benefits	11,054	14,281	11,798	0.93	0.85	0.97	0.26	0.35	0.11	1	1	1	1	1	0
Caregiver	28,667	31,199	30,102	0.07	0.03	0.04	0.25	0.17	0.20	1	1	1	1	1	0
Informal_sec	24,317	26,586	23,824	0.69	0.71	0.69	0.46	0.46	0.46	1	1	1	1	1	0
Soc_network	28,667	31,095	25,023	0.64	0.66	0.70	0.48	0.47	0.46	1	1	1	1	1	0
Myopia	28,508	31,183	29,991	0.92	0.98	0.97	0.27	0.15	0.16	1	1	1	1	1	0
Money_receive	24,800	27,911	30,061	0.45	0.49	0.44	0.50	0.50	0.49	1	1	1	1	1	0
Money_give	23,987	26,588	26,603	0.37	0.34	0.44	0.48	0.47	0.50	1	1	1	1	1	0
Num_doctor	28,667	31,199	30,104	0.22	0.28	0.33	0.06	0.08	0.07	0.43	0.48	0.54	0.12	0	0

The descriptive statistics of all variables given in Table 3.5 show that for 2011 to 2017 there were about 30,000 observations for each year. The means of dependent variables for the observations in three surveys are very similar, except for the dimension of financial security preparation (finsec).

The averages for housing preparation for the years 2011, 2014, and 2017 are 0.80, 0.83, and 0.82, respectively. These indicate that the pre-retirement population of Thailand have prepared in terms of future dwelling place to a great extent. Such preparation is supported by loan assistance programs for buyers of houses or condominium project properties nationwide, such as the Project for Low-income Earners and Affordable Housing Policies and Programs of the Government Housing Bank Thailand. (Ballobh, 2012)

The dimension of physical health preparation (phys) is measured by an index ranging from 0 to 1. The averages for the years 2011, 2014, and 2017 are 0.74, 0.76, and 0.76, respectively. These indicate that generally the pre-retirement population in the three surveys have prepared for good health based on their behaviours in terms of consumption, exercise, annual health check-up, and averting health risks. This dimension is important to study because if people have good health, the public sector's fiscal burden of supporting the healthcare system will be significantly reduced.

The leisure activities and social relationship activities (leisoc) is also measured by an index ranging from 0 to 1. However, average values of the leisure activities and social relationship activities for the years 2011, 2014, and 2017 are 0.15, 0.24, and 0.18, respectively. This reflects very low preparation among the pre-retirement population in terms of leisure activities and social relationship activities, which might indicate a current lack of social relationships.

Preparation for a safe environment (safe) in old age is measured on an index ranging from 0 to 1. The average value of safe environment preparation increases from 0.32 in 2011 to 0.42 in 2017. Although there is an increase in the average preparation level (they tended to increase their preparation by constructing a comfortable and safe environment for housing suitable for the elderly after retirement), the figures indicate that the pre-retirement population are less prepared in this dimension.

However, for the dependent variable of financial security preparation (finsec), using a dummy variable (have savings = 1, no savings = 0), the mean in 2011 shows

that most of people were not prepared (mean = 0.38) in terms of financial security while most people in 2014 and 2017 were prepared for financial security (mean = 0.84 and 0.80, respectively).

Comparing the means and standard deviations of the three components of human capital (knowledge, skill, and health status index) shows that they very similar. The mean of each of the three components indicates that most people in 2011, 2014, and 2017 had a low knowledge and skill index, yet they had a high health status index. Moreover, the standard deviation (Std.Dev) of the health status index was very low, indicating that the values tended to be close to the expected value (very close to the mean value).

The means of many variables in the three surveys were very similar. For example, the age of observation in the three surveys was 54 years and the number of children was around two. However, the average annual income increased from 114,346.70 Thai baht in 2011, to 139,110.80 Thai baht in 2014, but it decreased to 128,685.70 Thai baht in 2017.

To assess policy, this study uses “Benefits,” “Pub\_helper,” and “Num\_doctor.” The means of the Benefits variable for the years 2011, 2014, and 2017 were 0.93, 0.85, and 0.97, respectively. This variable is a dummy variable (received benefits from government health services, e.g., health card, social security card, etc. = 1, not received = 0). Results show that Thailand offers various health services, such as the elderly card, health card, social security card, and government or pensioner welfare. Thus, most of the pre-retirement population in Thailand can access health services.

Likewise, the averages of the Num\_doctor variable for the years 2011, 2014, and 2017 were 0.22, 0.28, and 0.33, respectively, meaning that the number of doctors in public hospitals was less than one doctor per 1,000 population in each province. This reflects a doctor shortage in Thai public hospitals.

Additionally, there is the “public\_helper” variable (consisting of healthcare visits that were free or almost free of charge and provided by healthcare personnel or healthcare services provided by village health volunteers at home). This was recorded as a dummy variable (received services = 1, not received = 0), showing that the public\_helper mean increased from 0.24 in 2011 to 0.33 in 2017, suggesting that the pre-retirement population not received services from public helpers. This reflects a

lack medical personnel and village health volunteers in Thailand and/or the failure to continue village health volunteer projects to visit people at home.



## CHAPTER 4

### RESULTS

This chapter consists of three sections. The first section (4.1) illustrates the results of the Human Capital Index (HCI) of each year in different groups and in different years, and the second section (4.2) presents regression analysis on determinants of Thai retirement preparation. Lastly, the third section (4.3) discusses the results of this study and previous studies, which cover the results of the components of HCI, policy variables, and specific variables of each model of this study.

#### 4.1 Human Capital Index (HCI) in different groups and different years

Table 4.1 The proportion of HCI in different years classified into 5 intervals

Intervals	2011	2014	2017
0.000–0.199 (Lowest)	103	191	284
(%)	(0.47)	(0.65)	(0.94)
0.200–0.399	9,575	12,401	12,863
(%)	(44.38)	(42.18)	(42.74)
0.400–0.599	7,266	10,731	10,891
(%)	(33.67)	(36.5)	(36.19)
0.600–0.799	3,921	5,192	5,249
(%)	(18.17)	(17.66)	(17.44)
0.800–1.000 (Highest)	710	883	811
(%)	(3.29)	(3.00)	(2.69)
Total	21,575	29,398	30,098
(%)	(100.00)	(100.00)	(100.00)

Note: The first numbers are numbers of people belonging to each group and the second numbers in parenthesis are the percentages.

The results in Table 4.1 show that most of the pre-retirement population had HCI values at second quintile (0.200 – 0.399), slightly over 40 percent for every survey (in years 2011, 2014, and 2017). The first quintile (Q1) represents the lowest value of HCIs (ranging from 0.000 to 1.999), and the fifth quintile (Q5) represents the highest HCI values (ranging from 0.800 to 1.000). The results show that the proportion of HCIs in

the lowest group (Q1) increased from 0.47% in 2011 to 0.94% in 2017. On the other hand, the proportion of HCIs in the highest group (Q5) decreased overtime from 3.29% in 2011 to 2.69% in 2017.

In addition, the 5 quintiles of HCI can be categorized into three classes, namely, bottom 40 %, middle, and top 40 %, as displayed in Table 4.2.

Table 4.2 the proportion of HCI in three classes for different years

<b>Three classes</b>	<b>2011</b>	<b>2014</b>	<b>2017</b>
Bottom 40 %	44.85	42.83	43.68
Middle	33.67	36.50	36.19
Top 40 %	21.46	20.66	20.13
Total	100.00	100.00	100.00

Table 4.2 shows that approximately 43–45% of the pre-retirement population in Thailand had HCI values in the bottom 40% class (HCI values of 0.000 through 0.599), which was the general trend from 2011 through 2017. However, roughly 20% of the pre-retirement population had HCI values in the top 40% class, but there was a decrease from 21.46% in 2011 to 20.13% in 2017. Hence, the overall HCIs of most in the sample groups were at low levels, and the proportion of people who had a high level of HCI decreased over time.

The mean values of the three HCI components of knowledge, skill, and health status in different years are displayed in Table 4.3.

Table 4.3 Mean values for HCI and three HCI components in different years

<b>Year</b>	<b>Mean</b>			
	<b>HCI</b>	<b>Knowledge index</b>	<b>Skill index</b>	<b>Health status index</b>
2011	0.481	0.246	0.348	0.782
2014	0.477	0.300	0.414	0.773
2017	0.478	0.299	0.359	0.773

The mean values for HCI and the three HCI components of knowledge, skill, and health status range from 0 to 1. The mean HCIs in the three years surveyed were very

close (approximately 0.48). From 2011 to 2014 the mean value of the knowledge index increased from 0.246 to 0.300 and that of the skill index increased from 0.348 to 0.414. But from 2014 to 2017, both indices decreased, from 0.300 to 2.99 and from 0.414 to 0.359, respectively. In addition, the health status index also decreased, from 0.782 (in 2011) to 0.733 (in 2014) and remained at that level in 2017. Hence, the overall knowledge and skill indices of the sample group in the three surveys were quite low, but the health status of this group was quite high.

To achieve the first objective of this research, the Human Capital Index (HCI) in different years and in different groups is assessed, which involves analyzing HCIs for different genders, different residential areas (urban or rural), different regions, different average annual income, etc., as discussed below.

First, the mean HCI values in 2011, 2014, and 2017 according to gender are displayed in Figure 4.1.

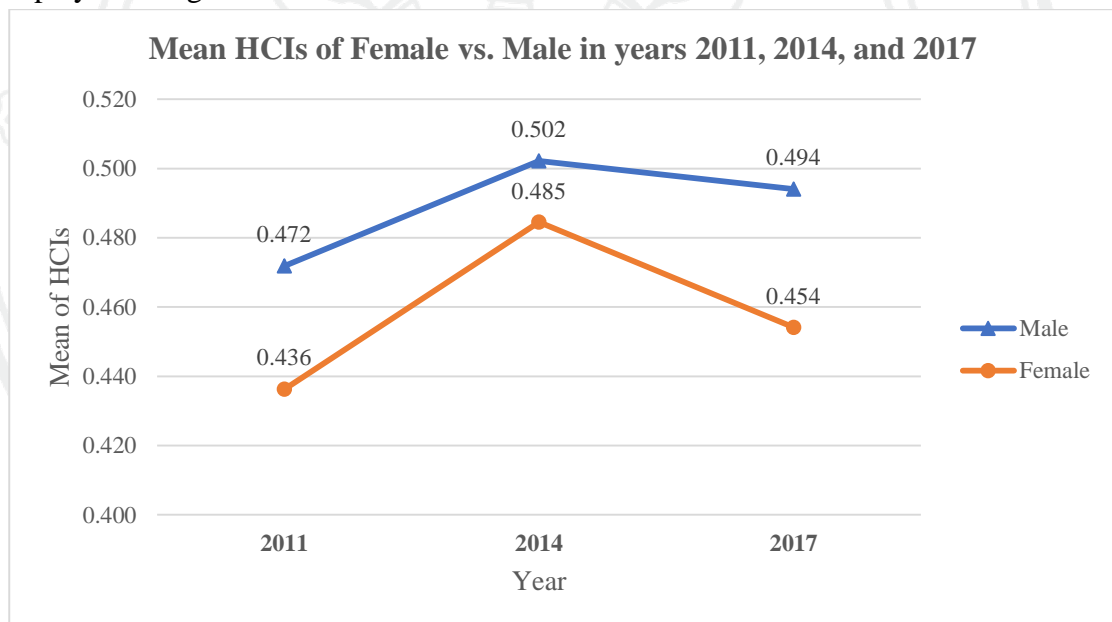


Figure 4.1 Mean HCIs of Female vs. Male in years 2011, 2014, and 2017

Source: Author

As indicated to the mean HCIs in Figure 4.1, males had higher HCIs than did females, on average and over time. Since Thai people aged 50–59 years grew up in a mostly traditional culture, females tended to have less formal education than did males. Moreover, in terms of the economic context, females tended to bear the responsibility



of taking care of children, doing housework, and thus engaging less in outside occupations as compared to males. Moreover, females were less likely to work in high-risk occupations or in highly skilled work as compared to males.

The HCI of males tended to increase from 0.472 in 2011 to 0.494 in 2017. However, nowadays the trend is toward more gender equality in terms of education and occupation. The mean HCI of females was higher in 2017 than in 2011, increasing from 0.436 to 0.454. (For details regarding the mean value of the three HCI components see [Appendix B, Table B1.](#))

The next measures of HCI, in different residential areas (urban vs. rural), are presented in Figure 4.2.

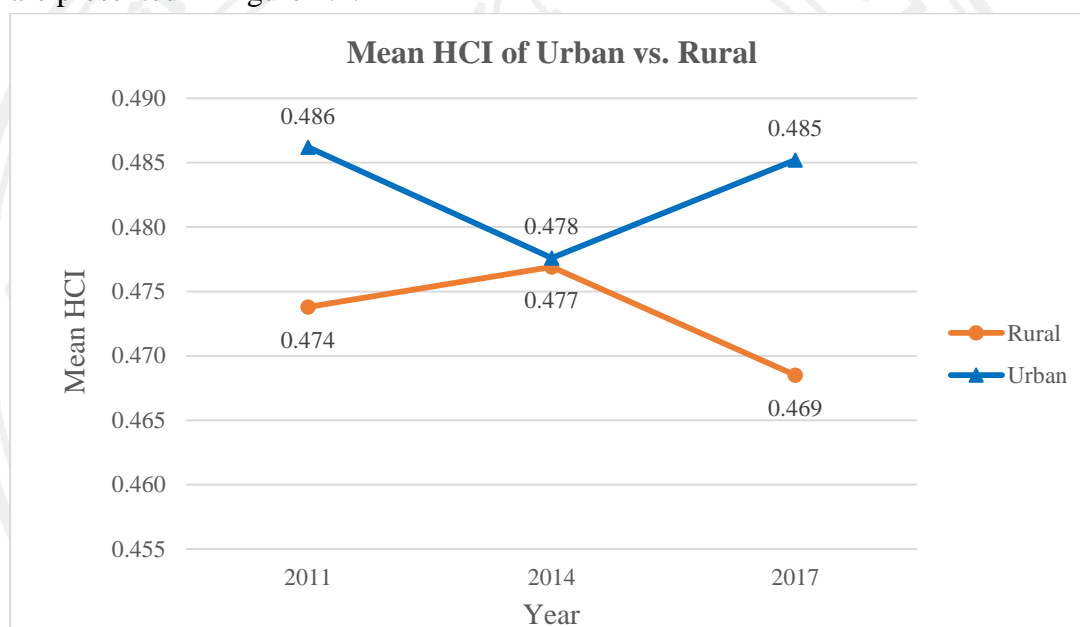


Figure 4.2 Mean value of HCIs in different residential areas in years 2011, 2014, and 2017

Source: Author

Figure 4.2 shows that the overall urban residents had higher HCIs than did those who lived in rural areas. This general trend continued for 2011 through 2017. However, in 2014 the mean HCI values of urban and rural residents were very nearly equal, at 0.478, and 0.477, respectively. The reason behind this is that most people in urban areas have higher levels of education and health status as compared to most people in rural areas. (The mean values of the three HCI components are provided in [Appendix B, Table B2](#))

Mean HCIs for 2011, 2014, and 2017 for people who lived in different regions (Bangkok, North, South, Central, and Northeast) are presented in Figures 4.3

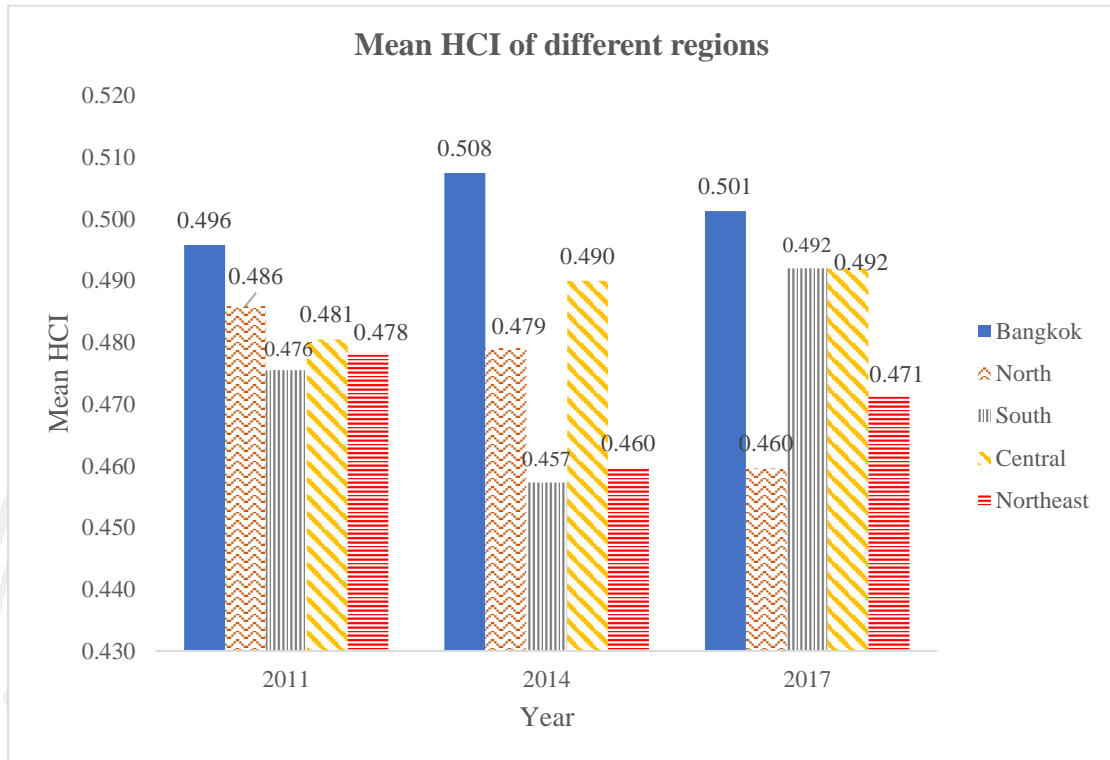


Figure 4.3 HCIs in different regions in 2011

Source: Author

Figure 4.3 displays 2011 HCIs according to region, indicating that most people from all regions had lower HCIs than did Bangkok residents. The mean HCIs of Bangkok residents was approximately 0.5 (for 2011 through 2017), which was greater than that of those living in other regions. Since Bangkok is the capital city of Thailand, many people from other regions tend to immigrate to Bangkok in order to find a job, study, etc. Therefore, most people who live in Bangkok end up with higher educational and skill levels than do most people in other regions. (The mean values of the three HCI components are provided in [Appendix B, Table B3](#))

HCI figures for 2011, 2014, and 2017 showing yearly income are presented Figure 4.4.

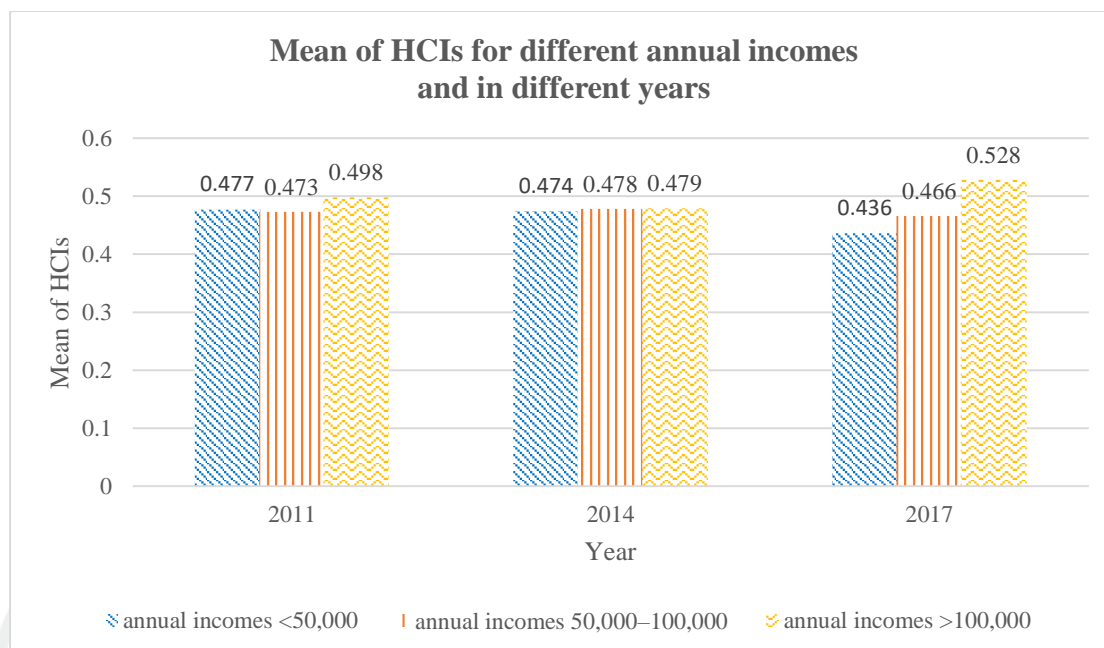


Figure 4.4 HCIs for different annual incomes and in different years

Source: Author

Figure 4.4 shows that most people surveyed in 2011, 2014, and 2017 who received an average annual income of less than 50,000 Thai baht and people who earned an average annual income of 50,000 to 100,000 Thai baht had lower mean HCIs than did people who earned an average annual income of 100,000 Thai baht per year and over. Moreover, the mean HCIs of people who earned an average annual income of 100,000 Thai baht per year and over increased from 0.498 in 2011 to 0.528 in 2017. Hence, people who earned a high average annual income tended to have a higher HCI.

The next measure is used to compare HCIs of people who lived in the top 10 provinces with those of people who lived in the bottom 10 provinces in terms of income per capita. The data for income per capita of the top 10 and bottom 10 provinces is proxied by the Gross Provincial Product (GPP) per capita in 2011, which was calculated by the Office of the National Economic and Social Development Council. (For the top 10 and bottom 10 provinces' income per capita in the years 2011, 2014, and 2017, see [Appendix A.](#))

Results of the calculation mean of HCIs for the top 10 and bottom 10 provinces via GPP per capita are displayed in Figure 4.5

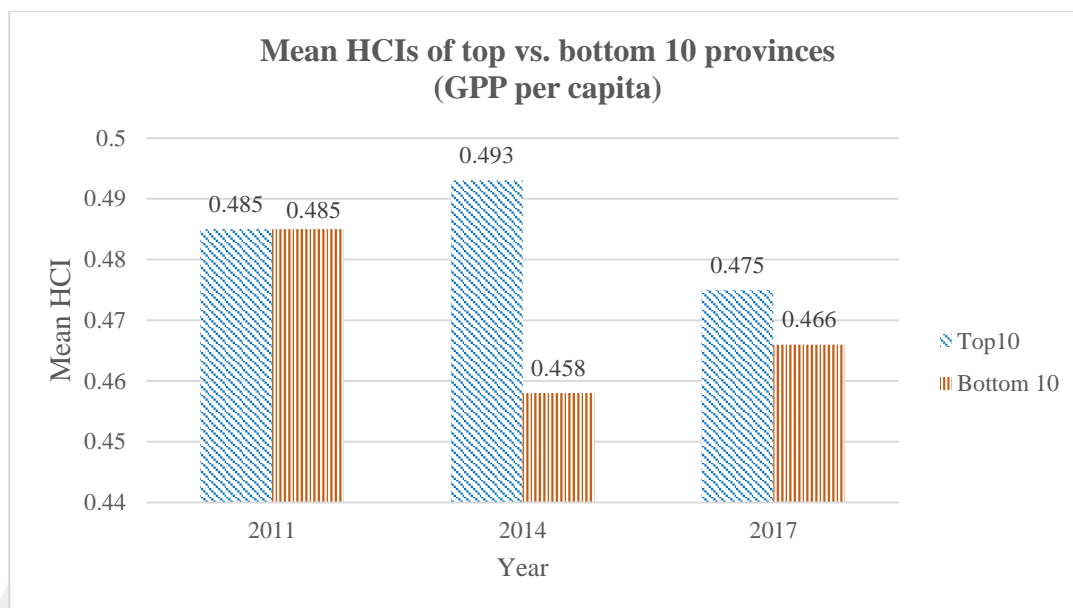


Figure 4.5 HCIs of people in top vs. bottom 10 provinces (GPP per capita) in different years

Source: Author

In 2011, mean HCIs for residents of both top 10 and bottom 10 provinces were equal. However, people who lived in the top 10 provinces had higher HCIs than did those who lived in the bottom 10 provinces in 2014 and 2017. For example, on average, the people who lived in the top 10 provinces had an HCI of 0.493 in 2014 and 0.475 in 2017, both of which are greater than the mean HCIs of people who lived in the bottom 10 provinces in 2014 and 2017. GPP per capita represents the average income per capita for each province. Hence, people who lived in the top 10 provinces (those that had the highest average income per capita), tended to have a higher human capital than did people who lived in the bottom 10 provinces. However, the mean HCI of the bottom 10 provinces increased from 0.458 in 2014 to 0.466 in 2017, but the mean HCI of the Top 10 provinces decreased.

Lastly are the results of Human Capital Index (HCI) calculations for 2011, 2014, and 2017 for people who were in the different age groups: pre-retirement population (whose age between 50–59 years), young-old population (whose age between 60–69 years), middle-old population (whose age between 70–79 years), and old-old population (whose age 80 years and above). Average HCIs of people in the different age groups are presented in Figure 4.6

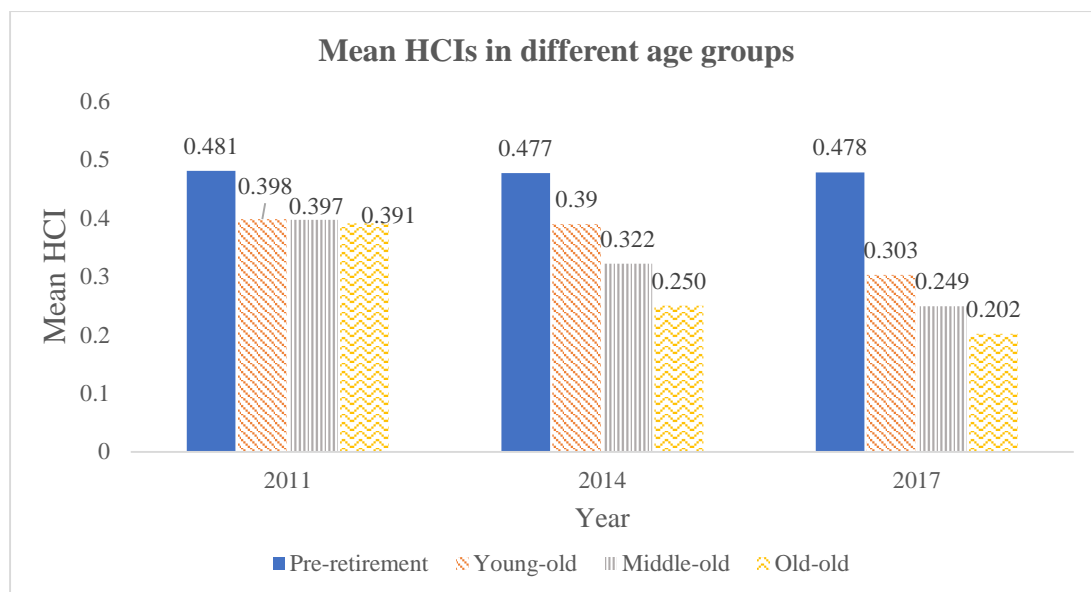


Figure 4.6 HCIs of people in different age groups in 2011

Source: Author

Figure 4.6 indicates that when people's age increases, their mean HCI tends to decrease, especially in the case of the HCIs of those aged 60 years and over. For example, the mean HCI of the old-old group decreased from 0.391 (in 2011) to 0.202 (in 2017). That means human capital of people aged 60 and over were tend to decrease when their age increase. On the other hand, the mean HCI of the pre-retirement group remained constant at about 0.48 from 2011 through 2017. (The mean values of the three HCI components are provided in [Appendix B, Table B6](#)).

Results of the HCI values for different groups in different years (in 2011, 2014, and 2017) can be summarized as follows: first, in every survey the mean HCIs for males is higher than that for females, and the HCIs of males tend to increase over time. Second, people who lived in urban areas had, on average, a higher HCI than did people who lived in rural areas. Third, people who lived in Bangkok had a higher HCI when compared with those living in other regions. Fourth, people who earned a high average annual income tended to have a higher HCI in every survey, and the people who lived in the top 10 provinces had a higher HCI than did people who lived in the bottom 10 provinces. Lastly, the mean HCIs of people aged 60 and over were likely to decrease the more they aged.

## 4.2 The determinants of Thai pre-retirement preparation

### 4.2.1 Determinants of housing and financial security preparation: Logit regression

This study used logit and probit regressions with maximum likelihood estimation in order to analyze the determinants of housing preparation and financial security preparation. Results of housing preparation and financial security preparation will be reported in terms of the value of the marginal effect because the marginal effect is a measure for predicting changes in probabilities as the binary dependent variable changes from 0 to 1. Hence, this study will analyze the marginal effect in order to explain the probability change of dependent variable when one unit of the independent variable of interest changes.

As for the dependent variable of housing preparation, the dependent variable = 1 if an individual or spouse is the owner of the house they live in. And the dependent variable = 0 if an individual or spouse is not the homeowner.

The dependent variable of financial security preparation (Model 2) refers to individuals having savings/assets (e.g., bonds, car, house, land, gold, other funds, etc.) to ensure their financial security (dependent variable = 1), or dependent variable = 0 if the individual has no savings/assets.

However, since the logit and probit regressions gave similar results in terms of statistical significance, this study also used log likelihood to compare nested models. The logit regression provides a higher log likelihood value than does probit regression. Maximum likelihood represents the fitted or predicted value for logit regression. Its estimation finds that coefficient ( $\beta$ ) maximizes expression (Hosmer & Lemeshow, 2000).

Hence, this study will show only the result of logit regression to interpret the marginal effect of each independent variable, because the log likelihood of logit regression is greater than that of probit regression, the goal is to maximize log likelihood, which will be used to represent the fitted or predicted value for logit regression. That number can be used to help compare the nested model. In addition, the distribution of the error term is not a normal distribution.

Therefore, this is the reason that the present research will show only the result of logit regression.

Determinants of housing preparation and financial security preparation are presented in Table 4.4.

Table 4.4 The determinants of housing and financial security preparation: Logit

Variables	Model 1	Model 2
	Hous (marginal effects)	Finsec (marginal effects)
Low_sec	-0.042 (0.035)	0.071 (0.110)
High_sec	-0.045 (0.042)	0.321** (0.145)
Occ_skill_lv2	0.014 (0.036)	0.713*** (0.180)
Occ_skill_lv3	0.627*** (0.037)	0.754*** (0.168)
Occ_skill_lv4	0.423*** (0.057)	0.354 (0.322)
Training	0.126*** (0.012)	0.237*** (0.040)
Health_inx	0.011*** (0.001)	0.001 (0.004)
Age	0.067*** (0.004)	-0.002 (0.011)
Female	0.196*** (0.024)	0.060 (0.066)
Single	-0.5114*** (0.0133)	-0.231* (0.124)
Divorced	-0.1715*** (0.0083)	-0.284*** (0.099)
Num_child	0.019*** (0.004)	0.036* (0.020)
Urban	-0.632*** (0.025)	-0.070 (0.065)
Northern	0.622*** (0.053)	0.123*** (0.015)
Southern	0.325*** (0.056)	0.333 (0.225)
Central	0.207*** (0.050)	0.274** (0.124)
Northeast	0.758*** (0.054)	0.777*** (0.193)

Variables	Model 1	Model 2
	Hous (marginal effects)	Finsec (marginal effects)
Avg_ann_inc	-0.001 (0.001)	0.041*** (0.003)
Alone	0.536*** (0.063)	0.177 (0.135)
Village_loud	0.131** (0.053)	0.106 (0.136)
Radio	0.136 (0.098)	0.128 (0.290)
TV	-0.015 (0.039)	-0.008 (0.102)
Print media	-0.027 (0.043)	0.078 (0.115)
Internet	-0.152*** (0.053)	0.340** (0.149)
Pub_helper		-0.056 (0.066)
Benefits		0.181 (0.154)
Doc1000person		0.124*** (0.044)
Working_hours		0.028 (0.020)
Informal_sec		0.296*** (0.068)
Myopia		0.310* (0.181)
money_receive		0.127** (0.064)
Money_given		0.080 (0.068)
Social_network		
Caregiver	0.077 (0.057)	
Constant	-2.950*** (0.257)	-1.526** (0.756)
Observations	64,899	8,015

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

Table 4.4 presents marginal effects of logit regressions in order to discuss the effects of variables on the probability of Thai pre-retirement housing preparation



and financial security preparation. The main findings regarding determinants of housing preparation (Model 1) are discussed as follows.

Variables that have positive impacts on Thai people's pre-retirement preparation in housing are Occ\_Skill\_Lv3, Occ\_Skill\_Lv4, training, health status index, age, gender (female), number of children, the regions of residence in (North, South, Central, and Northeast region), and living alone.

Results show that people who work at jobs requiring high occupational skill, which involves the ability to carry out technical operations, school teachers, medical practitioners, nurses, etc. (occupational skill levels 3 and 4) have a higher probability of housing preparation than do people who simple perform or manual labor (occupational skill level 1). Moreover, people who have undergone training from an occupational group have a 12% higher probability of preparing themselves in terms of housing than do people without such training. Hence, people with a higher occupational skill level and those who have extra training tend to be more prepare in terms of housing than people who manual labor and without training.

In the same manner, people with a higher health status index tend to be more prepare in terms of housing. When the health status index increases by one, the tendency for individuals to be prepared in terms of housing increases by 1.1%.

Moreover, older people have a higher tendency to prepare themselves for housing for their old age. When age increases one year, the probability of housing preparing for old age increases by 6.7%. The reason behind this is that when people get older, they might accumulate enough wealth to become the owner of a house, or they might realize the importance of housing when they are near to retirement. In terms of gender, results also show that females have a higher probability (by 19.6%) of housing preparation than males.

People with a greater number of children are also more prepared in housing than those who have fewer children. This signifies that when the number of children increases by one, the probability that people are prepared in housing increases by 0.19%. This may be because they might think about the importance of being a homeowner, and thus being an asset for their family or their children in the future.

Furthermore, people living in North, South, Central, and Northeast regions of Thailand have a higher probability of preparing for their old age in housing than do

people who live in Bangkok. The results show that people living in the North have a 62.2% higher probability of preparing themselves in terms of housing than do people who live in Bangkok. In the same manner, people living in the South, Central, and Northeast regions have a higher probability of housing preparation than do people who live in Bangkok by 32.5%, 20.7%, and 75.8%, respectively. The reason behind this is the price of houses in Bangkok is more expensive as compared to other regions.

In addition, people who live alone have a 53.6% higher probability of preparing themselves for housing than do people who live with their families. The probable explanation is that people who live alone are concerned about their old age since they are all alone and that there is no one around to take care of them in their old age while people who live with their families are less concerned about their old age as they believe that their family members can take care of them.

Getting news through village loudspeakers has a positive effect on housing preparation. People who receive information and news about preparation for old age through village loudspeakers have a 13.1% higher housing preparation than do people receiving such information from leaders in the community.

In addition to the aforementioned variables that have a positive effect on preparation, the factors which decrease the probability of pre-retirement preparation in housing are marital status (single and divorced), being in an urban area, and getting news through the Internet.

As for marital status, people who are single and divorced have a lower tendency to prepare for housing than do people who are married. People who are single have a 51.14% lower probability of housing preparation than do married people, and divorced people have a 17.15% lower probability than do married people.

In terms of residence, people who live in the urban areas are less likely to prepare for housing than are people living in rural areas. The reason for this may be that housing is more affordable in rural than in urban areas. Thus, rural residents appear to be 63.2% more prepared than their urban residents.

Finally, people who receive their news and information regarding preparations for old age through the Internet have a lower tendency to prepare for housing than do people who receive information and news from leaders in the community, by 15.2%. Since, people who receive news or information about importance of housing and

adequately address the problems of homelessness among the elderly from community leaders, which makes them feel that such news is important (and that they should keep up to date with it). As for the variable “caregiver,” it is statistically insignificant; having a caregiver does not have any impact on the probability of housing preparation.

Analysis of the determinants of financial security preparation are also presented in Table 4.4 (Model 2). The marginal effects of various variables on financial security preparation are discussed below.

The variables that increase the probability of pre-retirement preparation in financial security are: “High\_sec”, “Occ\_skill\_lv2”, “Occ\_skill\_lv3”, training, number of children, Northern, Southern, Central, and Northeast residence, average annual income, Internet, number of doctors, employment in the informal sector, money received, and myopia, which are positively and statistically significant.

First, education level and financial security preparation are positively related. People who continue beyond secondary school have a higher tendency to prepare for financial security than do people who graduated in secondary school.

Those people with higher occupational skills (working at occupational skill levels 2 and 3) tend to better prepare themselves in terms of financial security than do people who work at occupational skill level 1 (reference group). Moreover, people who participate in occupational club training tend to have a higher probability of financial security preparation than do those who do not participate in such training, by 23.7%.

As for the number of children, people with more children are more prepared in terms of financial security than are those who have fewer children. This signifies that when the number of children increases by one, this increases the probability of being prepared in terms of financial security by 3.6%.

As for residence, people living in Northern, Central, and Northeast regions of Thailand have a higher probability of preparing for their old age in terms of financial security than do people living in Bangkok, by 12.35%, 27.4%, and 77.7 %, respectively. The likely reason is that the cost of living in Bangkok is quite high as compared to other regions. Therefore, people living in Bangkok tend to save less than do people in other regions.

Likewise, people with high income are more likely to be prepared financially than people with less income. Results show that an increase in income by 10,000 Thai

baht per year increases the probability of being prepared in financial security by 4.1% because people who have a high average annual income have a greater ability to save for financial security.

People who receive information and news about preparation for old age through the Internet have a 34% higher tendency to prepare themselves for the financial security than do people who receive that information through leaders in the community.

As well, the number of doctors in public hospitals per 1,000 persons and financial security preparation are positively related. An increase in the number of doctors in public hospitals per 1,000 persons increases by one is associated with

a 12.42% increase in financial security preparation since the provision an adequate number of doctors in public hospitals can help in cost reduction for healthcare.

In addition, people who work in the informal sector have a 29.6% higher tendency to be prepared in terms of financial security than do people who work in formal sector. The reason could be that people who work in the informal sector might work harder than people who work in the formal sector and do not receive any benefits such as social security or a public pension after retirement. Hence, people who work in the informal sector tend to save more than people who work in the formal sector.

Myopia refers to the attitude of not needing someone to help oneself in performing daily living activities. Such persons have a 31% higher probability of preparing themselves for financial security than non-myopia. Since myopic people do not want to be dependent on others, they tend to be more serious about creating financial security for their future after retirement.

Finally, people who received money from their family have a 1.44% higher probability of preparing themselves for financial security than those who did not. People who have additional source of income which exhibit family altruism, tend to have a high probability of preparing for financial security their old age.

On the other hand, the variables that decrease the probability of the Thai pre-retirement population's preparation for financial security are being single and being divorced. People who are single and divorced have a lower probability (23.1% and 28.4%, respectively) of financial security preparation than married people.

#### 4.2.2 Determinants of preretirement preparation in three dimensions: OLS

This section discusses the results of Models 3–6 by using the Ordinary Least Squares (OLS) method. Model (3) is physical health preparation (Phys), Model (4) is leisure activities and social relationship activities preparation (Leisoc), Model (5) is safe environment preparation (Safe), and Model (6) is overall preparation index that indicates overall retirement preparation of the pre-retirement population. Results are presented in Table 4.5.

Table 4.5 Determinants of retirement preparation in three dimensions and overall: OLS

Variables	(3)	(4)	(5)	(6)
	Phys_inx (Coefficient)	Leisoc_inx (Coefficient)	safe_inx (Coefficient)	Prep_inx (Coefficient)
Low_sec	-0.008 (0.034)	0.004 (0.006)	-0.005 (0.007)	0.005 (0.005)
High_sec	0.009 (0.038)	0.005 (0.006)	0.011 (0.008)	0.012** (0.006)
Occ_Skill_Lv2	0.231*** (0.060)	0.077*** (0.005)	0.009 (0.006)	0.052*** (0.009)
Occ_Skill_Lv3	0.117** (0.057)	0.136*** (0.004)	0.022*** (0.006)	0.085*** (0.008)
Occ_Skill_Lv4	0.116 (0.080)	0.155*** (0.007)	0.208*** (0.011)	0.073*** (0.012)
Training	0.035*** (0.013)	0.063*** (0.002)	0.028*** (0.004)	0.026*** (0.002)
Health_inx	0.013*** (0.001)	-0.000** (0.000)	-0.002*** (0.000)	0.001*** (0.000)
Age	0.018*** (0.003)	0.001* (0.000)	0.003*** (0.001)	0.002*** (0.001)
Female	0.870*** (0.020)	0.021*** (0.003)	-0.110*** (0.005)	0.042*** (0.003)
Single	-0.056 (0.041)	-0.039*** (0.007)	0.085*** (0.010)	-0.103*** (0.007)
Divorced	-0.073** (0.031)	-0.015*** (0.004)	0.092*** (0.006)	-0.053*** (0.006)
Num_child	-0.008 (0.006)	0.016*** (0.000)	0.037*** (0.001)	0.001 (0.001)
Urban	0.048** (0.020)	-0.022*** (0.003)	0.013*** (0.004)	-0.009*** (0.003)
Northern	0.039 (0.055)	0.107*** (0.008)	-0.069*** (0.012)	0.061*** (0.009)
Southern	0.016 (0.077)	0.048*** (0.009)	-0.090*** (0.012)	0.012 (0.012)

Variables	(3) Phys_inx (Coefficient)	(4) Leisoc_inx (Coefficient)	(5) safe_inx (Coefficient)	(6) Prep_inx (Coefficient)
Central	0.061 (0.043)	0.021** (0.008)	-0.075*** (0.011)	-0.001 (0.008)
Northeast	0.153** (0.064)	0.082*** (0.008)	-0.029** (0.012)	0.039*** (0.010)
Avg_ann_inc	0.006*** (0.001)	-0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
Alone	-0.029 (0.040)	-0.017** (0.008)	-0.036** (0.018)	0.006 (0.008)
Village_loud	0.007 (0.044)	0.043*** (0.005)	-0.015* (0.009)	0.002 (0.007)
Radio	-0.034 (0.092)	0.054*** (0.009)	-0.029* (0.016)	0.013 (0.012)
TV	0.027 (0.035)	0.049*** (0.004)	0.001 (0.007)	0.013** (0.005)
Print media	0.119*** (0.038)	0.075*** (0.004)	0.019** (0.008)	0.026*** (0.006)
Internet	0.168*** (0.043)	0.064*** (0.006)	0.045*** (0.011)	0.035*** (0.007)
Pub_helper	0.126*** (0.021)		0.028*** (0.004)	0.009*** (0.003)
Benefits	0.075 (0.047)		0.088*** (0.034)	0.011 (0.008)
Num_doctor	0.206 (0.132)		0.290*** (0.033)	-0.015 (0.020)
Working_hours	-0.029*** (0.006)			-0.000 (0.001)
Informal_sec	-0.056*** (0.021)	-0.018*** (0.003)		0.033 (0.021)
Myopia	0.056 (0.064)	-0.025*** (0.007)	0.173*** (0.034)	0.003 (0.009)
Money_received	0.009 (0.020)	0.014*** (0.003)		0.007** (0.003)
Money_give	-0.011 (0.021)	0.002 (0.003)		-0.002 (0.003)
Social_network	0.070*** (0.021)	0.031*** (0.003)		0.019*** (0.003)
Caregiver			0.000 (0.009)	0.030** (0.013)
Constant	1.769*** (0.238)	-0.076** (0.030)	0.263*** (0.049)	0.244*** (0.038)
Observations	7,946	46,221	10,638	8,004
R-squared	0.240	0.106	0.430	0.176

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors in parentheses.

In interpreting the OLS results, coefficients are used to explain the average change in the dependent variable for one unit of change in the independent variable while holding other independent variables in the model constant. The OLS method (for Models 3–6) identifies variables that affect the preparation of the pre-retirement population in three dimensions as well as overall retirement preparation.

First is physical health preparation (Model 3 in Table 4.5). People who have a high occupational skill level (occupational skill levels 2 and 3) have more preparation in physical health than do people who work with occupational skill level 1 (reference group). The health status index also has a positive effect on physical health preparation. When the health status index increases by one, it increases the physical health preparation index by 0.013. This shows that when people have a high health status, they are more able to perform activities in daily life, which is one way to exercise and which in turn enhances their physical health preparation.

As for age, age of each person has a positive effect on physical health preparation. When age increases by one year, the physical health preparation index increases by 0.018. These results make sense because older people might be aware of the importance of maintaining physical health because they know they have a greater chance of experiencing problems and limitations with their health.

As for gender, females, who for the most part are less likely to consume alcohol and smoke, are better prepared in terms of physical health index (by 0.87) than are males. Additionally, individuals who are divorced are less likely to be prepared for their old age in terms of physical health than are individuals who are married.

People living in urban areas are more likely to be prepared for physical health when compared with people who live in rural areas. And people living in the Northeast are more prepared in terms of physical health than people living in Bangkok.

Average annual income also has a positive effect on physical health preparation index. When annual income increases by 10,000 baht, it increases the physical health preparation index by 0.006. It seems only natural that people who earn a high income will prepare more for their old age in terms of physical health since they are better able to afford nutritious food (vegetables, fruits, etc.) and annual health check-ups, etc.

The variable of print media and the Internet also have a positive effect on physical health preparation index. People who receive information and news through

print media or the Internet are better prepared in terms of physical health than are people who receive that information through leaders in the community. Findings here indicate that print media and the Internet are more effective channels for providing information and promoting preparation for physical health than providing information through community leaders.

As for healthcare visits, people who receive public health service or healthcare visits provided by health personnel or volunteers for the elderly will have more physical health preparation index (by 0.126) than people who did not receive such care. The “Pub\_helper” variable is positively and statistically significant at 1%. ( $p < 0.01$ ). The reason behind this is that public helpers, such as health personnel or volunteers for the elderly at home have more knowledge about taking care of physical health. Therefore, people who receive such services and get advice from public helpers tend to be well prepared in physical health.

The number of working hours per day negatively affects physical health preparation. People who work long hours on a daily basis have less time for leisure activities for maintaining good physical health. An increase in working hours by one hour per day leads to a physical health preparation index reduction of 0.029. Likewise, working in the informal sector also has a negative effect on physical health preparation. The result shows that people who work in the informal sector prepare themselves less in terms of their physical health index (by 0.056) than do people who work in formal.

On the other hand, people who have a social network experience a positive effect on their physical health preparation index. Result shows that people who have a social network are more prepared in terms of physical health index (by 0.07) than are people who do not have a social network. Since people who have a strong social network usually participate in community activities (e.g., Elderly Day, Songkran Day, ritual ceremonies, etc.), this allows them to share knowledge about how to look after themselves and ways to prepare for maintaining good physical health.

In the next preparation dimension, results of leisure activities and social relationship activities preparation (Model 4 in Table 4.5) show that the components of human capital (skill, and health status index) influence leisure activities and social relationship activities preparation index.



People who work in high-skills occupations have a higher leisure activities and social relationship activities preparation index than do people who work at occupational skill level 1 by 0.077, 0.136, and 0.155, respectively. Furthermore, people who obtained training from an occupational club also have a higher preparation in terms of leisure activities and social relationship activities than do people who do not obtained such training, by 0.063. The probable explanation of this is that the people who have a high skill are those who work in high-skills occupations or who obtained training from an occupational club. Thus, such people might give more importance to the joint activities of their occupational club as well as other clubs by using their leisure time to accumulate more skills. Hence, they are more likely to be prepared in terms of leisure activities and social relationship activities.

In contrast, the health status index has a negative effect on leisure activities and social relationship activities preparation index. Perhaps this is because people with less health status index might have many limitations on their physical health for participating in group activities.

Other variables also affect preparation for leisure activities and social relationship activities for the pre-retirement population. For example, the age of each person negatively affects the person's leisure activities and social relationship activities. When age increases one year, leisure activities and social relationship activities index decrease by 0.018. Older people are less likely to prepare for leisure activities and social relationship activities since older people face many obstacles, such as limitations on their physical health, that sometimes make it difficult to participate in club or group activities outside their home.

Individuals who are single and divorced are less likely to be prepared for their old age in leisure and social relationship activities than are individuals who are married status. Results show that single individuals are less prepared in leisure and social relationship activities than are individuals who are married. And people who are divorced are less prepared in leisure and social relationship activities than are married individuals. Individuals who are married tend to do better in terms of leisure and social relationship activities perhaps since they might joint clubs or participate in activities with their family members. And the more children in a family, the greater the positive effect on leisure activities and social relationship activities. When the number of

children increases by one, the leisure activities and social relationships activities preparation index increases by 0.016.

In terms of residence, people who live in urban areas are less likely to prepare for leisure activities and social relationship activities compared to people who live in rural areas. Besides, people who live in regions other than Bangkok (Northern, Southern, Central, and Northeast) are more prepared in leisure activities and social relationship activities than people who live in Bangkok.

Average annual income also has a negative effect on leisure and social relationships activities. When the annual income of a person increases by 10,000 baht, that person will decrease preparation in leisure and social relationships activities by 0.001. The likely reason is that people who earn a high annual income might spend more time at their job or their business and thus have less time to enjoy their life and participate in activities in groups or clubs. And people who live alone are less likely to prepare for leisure activities and social relationship activities index (by 0.017) compared to people who live with others.

Besides, village loudspeakers, radio, print media, television, and the Internet have positive effects on leisure activities and social relationship activities preparation. People who get information about how to prepare by themselves for old age in order to enjoy leisure and social relationship activities through village loudspeakers, radio, print media, television, and the Internet do better at preparing for such activities than do people who get information through leaders in the community (based group). Village loudspeakers, radio, print media, television, and the Internet are channels that can promote the preparation in leisure activities and social relationships activities. Hence, policymakers might use these effective channels to provide information about how to prepare for leisure activities.

In contrast, working in the informal sector is negatively correlated with preparation for leisure and social relationship activities. Individuals who work in the informal sector are less prepared in terms of leisure and social relationship activities index (by 0.018) than are individuals who work in the formal sector. The reason is that individuals who work in the informal sector might have different work schedules than those working in the formal sector, and individuals who work in the informal sector

might work for longer hours and not have time to participate in group or club activities in the community.

Besides, the myopia variable has a negative effect on leisure activities and social relationship activities preparation. Myopic individuals are less leisure and social relationship activities index (by 0.0538) than are people who are not myopic. Myopic individuals do not need anyone to help them to perform daily living activities because they do not consider themselves as disabled. This shows that myopic individuals might not like to join any activity or create a social network with the people in the community because they do not want to be dependent on others.

On the other hand, people who received money from family members have more the leisure and social relationship activities preparation index (by 0.014) than are people who did not receive any money. Altruism within the family might lead to social altruism and thus lead to greater participation in club or group activities.

As for social networking, people who tap into social networks experience has a positive effect on their leisure and social relationship activities preparation index by 0.070, greater than that of people who do not have a social network. People who have social networks usually also participate in community activities, clubs, or groups with their friends and other members of a community.

The next preparation dimension is safe environment preparation, presented in Table 4.2 (Model 5), also showing that the components of human capital (skill, and health status index) influence safe environment preparation.

In contrast, having high occupational skills positively affects safe environment preparation. Results show that people who are in high-skills occupations have a higher of safe environment preparation index than do people who work in occupational skill level 1. Moreover, people who have obtained training from an occupational club are more likely to prepare and adapt their house to create safe environment than are people who did not obtain training.

On the other hand, the health status index has a negative effect on safe environment preparation index, because individuals who have good health might not think about the importance of creating a safe environment and preparing themselves for a safe environment in their old age. When the health status index increases by one, it decreases safe environment preparation index by 0.002.

In terms of age, an increase of one year in age will increase the preparation for a safe environment index by 0.003. Older people in general might be more concerned than younger ones about creating a safe environment in their homes, females, in particular, are less prepared (by 0.11) than males for a safe environment in their old age. This might be due to less ability of females compared to males to adapt or create a safe environment of their homes.

In addition, single and divorced variables have a positive effect on safe environment preparation index. Single and divorced individuals are more likely to prepare for safe environment than are married people. Besides, the number of children has a positive impact on safe environment preparation index. An increase in family size of one child, it increases safe environment preparation index by 0.037. This suggests that parents with more children take more seriously the need for creating a safe living environment.

The urban variable also has a positive effect on safe environment preparation index. People who live in urban areas are more likely to prepare for a safe environment when compared with people who live in rural areas. However, people who live in Northern, Southern, Central, and Northeast areas are less likely to prepare themselves for a safe environment than were people who live in Bangkok. In other words, people who live in Bangkok province are more prepared in terms of providing a safe home environment than are those in other regions in Thailand.

Average annual income also has a positive effect on safe environment preparation index. An increase of 10,000 baht in annual income, it increases safe environment preparation index by 0.002. Besides, people who live alone are less likely to prepare for safe environment than those who live with others.

Print media and the Internet can also have a positive effect on safe environment preparation index. These media are more effective in providing information about safe environment preparation for retirement than are community leaders.

Receiving public health service or healthcare visits by health personnel or volunteers for the elderly at home has a positive effect on safe environment preparation index. People who receive public health service or healthcare visits show a greater safe environment preparation index (by 0.028) than do people who do not receive such care. The likely reason for this is that public helpers have more knowledge about caregiving

and creating or preparing a safe environment for the elderly. Therefore, people who receive their services and get suggestions from them might be expected to be better prepared in terms of a safe environment.

In the same manner, getting benefits from government health services (e.g., elderly card, health card, social security card, government or pensioner welfare, state enterprise welfare) also has a positive effect on the safe environment preparation index. People who get benefits from government health services are more prepared in safe environment preparation than are those who do not receive such aid, by 0.088. Since individuals who get benefits from health services can save money on their health care, they are more able to afford adapting their houses to create a safe environment for their old age.

The number of doctors in public hospitals per 1,000 population also has a positive effect on safe environment preparation index. An increase in the number of doctors in public hospitals of one doctor per 1,000 population increases safe environment preparation index by 0.29. Since the cost of seeing a doctor in a public hospital is less expensive than in a private hospital and if there are more doctors in public hospitals, this would make it cheaper and more convenient for the pre-retirement population to get information and suggestions about safe environment preparation for their old age.

In contrast, the myopia variable can have a positive effect on safe environment preparation index. A myopic person is better prepared in terms of a safe environment preparation index (by 0.172) than is a non-myopic person. As myopic individuals tend to prepare more for a safe environment by creating a living environment that will allow them to carry out daily living activities without need for a caregiver or public helper.

Lastly, the results of the overall preparation index (model 6) indicate the overall retirement preparation from the 5 dimensions of this research, showing that some variables, that are components of human capital (level of education, skill, and health status index) influence overall retirement preparation. The explanation of the important variables of this study follows.

The upper secondary school (High\_sec) variable and the overall preparation index are positively related. People who graduated beyond secondary school are better prepared for retirement than are people who graduated in secondary school. Moreover,

people who work in high-skills occupations have a higher prepared for retirement than are people who work at occupational skill level 1. In the same manner, people who obtained training from an occupational club are more likely to prepare for their old age retirement than are people who did not obtain training.

Additionally, health status index also has a positive effect on individual's preparation index. When the health status index increases by one, it increases the preparation index by 0.001. This shows that when people have a higher health status index, they are more able to prepare themselves for retired life, such as being able to perform activities of daily life and participate in club activities, which is one way to exercise and relax and which in turn enhances their physical health and social relationship preparation.

As for age, it has a positive effect on ones' preparation index. When age increases by one year, the physical health preparation index increases by 0.002. Older people might be aware of the importance of maintaining physical health, financial security, safe environment preparation, etc. because they know they have a greater chance of experiencing problems, limitations with their health, or accidents and illnesses. Females are more prepared for overall retirement preparation index (by 0.042) than are males.

People who have a high average annual income are more prepared in overall retirement preparation than are those with less income. And an increase in income by 10,000 Thai baht per year, it increases the preparation index by 0.001. As for communication channels, people who receive information and news promoting preparation for old age through television, print media, and the Internet are more prepared for retirement compared to those receiving such information directly from leaders in the community.

As for healthcare visits, people who received public health service or healthcare visits provided by health personnel or volunteers for the elderly are better prepared for retirement than are people who do not receive such care. Since public helpers have more knowledge about taking care of physical health, safe environment preparation, etc., people who receive such services and get advice from public helpers tend to be well prepared for their old age.

Additionally, people who receive money from family members, and people who have a social network experience are positive effect on overall preparation index. Result shows that people who have family altruism and social network are more prepared for their old age than are people who do not have such things.

In conclusion, the components in the Human Capital Index of this study—knowledge (level of education), skills (including occupational skills and training), and health status index—which have an influence on the preparation of the pre-retirement population in Thailand in 5 dimensions and overall preparation index as follows;

The determinants of housing preparation and financial security preparation were identified by employing logit and probit regressions. The result of a marginal effect also showed that the level of education (upper secondary school) is positively associated with financial security preparation. Furthermore, OLS estimation also shows that the level of education has a positive effect on the overall preparation index.

Occupational skill level and training, which are components in the Human Capital Index (HCI), are positively associated with housing and financial security preparation, and they also have a positive effect on physical health, leisure activities and social relationship activities, and safe environment preparation index, as well as on the overall preparation index. Hence, the promoting of training courses and promoting participation in occupational clubs can encourage people to gain higher skills, increase income, and increase the ability of people to save for the future. Developing higher skills can increase the probability that people will be better prepared for financial security and increase the probability that people will also be better prepared in terms of housing (as a result of attaining higher occupational skills, more savings, and accumulating more wealth). In addition, promoting participation in occupational clubs not only increases people's skills, but also has a positive impact on leisure and social relationship activities preparation etc.

The health status index has positively associated with housing preparation and has a positive effect on physical health preparation index. Hence, promoting a higher health status, such as by providing free vaccination and promoting activities to improve mobility and cognition through exercise, calculating activities, etc. can encourage the pre-retirement population to focus on preparation of their physical health for their later

years. In addition, when people are healthy they can reduce the cost of health care, thus allowing them to spend on things such as preparing for housing and overall preparation for their retirement.

Therefore, promoting these components in the Human Capital Index (HCI) can encourage the preparation of pre-retirement population in Thailand. That can be helpful in improving the quality of the Thai pre-retirement population and elderly in their old age and future.

Besides, the public helper variable has a positive effect on physical health and safe environment preparation index. People who receive public health services or healthcare visits provided by public helpers will have better preparation in terms of future physical health and a safe environment than people who do not receive such help. Public helpers, such as health personnel or volunteers for the elderly at home, have more knowledge about taking care of physical health and creating a safe environment in their home. Hence, an increase in the number of public helpers can encourage people to take better care of their physical health and prepare a safe environment for themselves for their old age. In addition, social networks has a positive effect on physical health, and leisure and social relationship activities preparation index. People who have social network involvement and participated in community activities have better preparation in physical health as well as leisure and social relationship activities preparation than people who do not engage with social networks.

### **4.3 Discussion**

The variables that are components of the Human Capital Index of this study—knowledge (education level), skill (including occupational skill and training), and health status—have positive correlations with retirement preparation among the pre-retirement population in many dimensions. For example, skills and health status are positively associated with housing and financial security preparation. These also have a positive impact on physical health preparation index. The results are consistent with Kumruangrit (2014), who concluded that the components in the Human Capital Index have a positive effect on physical health, mental health, financial security, housing, and caregiver preparation. Moreover, an education level (indicator in the knowledge index of this study) has a positive impact on the overall preparation index (which included



the 5 preparation dimensions of this study). These results are similar to those of Apouey (2018) and Yommana (2008), which argue that education level has a positive effect on physical activity and physical health preparation.

Additionally, the specific variable of each model in this study, such as working hours, also gave results similar to Luoh and Herzog (2002), who elaborate that working hours had a negative effect on physical health. Moreover, examination of the social network variable showed a positive effect on physical health preparation index, in accordance with the study of Thanakwang and Soonthorndhada (2011), which found that engagement with a social network had a positive impact on promoting healthy aging (physical health preparation).

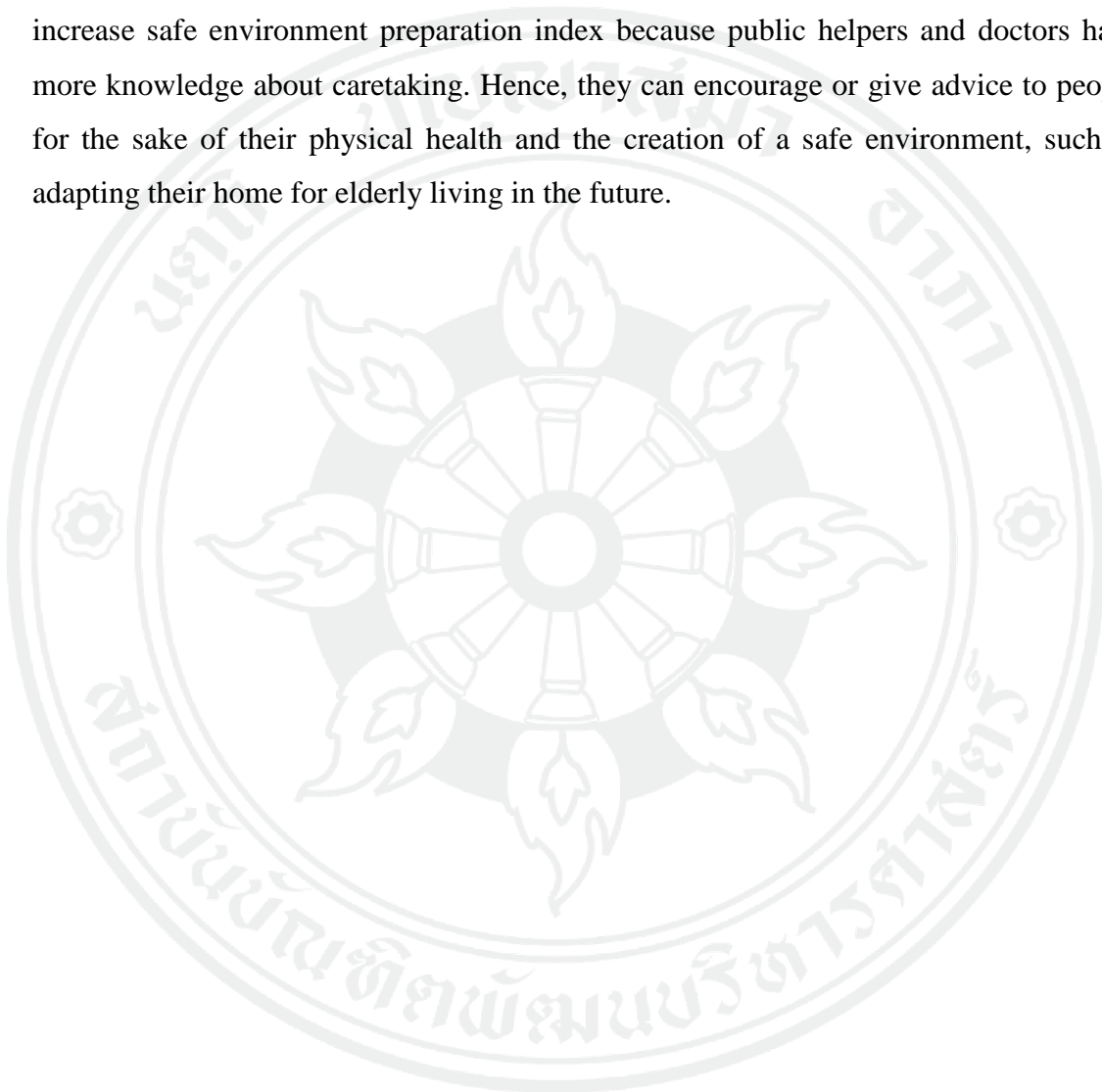
In the same way, the family altruism variable, which are proxied by individuals receiving money from a family member, has a positive effect on leisure and social relationship activities preparation. These results are consistent with Apouey (2018), who shows that receiving money had a positive effect on social ties preparation.

In addition, the myopia variable has a negative effect on leisure activities and social relationship activities preparation index, consistent with Apouey (2018). On the other hand, the myopia variable of this study has an opposite effect, contradicting the study of Apouey (2018) in safe environment preparation. Apouey (2018) found that myopia negatively affects home adaptation preparation, but this study shows that the myopic individual has better preparation by adapting or creating a safe environment in the home. Thus, in the Thai context, myopic people who do not need a caregiver or plan on relying on one in the future might be more concerned about the importance of creating a safe environment and thus remaining independent after their retirement.

Labor market status (having an informal job) in this study has a negative effect on leisure activities and social relationship activities preparation index, which is opposite from the results of Apouey (2018), which found that the being a member of the informal labor force results in better preparation in terms of physical activity and intellectual skills (Note: physical activity and intellectual skills are considered equivalent to leisure activities and social relationship activities of this study) than did the formal labor force. The reason for the different results might be that an informal job in the Thai context might involve very different schedules in terms of working hours compared to working in

a formal job. For example, informal job schedules may not be flexible enough or working hours short enough to allow for participation in club or community activities.

Lastly, the policy variable of public helpers, which have a positive role in encouraging preparation in terms of future physical health and creating a safe environment. Similarly, an increase in the number of doctors in public hospitals can also increase safe environment preparation index because public helpers and doctors have more knowledge about caretaking. Hence, they can encourage or give advice to people for the sake of their physical health and the creation of a safe environment, such as adapting their home for elderly living in the future.



## CHAPTER 5

### CONCLUSION AND POLICY IMPLICATIONS

#### 5.1 Conclusion

This study has two main objectives. The first objective is to compare the value of the individual's Human Capital Index (HCI) in different groups and different years. The second objective is to examine and support the components of the Human Capital Index that determine the preparation of the pre-retirement population in Thailand in order to improve the quality of life of the Thai elderly. This study uses secondary data from the National Statistical Office's three survey reports of the Older Persons in Thailand (conducted in 2011, 2014, and 2017), and this study also uses data such as the number of doctors per 1,000 population from the Ministry of Public Health, in order to study the effect of policy variables on retirement preparation among the Thai pre-retirement population.

The analysis of the HCIs in different groups of data (in 2011, 2014, and 2017) can be summarized as follows: first, the mean HCIs of males is higher than that of females. Second, people who lived in urban areas had a higher average HCI value than did people who lived in rural areas. Third, people who lived in Bangkok had a higher HCI when compared to those living in other regions, on average. Fourth, people who had a high average annual income tended to have a higher HCI in every survey, and the people who lived in the top 10 provinces (in terms of GPP) had higher HCIs than did people who lived in the bottom 10 provinces. Lastly, the mean HCIs among the pre-retirement group (50–59 years) were higher than they were for people aged 60 years and above. Moreover, people aged 60 years and above had a chance of a decrease in their HCIs as they aged.

In order to fulfill the second purpose of this study, which is to examine the components in the Human Capital Index that determined the level of preparation of the pre-retirement population in Thailand, the determinants of housing preparation and

financial security preparation were identified by employing the logit regression. The marginal effect of logit indicated that the education level is positively associated with financial security. Moreover, OLS estimation show that the education level have a positive effect on the preparation index (statistically significant at 5%,  $p < 0.05$ ). Additionally, occupational skill and training, which are components in the Human Capital Index (HCI), are positively associated with housing and financial security preparation. Furthermore, OLS estimation also show that the occupational skill and training have a positive effect on physical health, leisure activities and social relationship activities preparation index, at the 0.01 significance level.

Moreover, the health status index also is positively associated with housing preparation and also has a positive effect on physical health preparation index. Hence, encouraging people to strive for a higher health status, such as promoting exercise to maintain the mobility and etc., can promote an appreciation of the need for retirement preparation and for people to prepare themselves in terms of physical health because when people are healthy they can reduce the cost of illness, accumulate more wealth, and retain the resources necessary for preparation in housing (becoming a homeowner).

The analysis of the components of the Human Capital Index, the specific factors of each model, and the policy variables of this study, including the results of previous studies such as Kumrungrit (2014), Apouey (2018), Thanakwang and Soonthorndhada (2011), identifies the components in the Human Capital Index, as well as the preferences, expectations, and policy variables that can affect the preparation of people before their retirement.

Hence, promoting these components in the Human Capital Index (HCI) can be key factors to encourage the preparation of pre-retirement population in Thailand. This can be helpful in improving the quality of the Thai pre-retirement population and well-being of the elderly in their old age and in future years.

## **5.2 Policy implications**

These will be the foundation for suggestions regarding how to support and promote the components in the Human Capital Index (knowledge, skill, and health status indices). The knowledge of individuals (which proxied by level of education) is

positively associated with financial security preparation, and it also has a positive effect on safe environment preparation index. Hence, the government should support not only school and university education, but also promote lifelong learning for the Thai population, which can lead to increases in safety environment preparation as well as financial preparation. For example, if the public sector provides education and gives information regarding the National Savings Fund, nutritious food, and a safe environment, it would lead to improving the knowledge and lead to greater preparation in terms of financial security, physical health, and a safe environment.

Moreover, just as skills (occupational skill and training) are positively associated with housing and financial security preparation, they also have a positive impact on physical health, leisure activities and social relationship activities, and safe environment preparation index. Thus, the government should promote skill development for the pre-retirement population, providing re-training courses that provide the opportunity for people to update their skills in order to meet the needs and demands of the labor sector. Such courses can increase the level of skills and increase income from their occupations, which will encourage them to prepare for their old age in terms of financial security etc. And participating in occupational clubs or taking re-training courses will also increase preparation in social relationship activities.

In addition, since the health status index has a positive effect on physical health preparation index, people should be encouraged to strive for a higher health status. And, the public sector should provide free or inexpensive vaccines to build up disease resistance among the population as well as promoting physical activity in order to help older persons maintain mobility as well as cognitive function. For example, the public sector should promote aerobic exercise programs in the community and provide information on how to achieve good mental health by engaging in stress-reduction activities. When people are healthy they can reduce the cost of illness and thus save more. Hence, these programs can contribute to financial security and physical health preparation.

Furthermore, public helpers can encourage preparation for physical health and for a safe environment. Likewise, an increase in the number of doctors in public hospitals can increase safe environment preparation of individuals. Hence, the government should increase the number of doctors in public hospitals who

look after patients who seek treatment there and who can give advice for maintaining physical health and for how to create a safe environment in their home. Additionally, the government should increase the number of village health volunteers and health personnel who provide health care services, especially in local areas. Since public helpers and doctors have more knowledge about healthcare, they can encourage or give suggestions for maintaining physical health and for creating a safe environment, as well as advice on nutrition and how to adapt their home for elderly living in the future.

In addition, the public sector should provide useful information to the elderly regarding the importance of exercising, being a homeowner, eating nutritious food, saving money, etc. through multiple channels that can encourage people to prepare themselves in many dimensions for their old age. The public sector should provide news and information regarding housing preparation through community leaders, which is a more effective channel compared to other channels (such as the Internet, etc.). Community leaders can encourage people to prepare themselves in terms of housing as they get older, which can reduce the problem of homeless elderly. On the other hand, the public sector should use the Internet as a channel to provide news and information about how to prepare for financial security in order to promote saving and thus create financial security after retirement. Likewise, when the public sector has the objective to encourage the pre-retirement population's physical health preparation, policymakers can use print media, and the Internet to provide information to promote physical health preparation since the print media, and the Internet have a positive influence on physical health preparing behaviors of the pre-retirement population. In addition, policymakers should provide information and promote leisure activities and social relationship activities through other channels, such as print media, radio, television, and the Internet, which can serve as effective means to motivate people to join an activities club or community group in order to maintain interaction with society and foster good relationships among all age groups in the community. Lastly, the public sector should provide information about how to adapt houses, through print media and the Internet (which are more effective channels than community leaders for this purpose), so that they are suitable, comfortable, and safe for older persons.

### 5.3 Recommendation for future research

The limitation of data in Thailand prevents identification of variables representing preparation dimensions of insurance, emergencies and exceptional circumstances, mental health, work and employment, looks and appearance, estate planning, and caregivers from the NSO surveys in 2011, 2014, and 2017. In addition, the data on leisure activities and social relationship activities preparation of this study have some limitations since some areas have 5 groups or clubs in their communities, but some area might have only 3 or 4 groups or clubs in their communities, which will affect the maximum score of this preparation dimension of this study.

Furthermore, the independent variables that were omitted when considering the data in Thailand are the denial variable (he/she does not want to hear of disability) and the social altruism variable, which might be the specific factors of preparation for social relationship activities that have also been referenced by Apouey (2018). Besides, this study attempted to find data on policy variables for Thailand as much as possible from online access and by requesting information through various departments. Such data include information on education budgeting, the number of teacher per students, the number of educational institutions (schools/universities, etc.) in each province per year (data collected by the Ministry of Education and related departments) as well as data on the number of village health volunteers, government health expenditure per person per year (from the Ministry of Public Health and the National Health Security Office). However, these data were unavailable or did not cover the years 2011, 2014, and 2017.

Therefore, more detailed data are necessary to fully identify the necessary preparations of the elderly in various dimensions, the specific factors of each model, and the policy variables.

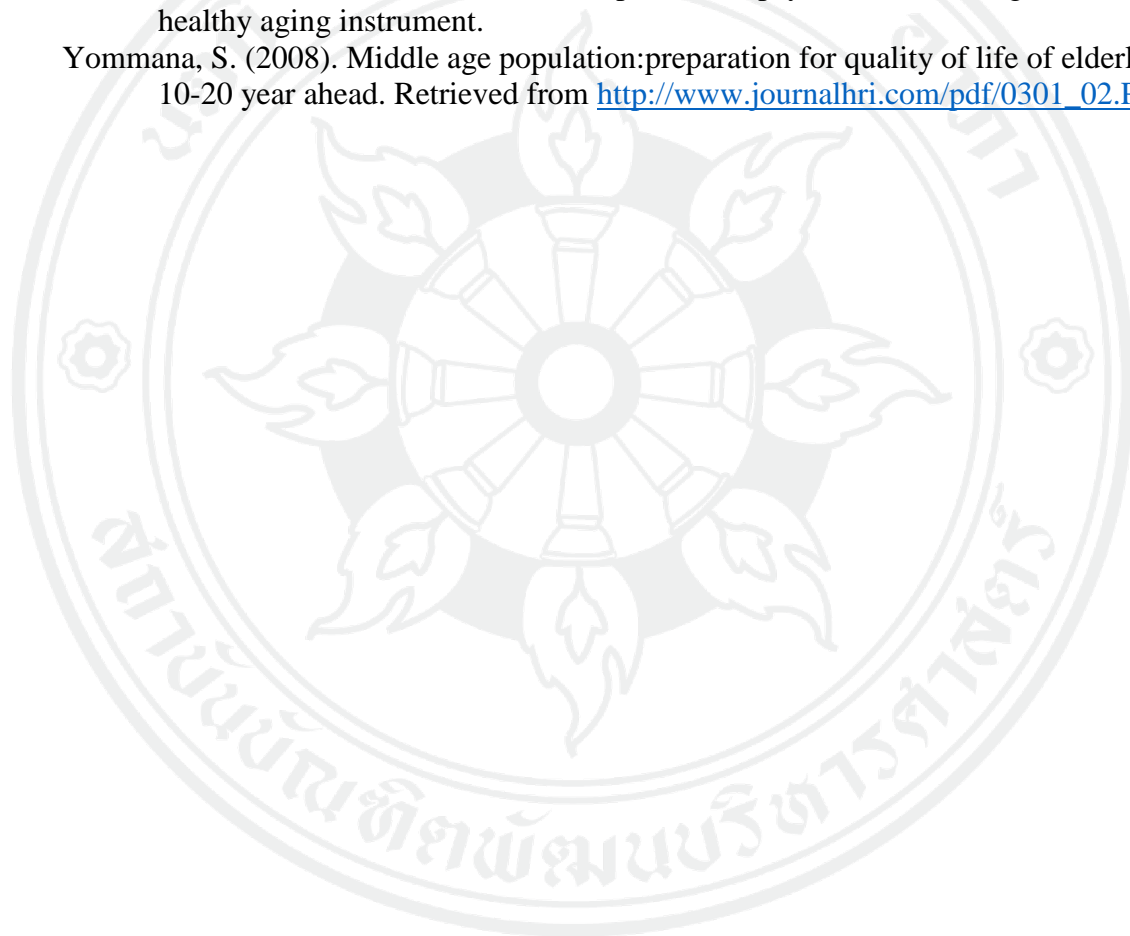
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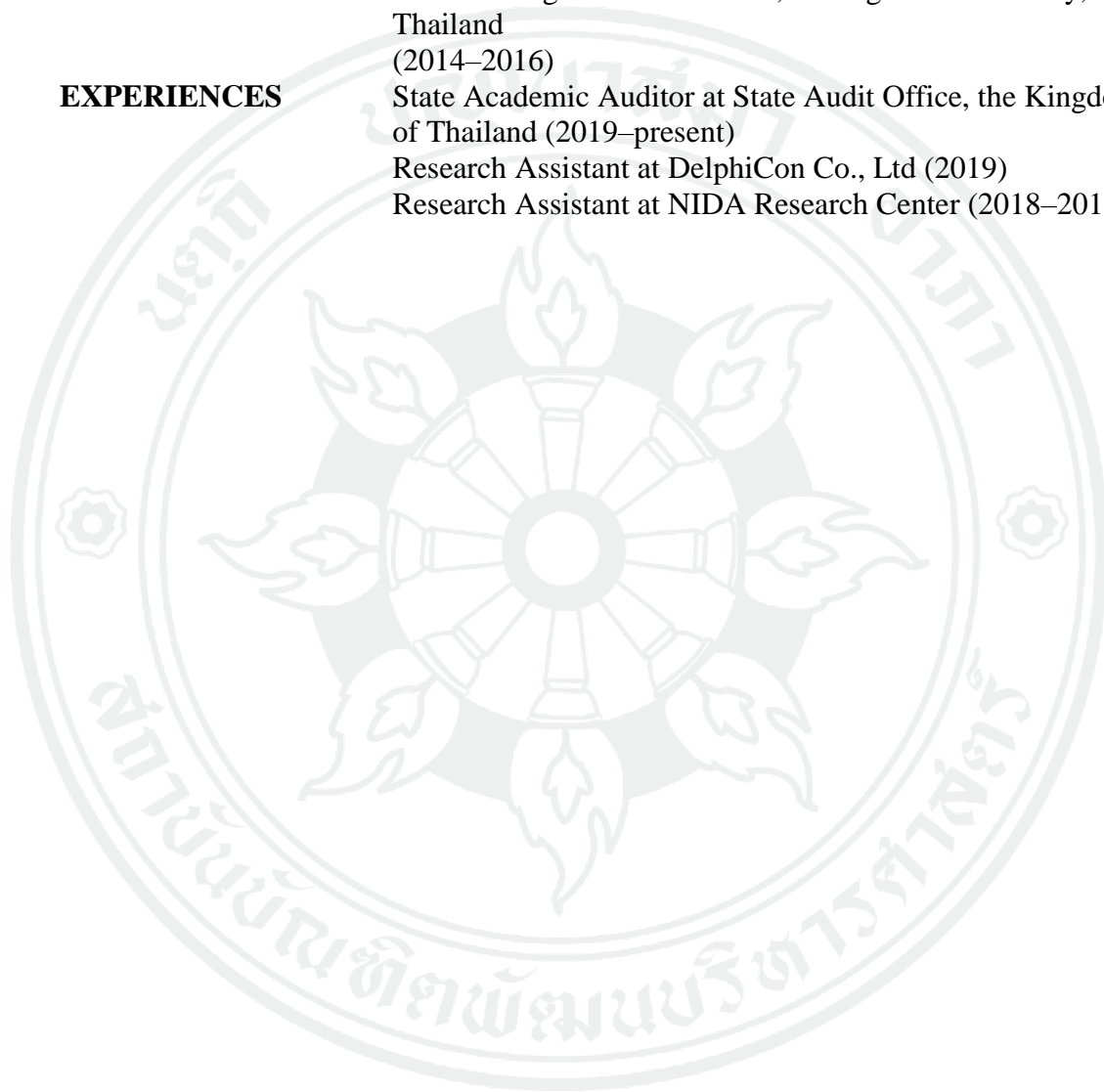


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## Appendix A

Gross Provincial Products per capita (GPP per capita) is simply the value of total GPP divided by the number of people in the area. Therefore, this study used GPP per capita to represent the average income per capita for each province; how well-off they would be if everybody in same province got an equal share of what the economy produces. Table A1 to A3 showed that the highest 10 GPP per capita (top 10) and lowest GPP per capita (bottom) in years 2011, 2014, and 2017 respectively.

Table A1 Top and Bottom 10 provinces GPP per capita in 2011

<b>Top 10</b>			<b>Bottom 10</b>		
	<b>Province</b>	<b>GPP per capita (baht per year)</b>		<b>Province</b>	<b>GPP per capita (baht per year)</b>
1.	Rayong	918,744	1.	Nong Bua Lam Phu	39,198
2.	Chon Buri	406,865	2.	Mae Hong Son	41,597
3.	Bangkok Metropolis	399,047	3.	Am Nat Charoen	44,571
4.	Phra Nakhon Si Ayutthaya	371,705	4.	Yasothon	45,618
5.	Chachoengsao	354,600	5.	Kalasin	48,321
6.	Samut Sakhon	353,739	6.	Bueng Kan	48,512
7.	Samut Prakan	322,897	7.	Nan	50,067
8.	Prachin Buri	306,071	8.	Ubon Ratchathani	50,101
9.	Saraburi	259,837	9.	Surin	50,422
10.	Pathum Thani	223,316	10.	Sakon Nakhon	50,850

Source: The office of the National Economic and Social Development Council, 2017

Table A2 Top and Bottom 10 provinces GPP per capita in 2014

<b>Top 10</b>			<b>Bottom 10</b>		
	<b>Province</b>	<b>GPP per capita (baht per year)</b>		<b>Province</b>	<b>GPP per capita (baht per year)</b>
1.	Rayong	1,008,615	1.	Nong Bua Lam Phu	43,385
2.	Bangkok Metropolis	481,118	2.	Yasothon	53,120
3.	Chon Buri	439,975	3.	Mae Hong Son	54,615
4.	Chachoengsao	423,965	4.	Amnat Charoen	54,678
5.	Phra Nakhon Si Ayutthaya	420,963	5.	Narathiwat	55,601
6.	Prachin Buri	371,776	6.	Kalasin	55,879
7.	Samut Sakhon	359,566	7.	Chaiyaphum	57,774
8.	Samut Prakan	331,142	8.	Maha Sarakham	58,727
9.	Saraburi	289,998	9.	Buri Ram	59,284
10.	Phuket	258,817	10.	Surin	59,299

Source: The office of the National Economic and Social Development Council, 2017

Table A3 Top and Bottom 10 provinces GPP per capita in 2017

<b>Top 10</b>			<b>Bottom 10</b>		
	<b>Province</b>	<b>GPP per capita (baht per year)</b>		<b>Province</b>	<b>GPP per capita (baht per year)</b>
1.	Rayong	1,095,667	1.	Nong Bua Lam Phu	53,416
2.	Chon Buri	581,475	2.	Yasothon	54,183
3.	Bangkok Metropolis	573,907	3.	Kalasin	61,084
4.	Prachin Buri	486,601	4.	Narathiwat	61,765
5.	Phra Nakhon Si Ayutthaya	465,972	5.	Chaiyaphum	63,010
6.	Chachoengsao	472,409	6.	Am Nat Charoen	63,860
7.	Samut Sakhon	411,326	7.	Mae Hong Son	65,448
8.	Phuket	388,559	8.	Surin	65,810
9.	Samut Prakan	343,215	9.	Phrae	67,057
10.	Saraburi	330,750	10.	Si Sa Ket	67,362

Source: The office of the National Economic and Social Development Council, 2017

## Appendix B

Table B1 Mean of HCIs in different genders in years 2011, 2014, and 2017

Gender	HCI			Knowledge index			Skill index			Health status index		
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
Male	0.4719	0.5022	0.4941	0.2883	0.3349	0.3335	0.3573	0.4188	0.3986	0.7853	0.7674	0.7651
Female	0.4363	0.4845	0.4541	0.2118	0.2712	0.2706	0.3392	0.4098	0.3265	0.7792	0.7777	0.7789

Table B2 Mean of HCIs in different residential areas in years 2011, 2014, and 2017

Resident	HCI			Knowledge index			Skill index			Health status index		
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
Rural	0.4738	0.4769	0.4685	0.1227	0.2154	0.2205	0.3684	0.4326	0.3821	0.7776	0.7715	0.7733
Urban	0.4862	0.4776	0.4852	0.3312	0.3715	0.3662	0.3330	0.3985	0.3396	0.7845	0.7742	0.7720

Table B5 Mean HCIs of people in top vs. bottom 10 provinces GPP per capita in different years

Top & Bottom 10	HCI			Knowledge index			Skill index			Health status index		
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
<b>Top10</b>	0.485	0.493	0.475	0.349	0.436	0.434	0.309	0.360	0.295	0.789	0.762	0.775
<b>Bottom 10</b>	0.485	0.458	0.466	0.241	0.236	0.240	0.383	0.432	0.396	0.779	0.784	0.776

Table B6 Mean HCIs of people in different age group in different years

Age groups	HCI			Knowledge index			Skill index			Health status index		
	2011	2014	2017	2011	2014	2017	2011	2014	2017	2011	2014	2017
Pre-retirement	0.481	0.477	0.478	0.246	0.300	0.299	0.348	0.414	0.359	0.782	0.773	0.773
Young-old	0.397	0.390	0.303	0.256	0.212	0.113	0.266	0.394	0.330	0.688	0.765	0.633
Middle-old	0.391	0.322	0.249	0.264	0.163	0.091	0.256	0.388	0.316	0.634	0.733	0.599
Old-old	0.398	0.250	0.202	0.243	0.117	0.069	0.280	0.397	0.329	0.560	0.629	0.528



## Appendix C

Table C1 Correlation Test data 3 waves

	Low_sec	High_sec	Occ_skill_Lv2	Occ_skill_Lv3	Occ_skill_Lv4	Training	Health_inx	Age	Female	Single	Divorced	Num_child
Low_sec	1.00											
High_sec	-0.56	1.00										
Occ_skill_Lv2	0.06	0.03	1.00									
Occ_skill_Lv3	0.07	0.05	-0.11	1.00								
Occ_skill_Lv4	0.06	-0.01	-0.04	-0.06	1.00							
Training	-0.11	-0.06	-0.41	-0.53	-0.20	1.00						
Health_inx	0.00	0.00	0.01	0.00	0.06	0.01	1.00					
Age	-0.02	0.00	-0.01	0.02	0.00	0.02	-0.02	1.00				
Female	0.00	0.01	0.02	0.00	0.00	-0.07	0.06	-0.01	1.00			
Single	0.01	0.01	0.00	-0.04	0.01	0.01	0.01	-0.02	0.10	1.00		
Divorced	0.02	0.00	0.00	-0.03	0.00	-0.05	0.03	0.02	0.17	-0.10	1.00	
Num_child	0.12	0.04	0.39	0.56	0.23	-0.67	0.18	0.01	0.20	0.02	0.19	1.00
Municipality	0.03	0.00	0.10	-0.08	0.04	-0.04	0.00	-0.01	0.00	0.06	0.02	0.02
Northern	-0.46	-0.13	0.00	0.04	-0.02	-0.01	0.01	0.03	0.00	-0.03	-0.03	0.03
Southern	0.05	0.00	0.17	0.22	0.09	-0.26	-0.01	-0.01	0.01	0.00	-0.01	0.25
Central	0.27	0.12	-0.15	-0.29	-0.10	0.28	-0.04	-0.01	0.02	0.02	0.05	-0.29
Northeastern	0.08	0.00	0.16	0.42	0.18	-0.39	0.05	0.00	-0.01	-0.03	-0.04	0.41
Avg_ann_inc	0.06	0.00	-0.01	-0.14	0.20	0.19	0.06	-0.03	-0.13	0.00	-0.04	-0.08
Alone	-0.01	-0.01	-0.07	-0.10	-0.04	0.08	0.06	0.01	0.03	0.16	0.27	-0.04
Broadcast	-0.07	-0.02	-0.03	0.03	-0.03	0.01	-0.02	0.02	0.01	-0.03	0.00	0.00
Radio	-0.04	-0.01	0.00	0.04	-0.01	-0.02	0.01	0.01	0.00	-0.03	-0.01	0.01
TV	0.02	0.01	-0.05	0.07	-0.08	-0.04	-0.04	0.00	0.02	-0.02	0.00	0.00
Publications	0.02	0.02	0.11	-0.01	0.05	-0.08	0.04	0.00	-0.03	0.02	0.00	0.08
Internet	0.01	-0.01	-0.04	-0.14	0.12	0.18	0.07	-0.04	-0.01	0.05	-0.01	-0.09
Informal_sec	-0.04	0.00	0.05	0.12	0.02	-0.03	0.02	0.03	0.06	-0.05	-0.04	0.11
Soc_network	-0.08	-0.02	0.03	0.10	0.03	-0.05	0.06	0.01	0.05	-0.05	-0.03	0.11

	Low_Sec	High_Sec	Occ_skill_LV2	Occ_skill_LV3	Occ_skill_LV4	Training	Health_inx	Age	Female	Single	Divorced	Num_child
Myopia	-0.03	0.00	-0.03	-0.11	-0.05	0.10	0.02	0.01	0.01	0.00	-0.02	-0.13
Money_receive	-0.01	0.02	0.05	0.07	0.02	-0.09	0.02	0.02	-0.03	0.00	0.01	0.08
Money_give	0.02	0.00	0.04	0.02	0.02	-0.03	-0.01	-0.02	0.01	0.00	-0.01	0.04
Num_doc	-0.23	-0.05	-0.18	-0.29	-0.11	0.32	-0.02	0.04	0.00	0.00	0.02	-0.32
Pub_helpers	0.01	0.02	0.09	0.19	0.05	-0.18	0.08	0.04	0.03	-0.03	0.02	0.20
Benefits	-0.06	-0.01	-0.16	-0.23	-0.03	0.26	-0.01	0.01	-0.01	0.01	0.00	-0.28
Working_hour	-0.02	-0.01	0.14	-0.19	0.02	-0.06	0.00	-0.05	-0.07	0.04	0.01	-0.06
Care_giver	0.01	0.00	0.00	0.04	0.00	-0.02	0.01	0.00	-0.03	-0.03	-0.01	0.02

Table C2. Correlation Test data 3 waves (section 2)

	Urban	Northern	Southern	Central	Northeast	Avg_ann_inc	Alone	Village_lound	Radio	TV	Print media	Internet
Urban	1.00											
Northern	-0.02	1.00										
Southern	0.00	-0.10	1.00									
Central	-0.14	-0.65	-0.22	1.00								
Northeast	0.03	-0.16	-0.05	-0.35	1.00							
Avg_ann_inc	0.15	-0.10	0.00	0.04	-0.08	1.00						
Alone	0.03	-0.01	-0.05	0.07	-0.07	0.04	1.00					
Village_lound	-0.06	0.10	-0.04	-0.04	0.03	-0.10	-0.03	1.00				
Radio	0.01	0.07	-0.01	-0.05	0.02	-0.04	-0.01	-0.04	1.00			
TV	-0.09	-0.02	0.03	0.02	0.00	-0.17	-0.03	-0.30	-0.11	1.00		
Print media	0.06	-0.03	0.01	0.00	0.01	0.02	0.01	-0.17	-0.06	-0.47	1.00	
Internet	0.14	-0.02	-0.03	-0.02	-0.04	0.39	0.07	-0.13	-0.05	-0.35	-0.20	1.00
Informal_sec	-0.08	0.09	0.03	-0.10	0.12	-0.18	-0.10	0.05	0.03	0.07	0.00	-0.17
Soc_networkk	-0.15	0.14	-0.01	-0.06	0.12	-0.10	-0.05	0.02	0.02	0.00	0.01	-0.04
Myopia	0.02	0.02	-0.07	0.04	-0.08	0.02	0.02	-0.01	0.01	-0.01	0.01	0.03
Money_receive	-0.01	0.03	-0.02	-0.06	0.10	-0.06	-0.03	0.00	0.01	0.00	0.03	-0.04
Money_give	0.03	-0.01	0.04	-0.02	-0.01	0.04	0.00	-0.02	0.00	-0.03	0.04	0.03
Num_doc	-0.10	0.32	-0.09	0.10	-0.40	0.01	0.06	0.01	0.00	0.02	-0.04	0.01
Pub_helper	-0.10	0.03	0.05	-0.04	0.17	-0.11	-0.05	0.02	0.02	-0.02	0.06	-0.07
Benefits	0.00	-0.02	-0.05	0.11	-0.15	0.03	0.02	0.00	-0.01	-0.01	-0.01	0.05
Working_hour	0.12	0.05	-0.06	-0.06	-0.08	0.16	0.03	-0.04	-0.02	-0.06	0.04	0.10
Care_giver	0.01	-0.03	0.01	-0.02	0.03	-0.01	-0.04	0.00	-0.01	-0.01	0.03	0.00

Table C3. The result of testing heteroskedasticity of safe environment preparation

---

**Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

---

Ho: Constant variance

Variables: fitted values of Y5

chi2(1) = 0.87

Prob > chi2 = 0.3521

---

Since the Null hypothesis (Ho) is homoscedasticity. The prob > chi2= 0.3521, which accept Ho. That means the model of safe environment preparation is homoscedasticity (no heteroskedasticity)

Table C4. The result of testing heteroskedasticity of physical health preparation.

---

**Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

---

Ho: Constant variance

Variables: fitted values of Y3

chi2(1) = 242.54

Prob > chi2 = 0.0000

---

According to the result in Table C4, the Null hypothesis (Ho) is homoscedasticity. The prob > chi2= 0.0000, which reject Ho. That means the model of physical health preparation is heteroskedasticity. Hence, this study will solve the problem of heteroskedasticity by the robust standard error. The result of the robust standard error given in parenthesis Table 4.5 (model 3)

Table C5. The result of testing heteroskedasticity of leisure activities and social relationship activities preparation

---

**Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

---

Ho: Constant variance

Variables: fitted values of Y4

chi2(1) = 7528.64

Prob > chi2 = 0.0000

---

According to the result in Table C5, the Null hypothesis (H<sub>0</sub>) is homoscedasticity. The prob > chi2= 0.0000, which contradicts(s) H<sub>0</sub>. That means the model of leisure

activities and social relationship activities preparation is heteroskedasticity. Hence, this study will solve the problem of heteroskedasticity by the robust standard error. The result of the robust standard error given in parenthesis Table 4.5 (Model 4).

Table C6. The result of testing heteroskedasticity of preparation index

---

**Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

---

H<sub>0</sub>: Constant variance

Variables: fitted values of Prep\_inx

chi2(1) = 329.45

Prob > chi2 = 0.0000

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According to the result in Table C6, the Null hypothesis (H<sub>0</sub>) is homoscedasticity. The prob > chi2= 0.0000, which contradicts(s) H<sub>0</sub>. That means the model of preparation index is heteroskedasticity. Hence, this study will solve the problem of heteroskedasticity by the robust standard error. The result of the robust standard error given in parenthesis Table 4.5 (Model 6).