

DEVELOPING AN INDEX FOR MEASURING RETIREMENT READINESS IN THAILAND: THE NATIONAL RETIREMENT READINESS INDEX

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ABSTRACT

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Many countries are facing challenges regarding the inclusiveness and sustainability of pension systems, including Thailand. With increasing life expectancy, both the government and people need to efficiently manage their financial situations and plan for their retirement. To achieve this goal, a benchmark for measuring the state of retirement readiness is imperative but is lacking in Thailand. Thus, this study aimed to develop a framework to construct the National Retirement Readiness Index (NRRI) for the country. The developed NRRI was based on "Financial Retirement Readiness Index (F-RRI)" and "Quality of Life Retirement Readiness Index (Q-RRI)". The F-RRI and Q-RRI were constructed separately from their four respective sub-dimensions, including State of Financial (or Health) Adequacy, Financial (or Health) Preparedness, Employer (or Institution) Enabler and Financial (or Health) Literacy. Scores from each dimension were computed from questionnaires by surveying working individuals aged 18-59 years from the government sector (G1), private sector who registered for provident funds or the government's social security fund (G2), and low-income individuals who registered in the government welfare program (G3). The scores from the sub-dimensions were then aggregated using Principal Component Analysis (PCA) and used to calculate the NRRI. Results showed that G2 received the highest averaged NRRI score and ranged in high retirement readiness threshold. Government employees (G1) also performed well with averaged NRRI score slightly lower than that of the private sector employee group. However, G3 was the most vulnerable to retirement. Thus, retirement policies targeting this group are urgently needed. The NRRI allows working individuals to compare their scores to the national ones, thus identifying their state of retirement readiness. Furthermore, the index provides useful information for policy makers to design effective retirement programs that can prepare individuals for a happy retirement.

Keywords: Retirement index; financial sustainability; quality of retirement; pension system

1. INTRODUCTION

Inclusiveness and sustainability of pension systems are two of the main challenges around the world. Many countries, including Thailand, are now facing unprecedented changes including an increasing life expectancy, greater financial burdens on governments' budget, and higher pressure on individuals to plan for their own retirement. The latter is particularly difficult because it requires a certain degree of financial literacy to foresee retirement expenses, investment performances and the longevity after retirement. The ageing population places pressure on governments to effectively manage scenarios for coping with increasing old-age dependency ratios in the next decades. One of the main challenges is whether the most vulnerable group in the society can effectively plan for their own financial future. The financial adequacy problem is also further intensified by the low interest rates and volatile asset prices, which reduce the expected value of lump sum at retirement, especially for younger people. To overcome such issues, many private and public organizations have set up several task forces to increase financial literacy, awareness of retirement savings, and knowledge about risk and returns. In Thailand, even though the pension system appears to be inclusive, the level of expected pension incomes and the coverage rate of voluntary systems, especially for formal private workers, are significantly suboptimal. With a 35-year membership in the Social Security Fund (SSF), the mount of pension income can reach up to 7,500 baht per month. Additionally, the voluntary Provident Fund (PVD), which is the complementary plan for SSF, covers only 20% of private formal workers in the country. With these regards, it is crucial to develop an approach for measuring the retirement readiness of people in Thailand.

Hence, this study is a first attempt to develop a framework and construct a National Retirement Readiness Index (NRRI) for Thailand. In addition to the financial aspect of retirement readiness, the NRRI also accounts for the "quality of life" aspect since it has been well-documented that health, social relationships and life activities essentially determine retirement happiness (Frey and Stutzer, 2002; Van Solinge and Henkens, 2008; Dolan et al., 2008). To measure the so-called Financial Retirement Readiness Index (F-RRI) and Quality of Life Retirement Readiness Index (Q-RRI), each of these indices were calculated based on four sub-dimensions, namely State of Financial (or Health) Adequacy, Financial (or Health) Preparedness, Employer (or Institution) Enabler and Financial (or Health) Literacy. Scores from each dimension were computed from questionnaires by surveying working individuals aged 18-59 years old, including government employees, private sector employees registered for PVD or the government's SSF, and low-income individuals registered in the government welfare program. The scores from the sub-dimensions were combined into the aggregate index using Principal Component Analysis which guarantees that the linear combination of each sub-dimension would greatly explain the variation in the information contained within each sub-dimension. The newly developed NRRI could serve as the benchmark for the Thai government, retirement organizations such as the Government Pension Fund (GPF), National Savings Fund (NSF), SSF, and PVDs, policymakers and other related institutions to understand the situations of retirement in Thailand. Such information will also facilitate the identification of groups among the Thai populations who are ready or those who are vulnerable to retire and thus allowing the relevant organizations to tackle retirement issues and effectively prepare the individuals for retirement.

2. LITERATURE REVIEWS

Several attempts have been made to develop an index that can measure the readiness of people during retirement. Most of the developments were proposed by financial management firms such as Aegon, Prudential, State Street and Mercer. Aegon (2016) developed the Aegon Retirement Readiness Index (ARRI) providing a score ranging from 1 to 10 to measure retirement preparedness. The computation of the index was based on a surveyed sample of 14,400 employees in six key aspects including personal responsibility, awareness, financial understanding, retirement planning, financial preparations and income replacement. The ARRI focused on attitudes and behaviors surrounding financial aspects of retirement. One key advantage of this index is that it was developed from responses from employees in 15 countries.

Mercer (2019) initiated the Melbourne Mercer Global Pension Index (MMGPI). This index was constructed by mainly using aggregate international data collected by the World Bank, Organisation for Economic Co-operation and Development (OECD), and national offices of statistics. If secondary data was unavailable, Mercer would obtain information from relevant Mercer's consultants. Mercer computed this index to cover subjects from 37 different countries. The overall index value represented the weighted average of three sub-dimensions composing of the adequacy sub-index, the sustainability sub-index and the integrity sub-index. These sub-dimensions were weighted with 40%, 35% and 25%, respectively. However, this weighting scheme was merely from the subjective judgement of the company's experts rather than from proper statistical technique. Nevertheless, MMGPI extended the aspects of ARRI by considering the factors that determined the

sustainability of the pension system in each country and the indicators that influenced the governance, regulation and operations of the system. In 2019, it was found that Thailand only scored 39.4 compared to 81 in the Netherlands, 80 in Denmark and 73.6 in Finland (Mercer, 2019). Because MMGPI extensively focused on the pension system, this index cannot be used to represent the living standards during retirement.

MetLife's Mature Market Institute, a research organization focusing on multi-dimensional issues of ageing and retirement, proposed an approach to measure how well people prepare for their retirement by constructing tasks needed to be accomplished before retirement to ensure their happiness. In their study (MetLife, 2010), MetLife created tasks at various stages of the life cycle that should be completed. The completion of these tasks was mathematically rescaled to an index with a score between 0-100. The list of these tasks can also be considered as the guideline or benchmark for people to develop their career and life activities for a successful transition to retirement. The 15 specific tasks were categorized into 5 main aspects covering work, leisure and activity, relationships, income and benefits, and planning. Different degrees associated with the level of completion were suggested to indicate the readiness for retirement. This index provided a holistic approach for measuring retirement readiness by focusing on other important aspects in life rather than solely financial issues.

Besides these indices, many private organizations attempted to visualize the retirement preparedness of citizens by conducting a survey on certain issues. For example, the Global Retirement Reality Report (State Street Global Advisors (SSGA), 2019) proposed by State Street Global Advisor focused on the preparedness of plan sponsors in 5 countries including Australia, Ireland, Netherlands, the United Kingdom, and the United States. It introduced the happiness formula consisting of trust, ownership, and preparedness. The retirement readiness, therefore, depended on the support by employers to provide digital tools, such as dashboards or mobile applications, for employees to monitor their financial situation and retirement benefits. The study suggested that plan sponsors should also be involved with public policy initiatives to help design appropriate pension systems. For example, plan sponsors should promote and propose a policy to incorporate environment-social-governance (ESG) values into investment process of defined-contribution (DC) funds. Additionally, plan sponsors should provide readily retirement advice and learning tools for plan members to increase their financial literacy and obtain appropriate information for investment decisions.

Prudential commissioned a survey to investigate how 1,500 American adults, aged 21 and older, prepare for their retirement. The study (Prudential, 2018) covered working population in all segments (i.e., full-time, part-time, self-employed and stay-at-home workers). Aside from the survey of working populations, Prudential considered current retirees to investigate what types of behaviors were associated with good well-being in retirement. The main findings include 1) pre-retirees did not appropriately plan about their spending during retirement, 2) pre-retirees did not know how to prepare adequately for retirement and 3) millennials had significantly different attitudes about retirement planning compared to older generations.

The American Academy of Actuaries, Institute and Faculty of Actuaries (United Kingdom), and Actuaries Institute Australia (2017) investigated determinants of how people in the UK, the US, and Australia prepare for the longevity risk after retirement. They included other relevant risks in retirement such as unexpected health needs, loss of independence, loss of a spouse or dependency by children in the survey. The study also stressed the importance of including other non-financial aspects in determining the happiness in retirement.

Employee Benefit Research Institute (EBRI), in collaboration with Greenwald & Associates, which is an independent research firm, conducted a survey on retirement readiness (Employee Benefit Research Institute: EBRI, 2020). Their Retirement Confidence Survey was argued to be the longest-running survey to date on retirement. However, this survey only included a sample of around 2,000 Americans, half of which were retirees. The survey only focused on financial aspects of retirement which covered confidence in the comfortable retirement, estimation of retirement amount target, investment plan, planning resources, obstacles in saving, and aspects of financial conditions during retirement.

3. DATA AND METHODOLOGY

In this study, the NRRI was constructed from survey-based primary data collected from a questionnaire. For clarity, this section explains the involved methods starting from building the framework for retirement readiness, designing the questionnaire, determining sampling design for the survey, and developing the calculation of the index. Here, we measured retirement readiness at the individual level, rather than measuring it at the infrastructure level (i.e., retirement support programs or existing facilities) because data from individuals better represented the population's status for the readiness. Furthermore, individual-based data enabled in-depth cluster analysis in various dimensions, yielding results that benefit retirement-related policy design for specific groups of population.

3.1 The framework for constructing NRRI

Based on the review of previous studies and surveys, financial adequacy during retirement is not the only important factor determining retirement readiness. Social interactions, lifestyle activities, and health conditions are also crucial for happiness during retirement. Consequently, we constructed the NRRI from 2 aspects below.

3.1.1 Financial retirement readiness

To cover this aspect in more details, we categorized it into 4 sub-dimensions. The sub-dimension capturing financial retirement readiness are discussed as follows.

3.1.1.1 *State of financial adequacy*

The current state of savings and financial conditions can determine the degree of financial readiness because it is the direct parameter that determines the level of financial adequacy. The term financial adequacy can be determined by many variables such as comparing the expected wealth at retirement with the minimum amount of lump sum required to support certain living standards at retirement (Deeming, 2005; Mirowsky and Ross, 1999) or estimating the changes in expenditure across different lifecycle (Banks et al., 1998; Gourinchas and Parker, 2002; Bernheim et al., 2001) or defining replacement ratio which is calculated from the ratio between expected consumption at retirement and the amount of salary before retirement (Hurd and Rohweder, 2003; Munnell and Soto, 2005; Groyer and Holtzhausen, 2006).

3.1.1.2 *Financial preparedness*

The financial preparedness sub-dimension focused on the attitude of individuals in the planning for retirement. The attitude and behavioral characteristics are important because individuals have increasingly been provided with an unprecedented degree of responsibility toward their own retirement. Positive financial attitudes and behaviors have been found to be positively related with adequate retirement (Joo and Pauwels, 2002). The relationship between behavioral or psychological influences on retirement adequacy results from either cognitive limitations or individual psychological factors such as willpower and risk tolerance (Benartzi and Thaler, 2007; Howlett et al., 2008; Jacobs-Lawson and Hershey, 2005). Individuals who put high weights on long-term outcomes appear to have more willpower to save for retirement (Malroutu and Xiao, 1995). The degree of financial risk tolerance is also found to have a positive relationship with the level of retirement confidence (Joo and Pauwels, 2002). Those links between personal attitude and financial decision making have been found to exist across all income levels of households (Joo and Grable, 2000; Hogarth and Anguelov, 2013; Mauldin et al., 2016).

3.1.1.3 *Employer enabler*

The main reason for including the employer (or institution) enabler factor into the index came from the fact that even though most of the responsibility of retirement planning has already been transferred from the institutions (or plan sponsors) to individuals, the institutions should also provide support, tools and advice to help individuals plans for their retirement in both the financial and health aspects (SSGA, 2019).

3.1.1.4 *Financial literacy*

The last sub-dimensions related to financial literacy was included as it has been confirmed to have a significant positive outcome with savings for retirement. For instance, Vissing-Jørgensen (2002) found that financial knowledge reduces the costs of processing information. This can encourage financially sophisticated households to invest more optimally by buying appropriate levels of risky assets (Calvet et al., 2007; Van Rooij et al., 2011; Kimball and Shumway, 2006). In addition, higher financial literacy also creates higher levels of confidence in planning, lower financial stress, and higher tendency to save for retirement (Lusardi and Mitchell, 2011; Ameriks et al., 2003).

3.1.2 Quality of life retirement readiness

To develop the Quality of Life Retirement Readiness Index, Frey and Stutzer (2002) argued that the overall well-being that included all aspects of life satisfaction was more appropriate than just focusing on the economic well-being. While financial assets could support expenditure during retirement, the financial adequacy was not a goal, but rather a contributing parameter to the well-being of life. Our Quality of Life Retirement Readiness Index was also based on the four dimensions, explained as follows.

3.1.2.1 *State of health adequacy*

Veehoven (1993) argued that the measurement of the overall quality of life can be derived by factors that determine the livable conditions. These factors include various health-related parameters such as physical health, life expectancy, and mental health. When measuring physical health of ageing, questions included in the index cover Body Mass Index (BMI), estimated duration of exercise per day, amount of alcohol consumptions,

frequency of relax behavior, period of sleep time, domain meal, and level of smoking. Furthermore, family history of diseases is also important as it determines the likelihood of developing certain non-chronic diseases.

Aside from physical health, mental conditions and emotional intelligence have also been found to determine how retirees cope with retirement. Leung and Earl (2012) showed that optimism and self-esteem are predictors of high happiness in retirement. Taylor-Carter et al. (1997) also discovered that retirement anxiety, which was defined as a feeling of unease and fear, can largely be reduced if retirees continue to have certain social activities such as helping others or working in a group. Greenfield and Marks (2004) and Butrica and Schaner (2005) showed that community involvement and care-giving activities increase life satisfaction after retirement. Therefore, some questions related to mental health conditions of respondents were included in the index.

3.1.2.2 Health preparedness

Diener (2000) extended the concept of happiness by defining the cognitive happiness as “the perceived discrepancy between aspiration and achievement, ranging from the perception of fulfilment to that of deprivation”. This means that the survey questions need to focus on what will happen in the future rather than just asking what is happening at the moment. As a consequence, the first sub-dimension under the Quality of Life Retirement Readiness Index that focused on the current state of health was not enough. It was suggested to be complemented by the second sub-dimension (Health preparedness) to cover the measurement of perceived fulfilment. The measurement of expected health conditions during retirement is important as many research papers found that health was positively correlated with happiness (Van Solinge and Henkens, 2008; Dolan et al., 2008)

3.1.2.3 Institution enabler for health

The third sub-dimension that focused on the institution enabler was an attempt to score the availability and convenience of public health services. High level of well-being can be achieved if the government provides adequate health benefit system (Cylus et al., 2018; Kickbusch and Gleicher, 2020). The questions included under this sub-dimension also ask about how effective the government is in communicating to all different groups of citizens in order to let them know their health benefits and rights.

3.1.2.4 Health literacy

The measurement of health literacy in the fourth sub-dimension is also crucial to encourage better health-related quality of life. This is because Jayasinghe et al. (2016) found that people with low health literacy were more likely to smoke, perform less physical activity, have higher risk of overweight and lower mental health. Berkman et al. (2011) also confirmed that lower health literacy was positively correlated with more hospitalization, lower receipt of necessary vaccine and lower ability to understand health messages.

For brevity, we summarized the framework used for constructing NRRI as shown in Figure 1.

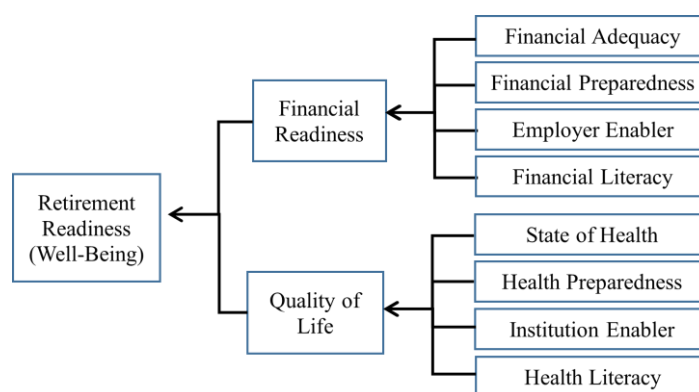


Figure 1: The Framework for Constructing NRRI

3.2 Designing the questionnaire

The questionnaire was designed to measure retirement readiness at the 4 sub-dimension levels of financial and quality of life aspects. In each sub-dimension, five multiple-choice questions were written, resulting in 40 questions in total. Responses to each question were given scores ranging from 0 to 5 varying upon sub-dimension; however, the total score was later rescaled to range equally from 0 to 100 in each sub-dimension. For the Financial Readiness Index, questions measuring financial adequacy and preparedness were adopted from various studies, including (InfRE, 2007) and (Aegon, 2016). Responses to each question in these two sub-dimensions were given scores ranging from 1 to 5 based on the level of, with 5 being the most ready

and 1 being the least ready. Questions for Enabler were based on the awareness of the pension system that was applicable to the individual respondents and were also given scores of 1-5. Finally, questions for Financial Literacy, evaluating the basic knowledge related to wealth management and investment, were given scores of either 5 or 0 based on the correctness of the response. For the Quality of Life Retirement Readiness Index, the question and score structures were similar to those for Financial Readiness Index, with the exception that the Enabler dimension focused on the access to health benefits provided by employer and government organizations. Nevertheless, questions in the Quality of Life Index were mainly adopted from domestic literature, including reports from the Ministry of Public Health, to specifically suit the demographic and health traits of the Thai population.

3.3 Data and sampling

The target population in this study was 21,870,282 working individuals in the age of 18-59. The population was categorized into 3 groups due to the different natures of their work and distinct access to retirement pension and health benefits. The 3 groups were (1) government employees, (2) private sector employees who are on a provident fund or the Social Security Fund (hereafter Private sector employees), and (3) low-income workers who are on the government welfare program (hereafter low-income workers). Government employees, consisting of 1,090,503 individuals, received pensions determined by their total number of working years and benefits from their contribution to the Government Pension Fund (GPF) during that time. Private sector employees consisted of 11,548,061 individuals who were enrolled in either a provident fund or Social Security, and low-income workers consisting of 9,231,718 individuals who relied on the minimal pension welfare provided by the government. The survey was conducted separately with these 3 groups using the questionnaire. The sample sizes required and collected for each group are represented in Table 1. Furthermore, we considered factors such as age, gender, occupation, and location of work to achieve an appropriate representation of each group. For example, we selected samples of government employees and low-income group from provinces with various average costs-of-living to ensure that these represent the distribution of both groups' income and expenses nationwide. For private sector employees, besides the age and gender, one key factor in drawing a properly represented sample for this group was the company for which the individuals worked. The collected data of individual responses to the questionnaire were aggregated for entire sample and in various groups of age, gender, type of employee, or occupation, to be analyzed and compared the readiness level among groups. The analysis was also conducted on the sub-dimension level for the insight of strengths and weaknesses regarding the retirement readiness in each group. At last, a cluster analysis based on the retirement readiness score was performed to identify common traits of the readiness lacking group.

Table 1: Sample Data

Category	Target population	Sample size required	Sample size collected
Government employees	1,090,503	671	1,082
Private sector employees	11,548,061	669	904
Low-income workers	9,231,718	670	727

3.4 Calculating the NRRI

The Retirement Readiness score for an individual was calculated from the equal weight of the Financial Readiness score and Quality of Life score, which were obtained from individual responses to the corresponding part of the questionnaire. Precisely, the score was first computed at each of the 4 sub-dimensional level by summing up the raw scores given in the designed questionnaire before being rescaled to range from 0 to 100 based on the following min-max transformation:

$$\text{Score}_{i,c} = \left(\frac{\text{Raw}_{i,c} - \text{Min}_c}{\text{Max}_c - \text{Min}_c} \right) \times 100 \quad (1)$$

where $\text{Score}_{i,c}$ was the rescaled score for individual i and sub-dimension c ,
 $\text{Raw}_{i,c}$ was the raw score for individual i and sub-dimension c ,
 $\text{Max}_c, \text{Min}_c$ were the maximum and the minimum individual raw scores respectively from the data sample.

However, the Financial Readiness Score and the Quality of Life Score were constructed from a weighted average of the rescaled scores from the 4 sub-dimensions:

$$F - \text{Score}_i \text{ (or } Q - \text{Score}_i) = (w_1 \cdot \text{Score}_{i,1}) + (w_2 \cdot \text{Score}_{i,2}) + (w_3 \cdot \text{Score}_{i,3}) + (w_4 \cdot \text{Score}_{i,4}) \quad (2)$$

where $F - \text{Score}_i$ was the Financial Readiness score,
 $Q - \text{Score}_i$ was the Quality of Life score,
 $\text{Score}_{i,1}, \text{Score}_{i,2}, \text{Score}_{i,3}, \text{Score}_{i,4}$ were the scores for each of the 4 sub-dimensions,
 w_1, w_2, w_3, w_4 were the weights for corresponding sub-dimensions.

The weights, which represent varying levels of importance of the sub-dimension to the F-RRI or Q-RRI, were determined by the Principal Component Analysis (PCA). Principal Component Analysis (PCA) is a method to determine the important components without the need to identify the dependent variables. The central idea of PCA is projecting each data point onto only a few principal components while preserving the data's variation as much as possible. Such a principle perfectly fits this study's concept of unifying several sub-dimensions of retirement readiness into one. When applying PCA to determine the weight, the high weight represents a relatively high variation of the components compared to others. Because the survey was structured to be conducted separately on three groups of the target population, PCA gave the weight for each group, resulting in three sets of weights. Then, the three sets of weights must be integrated into one set of weights, by combining them according to the distribution of the three groups in the target population using weighted average. In other words, the overall weight was combined according to the equation:

$$w_c^{all} = p_1 w_c^{(1)} + p_2 w_c^{(2)} + p_3 w_c^{(3)} \quad (3)$$

where w_c^{all} was the combined weight of sub-dimension j from all three groups,
 $w_c^{(1)}, w_c^{(2)}, w_c^{(3)}$ were the weights of sub-dimension c for (1) Government employees, (2) Private sector employees, and (3) Low-income workers,
 p_1, p_2, p_3 were the ratios of (1), (2), and (3) to the size of target population, respectively.

Finally, to compute the National Retirement Readiness Index (NRRI), the F-RRI and Q-RRI were obtained respectively from the average of all respondents' $F - \text{Scores}$ and $Q - \text{Scores}$, then combined by applying the equal weight based on the reason that both factors are equally important.

$$\text{NRRI} = 0.5 \times (F - \text{RRI}) + 0.5 \times (Q - \text{RRI}) \quad (4)$$

The calculated F-RRI, Q-RRI and NRRI range between 0 to 100. Interpretation of those scores is summarized in Table 2.

Table 2: Interpretation of the Retirement Readiness Index Scores

Scores	Interpretation
0-20	No readiness for retirement
20-40	Low readiness for retirement
40-60	Medium readiness for retirement
60-80	High readiness for retirement
80-100	Extremely high readiness for retirement

4. RESULTS AND DISCUSSION

In this section, we report the statistics of sub-dimension scores comprising the Financial Retirement Readiness Index (F-RRI) and the Quality of Life Retirement Readiness Index (Q-RRI) from all categories. Finally, the National Retirement Readiness Index (NRRI) scores and their statistics are shown.

4.1 The sub-dimension scores of the Financial Retirement Readiness Index (F-RRI)

Table 3 reports the mean, median and one standard deviation (SD) of the sub-dimension scores comprising the F-RRI. The sub-dimensions include Financial Adequacy (F-ADQ), Financial Preparedness (F-PRE), Employer Enabler (F-ENA) and Financial Literacy (F-LIT).

Table 3: F-RRI Sub-Dimension Scores

Group	Sample	Statistics	F-ADQ	F-PRE	F-ENA	F-LIT
Government employees	1,082	Average	58.31	52.04	42.40	35.77
		Median	60.00	50.00	40.00	30.00
		SD	17.70	17.96	21.81	23.20
Private sector employees	904	Average	59.10	51.79	64.78	47.42
		Median	60.00	50.79	69.57	40.00
		SD	16.78	17.57	18.11	26.23
Low-income workers	717	Average	46.80	43.05	30.53	16.20
		Median	45.00	41.27	29.17	10.00
		SD	15.45	13.62	14.51	16.67
All groups	2,713	Average	55.49	49.55	46.68	34.41
		Median	55.00	47.62	45.00	30.00
		SD	17.61	17.22	23.27	25.77

The averaged F-ADQ scores for the government employees and private sector employees were almost 60%, indicating that their financial adequacy was medium but nearly at a high readiness level while financial adequacy of the low-income workers was substantially inferior. Similarly, the averaged F-PRE scores for the government employees and private sector employees were significantly greater than that of the low-income group, suggesting that the government and private sector employees were financially more prepared. Moreover, the low-income group had much lower scores in the dimensions of Employer Enabler (F-ENA) and Financial Literacy (F-LIT) compared to the other groups. The main distinctions between government employees and private sector employees were related to the employer enable (F-ENA) and Financial Literacy (F-LIT). Private sector employees performed significantly better in these two areas. All comparisons were statistically tested with significant results ($p < 0.0001$). The sub-dimension analysis suggested that the low-income individuals who are on the government welfare program are significantly less ready to retire in every financial dimension compared to the other groups. Therefore, retirement policies addressing this group should be prioritized in order to raise the overall financial retirement readiness of the society. To combine the 4 sub-dimension scores into the aggregate F-RRI scores, the weights as calculated from PCA were used (Table 4).

Table 4: Weighting Sub-Dimensions of F-RRI

Dimension	Sub-dimension weights for computing F-RRI			
	Government employees	Private sector employees	Low-income workers	All groups
F-ADQ	28.87%	28.65%	29.74%	29.74%
F-PRE	26.93%	28.39%	26.77%	26.77%
F-ENA	18.79%	32.41%	20.39%	20.39%
F-LIT	25.41%	10.55%	23.11%	23.11%

According to Table 4, financial adequacy and financial preparedness, in general, were the factors that matter more for most groups so that the PCA method placed more weights on those factors whereas employer enabler was the least important for the government employees and low-income workers. On the other hand, this factor had the heaviest weight for the private sector employees since the retirement schemes and policies for the private sector employee vary across companies they work for. In other words, the variation causes the PCA technique to put more weight on that factor. According to the results for all groups, the weights applied to each factor were similar but financial adequacy and financial preparedness were slightly more important in explaining the variation in the financial retirement readiness compared to other sub-dimensions.

4.2 The sub-dimension scores of the Quality of Life Retirement Readiness Index (Q-RRI)

Table 5: Q-RRI and Sub-Dimension Scores

Group	Sample	Statistics	Q-STA	Q-PRE	Q-ENA	Q-LIT
Government employees	1,082	Average	73.10	58.37	78.41	63.77
		Median	75.00	60.00	80.00	60.00
		SD	10.63	13.61	15.27	22.06

Table 5: Q-RRI and Sub-Dimension Scores (continued)

Group	Sample	Statistics	Q-STA	Q-PRE	Q-ENA	Q-LIT
Private sector employees	904	Average	70.95	58.99	81.94	61.50
		Median	70.00	60.00	84.00	60.00
		SD	11.48	13.25	14.68	23.52
Low-income workers	717	Average	71.79	52.76	56.89	45.58
		Median	75.00	50.00	60.00	40.00
		SD	11.52	13.47	24.20	21.77
All groups	2,713	Average	72.03	57.08	73.82	58.14
		Median	75.00	55.00	76.00	60.00
		SD	11.19	13.70	20.70	23.74

Table 5 reports the sub-dimension scores and their statistics of the Q-RRI, including State of Health (Q-STA), Health Preparedness (Q-PRE), Institution Enabler (Q-ENA) and Health Literacy (Q-LIT) obtained from the surveyed questionnaires.

Both government employee and private sector employee groups received good scores in all sub-dimensions, particularly in the dimensions of State of Health and Institution Enabler. Again, the scores of the low-income individuals who are on the government welfare plan, particularly in the dimensions of institution enabler (Q-ENA) and health literacy (Q-LIT) were poorer (all statistically significant with $p < 0.0001$), suggesting that they were also less ready to retire compared to the other two groups regarding health aspect. Therefore, policies targeting the low-income group should emphasize the health literacy and institution enabler would be helpful to prepare them for healthy retirement. Table 6 shows the weight of each sub-dimension of the quality of life readiness index. These weights were used to combine the 4 sub-dimension scores into the aggregate Q-RRI index. The results for all three groups were consistent and placed considerably heavy weights on state of health (Q-STA) and health literacy (Q-LIT) whereas health preparedness and health literacy had much smaller weights.

Table 6: Weighting Sub-Dimensions of Q-RRI

Dimension	Sub-dimension weights for computing Q-RRI			
	Government employees	Private sector employees	Low-income workers	All groups
Q-STA	30.16%	34.66%	31.98%	33.30%
Q-PRE	16.18%	16.12%	17.07%	16.53%
Q-ENA	13.45%	19.60%	16.45%	17.96%
Q-LIT	40.20%	29.62%	34.51%	32.21%

4.3 The National Retirement Readiness Index (NRRI) scores

For each individual surveyed, sub-dimension scores were combined into the aggregate indices (F-RRI and Q-RRI) using their corresponding weights reported in the previous sections. Then, the F-RRI and Q-RRI were equally weighted to compute the NRRI for each individual. Table 7 reports the mean, median and standard deviation (SD) of the F-RRI, Q-RRI and NRRI for each group of populations. The result showed that the private sector employee group had the highest NRRI score at 62.68 categorizing in the high readiness threshold. Therefore, it indicated that these private sector employees were ready to retire, especially considering the quality of life. Similarly, the government employee group had a medium NRRI score at 58.61 which was close to the high readiness threshold. Their averaged Q-RRI score was even better than of the private sector employees ($p = 0.0279$), but the private sector employees were superior in the financial dimension represented by F-RRI. The low-income group were the most vulnerable to retire considering both financial and quality of life factors although their averaged score still made the medium retirement readiness threshold.

Figures 2 to 4 shed further light on the F-RRI, Q-RRI and NRRI scores by providing the distributions of those scores according to different threshold and comparing them among groups of population. Table 8 categorizes the F-RRI, Q-RRI and NRRI of all populations into different age and gender groups. For genders, differences of F-RRI, Q-RRI and NRRI scores between male and female were small. Likewise, the F-RRI, Q-RRI and NRRI scores did not seem to vary across age groups. This finding suggested that both gender and age were not significant factors in determining retirement readiness. Because the index was based on the projection of readiness at retirement, the result was less dependent on the proximity to retirement age. In other words, young individuals who are financially disciplined may be as ready for retirement as nearly retired ones.

Table 7: F-RRI, Q-RRI and NRRI Scores by Groups of the Surveyed Population

Group	Sample	Statistics	F-RRI	Q-RRI	NRRI
Government employees	1,082	Average	48.60	68.61	58.61
		Median	47.40	69.11	58.25
		SD	14.41	9.35	9.82
Private sector employees	904	Average	56.66	67.90	62.28
		Median	56.06	68.02	61.52
		SD	13.92	10.35	10.69
Low-income workers	717	Average	36.35	57.53	46.94
		Median	36.11	57.62	46.96
		SD	9.82	10.12	8.42
All groups	2,713	Average	48.00	65.41	56.70
		Median	46.68	65.77	56.36
		SD	15.32	10.99	11.53

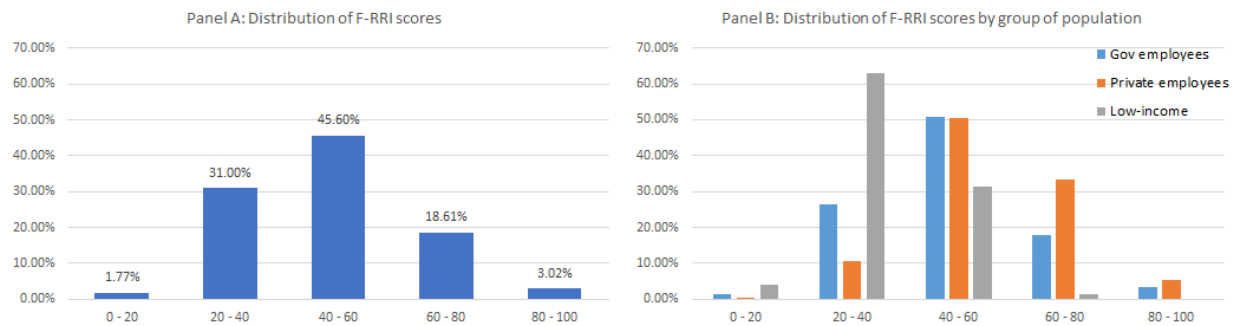
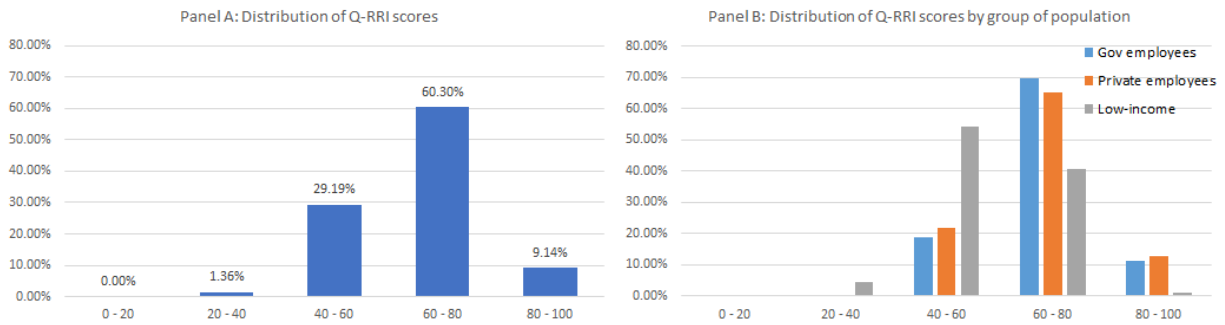
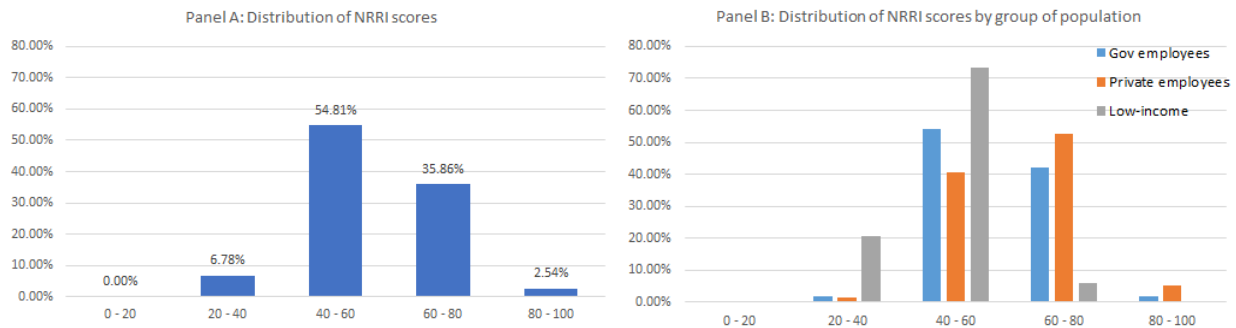
**Figure 2:** The Distribution of the Aggregate F-RRI by Total and by Group of Population**Figure 3:** The Distribution of the Aggregate Q-RRI by Total and by Group of Population**Figure 4:** The Distribution of the Aggregate NRRI by Total and by Group of Population

Table 8: F-RRI, Q-RRI and NRRI Scores by Age and Gender

Age	Gender	Number of samples	F-RRI	Q-RRI	NRRI
<30	Male	326	44.80	62.79	53.80
	Female	502	45.11	62.02	53.56
30-39	Male	314	48.64	66.07	57.36
	Female	579	47.86	64.72	56.29
40-49	Male	236	48.21	67.13	57.67
	Female	368	49.39	67.24	58.31
50-59	Male	163	49.43	68.71	59.07
	Female	225	55.03	70.38	62.71

5. CONCLUSION

In this study, we developed the framework to construct the National Retirement Readiness Index (NRRI) for Thailand which can serve as the benchmark for measuring the state of retirement readiness for Thai society. The proposed NRRI uniquely emphasizes on both financial and quality of life aspects of retirement. Based on large samples of working individuals covering a wide range of ages and genders, the derived scores showed that the private sector employees registered in provident funds or the government's social security fund received the highest averaged NRRI score and ranged in high retirement readiness threshold. The government employee also performed well with averaged NRRI score slightly lower than that of the private sector employee group. In contrast, the low-income workers who registered in the government welfare program were the most vulnerable to retirement considering both financial and quality of life factors, relative to the other groups. Therefore, retirement policies targeting on this last group will be needed. The results also indicated that different ages and genders were not significant factors determining the retirement readiness. These findings allow individuals, regardless of age and gender, to compare their scores to the national score and determine the vulnerability to retire. Furthermore, the information will benefit policy makers and related retirement organizations for tackling retirement issues and thus preparing individuals to retire happily.

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