Transitions into Severe Health-Dependent State Among Thailand's Elderly: A Multistate Analysis for a Dynamic Study and Projection From 2007 to 2030 Using Cross-Sectional Datasets

Short abstract

As life expectancy in Thailand increases and the elderly population continues to expand, late-life health issues have become a key concern for population policy. This study examines the dynamics of transitions into worse health statuses among Thailand's elderly, focusing on shifts from a normal state to a moderate state, and from a moderate state to a severe (health-dependent) state. Using 5-round cross-sectional data from the Survey of Older Persons in Thailand—collected in 2007, 2011, 2014, 2017, and 2021—this research calculates transition risks over consistent 3-year intervals and projects future trends for 2024, 2027, and 2030. A three-state multistate model, typically applied to longitudinal data, is adapted to cross-sectional data to estimate transition probabilities, excluding death as a state. The analysis also addresses health disparities by considering variations in socioeconomic and demographic characteristics. By identifying the heterogeneity in health transitions due to these variations, this study provides valuable insights for designing health and social services that not only meet the needs of Thailand's rapidly aging population but also accommodate the diverse health trajectories within the elderly population.

Introduction (Topic and Theorical Focus)

According to the demographic transition theory (Mason, 1997), declines in birth and death rates are the main reasons for the expansion of the elderly population proportion. In 2021, life expectancy at birth increased from 64.0 years in 1990 to 71.0 years, with females exceeding males at 73.8 and 68.4 years, respectively (United Nations, 2022). It is therefore not surprising that the world is facing a situation of rapid and continuous increase in the aging population (population aged 65 years and over as defined by the United Nations) which has already been shown to triple from approximately 260 million in 1980 to 761 million in 2021 (United Nations, 2023). Based on the UN's World Population Prospects (2022), the global population of people aged 65 or over is projected to double over the next three decades, reaching 1.6 billion by 2050, representing more than 16 percent of the global population. This is in line with the projected increase in life expectancy to 77.2 years in the same year (United Nations, 2022).

This evolving pattern of longevity in the population has been progressively common across countries (Atance et al., 2024; United Nations, 2023; Wilson, 2011). As in Thailand, the aging population (population aged 60 years and over as defined in Thailand) has a tendency to increase rapidly and continuously as well, increasing from 4.01 million in 1994 to 13.36 million in 2021, which is 6.8 and 19.6 percent of the total population, respectively (National Statistical Office, 2022). Since 2013, Office of The National Economic and Social Development Council, in collaboration with the Institute for Population and Social Research of Mahidol University, has projected the proportion of the elderly population in Thailand using the base population as the enumerated population[1] from the 2010 census. They found that by 2040, life expectancy at birth for women and men will be 81.9 and 75.3 years, respectively and the aging population will account for 25.5 percent of the total population and 31.4 percent (Office of the National Economics and Social Development Council, 2013).

While the increasing in aging population reflects the success of public health systems in many countries (United Nations, 2023), it may also especially increase the economic burden which can be observed from the old-age dependency ratio and the potential support ratio. In Thailand, the former, which indicates the burden of caring for the elderly of the working age population, has been rising from

[1] The non-Thai nationals and those not registered in the household registration were excluded from the calculation.

10.7 in 1994 to 30.5 in 2021, which means that 100 working age people will have to support approximately 31 elderly people. This is consistent with the latter, an indicator showing the number of working age people who can support one elderly person. The ratio has been declining steadily from 9.3 in 1994 to 3.3 in 2021, meaning that for every elderly person, there were only about 3 working age people who could support them (National Statistical Office, 2022).

Furthermore, the increase in life expectancy emphasizes only the quantitative aspect and lacks qualitative details, especially the health of those living longer. This concern led to the development of an additional indicator, healthy life expectancy which is a summary measure of how many years one can expect to live in good health (United Nations, 2023). According to World Health Organization's method (2024), healthy life expectancy or health-adjusted life expectancy is refers to disability-free life expectancy (United Nations, 2023; World Health Organization, 2024). As shown in Figures 1 and 2, whether global or Thai data are used, health-adjusted life expectancy is consistently lower than life expectancy across sexes and years. The gap between these two indices for each sex represents the number of years after age 60 that individuals of that sex are expected to experience unhealthy conditions or disabilities.

In addition to interpreting increases in life expectancy with caution—considering the potential rise in years lived with disability (Robine, 2021; United Nations, 2023)—it is also important to take into account the specific characteristics of the population being used for the calculation. An example that appears in both Figures 1 and 2 is that the values of those 2 indices were consistently higher for women than for men. This gender gap in disability reveals that older females were more likely to experience negative health conditions compared to males at the same age (United Nations, 2023). Other characteristics such as socioeconomic status, education, income, or even those with health risk factors, etc., should be studied as well because they are all characteristic factors that lead to disparities in life expectancy and health inequalities among the population in order to reduce the possible economic, social, and public health impacts (United Nations, 2023).

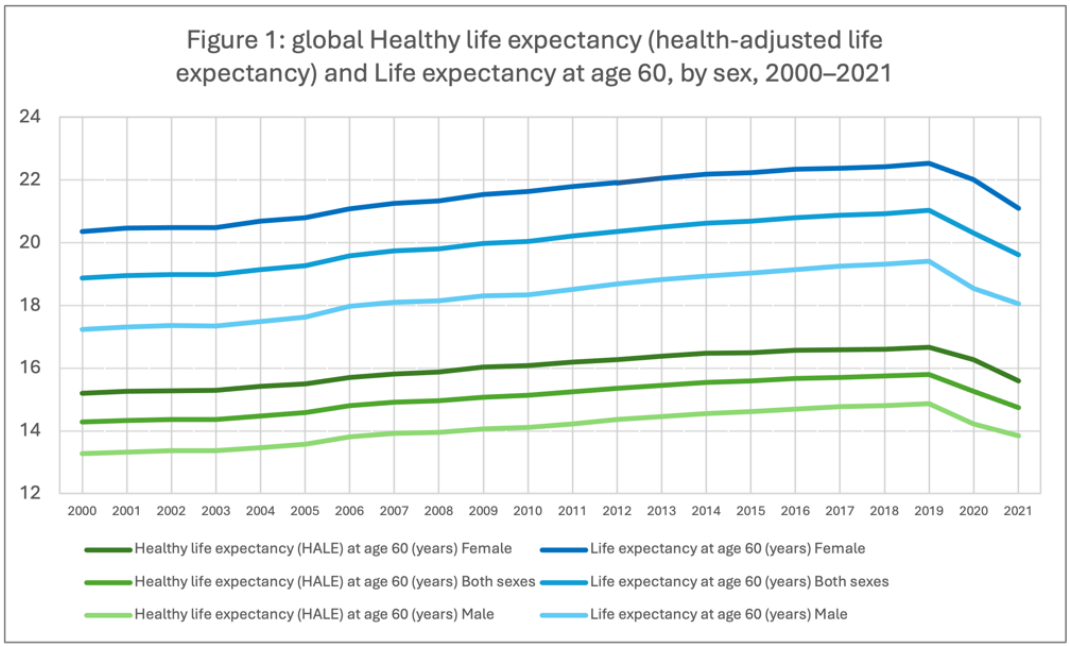

Figure 1: global Healthy life expectancy (health-adjusted life expectancy) and health-adjusted life expectancy at age 60, by sex, 2000-2021. *(The diagram is created using Microsoft Excel by the authors.)*
Source: [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/gho-ghe-hale-healthy-life-expectancy-at-age-60] & [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/life-expectancy-at-age-60-(years)] (will find more suitable citation format again)

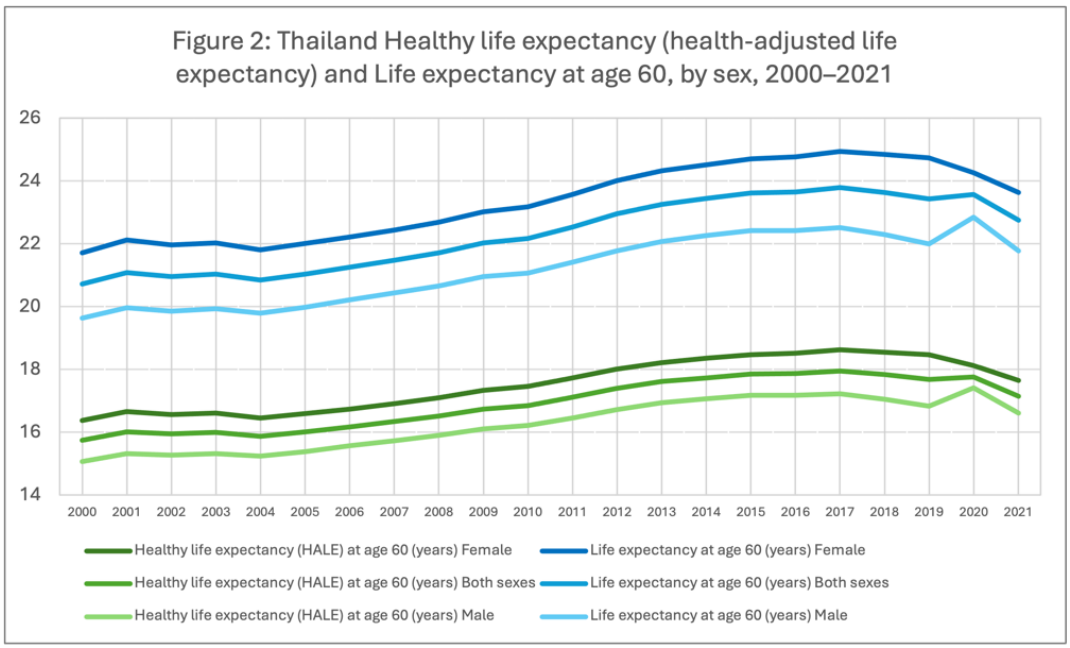

Figure 2: Thailand Healthy life expectancy (health-adjusted life expectancy) and health-adjusted life expectancy at age 60, by sex, 2000-2021. *(The diagram is created using Microsoft Excel by the authors.)*
Source: [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/gho-ghe-hale-healthy-life-expectancy-at-age-60] & [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/life-expectancy-at-age-60-(years)] (will find more suitable citation format again)

Although data from medical institutions are the most relevant source for studying health-related topics because they are more detailed and often follow long-term, it is undeniable that such data are difficult to access completely, especially if it is not for clinical research. However, in the context of official statistics collection in Thailand, the main responsible agency is the National Statistical Office. Cross-sectional survey statistics on many issues are available to researchers and have been continuously repeated over many waves[2]. Like many data collections, the survey of the older persons in Thailand, which is part of the demography, population, and housing statistics branch, has been collected seven times since 1994 to 2021 and it also contains information on the health dimensions of the elderly (National Statistical Office, 2022).

To address the knowledge gaps regarding elderly health in Thailand, this research focuses on studying the dynamics of transitions into worse health statuses, from a normal state to a moderate state, and especially from a moderate state to a severe (health-dependent) state, among older adults with different characteristics, as well as projecting future possibility trends in these transitions in 2024, 2027, and 2030. Identifying the heterogeneity in transition risks can help design health and social services that account for the rapidly growing number of the elderly population and their diversity of backgrounds. Methodologically, this research contributes by applying a multi-state model, which typically requires longitudinal data (van den Hout, 2016), to analyze and project these transitions using multiple waves of cross-sectional surveys due to the data limitation. Despite seven rounds of data collection, only five waves of the survey of older persons in Thailand—conducted in 2007, 2011, 2014, 2017, and 2021—are utilized in this research to enable the calculation of health status transition risks over consistent 3-year difference periods.

Data

[2] The list of surveys collected under the responsibility of the National Statistical Office can be retrieved from [https://www.nso.go.th/nsoweb/nso/survey].

The Survey of Older Persons in Thailand has been conducted by the Thai National Statistical Office. The first survey took place in 1994, and since 2007, data has been collected every three years to continuously update the elderly population database. The latest survey, the seventh, was conducted in 2021. The Survey of the Elderly in Thailand aims to collect data on the elderly across three dimensions: 1) Basic demographic data of the elderly, 2) Data related to the stability of elderly life, and 3) Data on elderly caregivers. The data from this survey are nationally representative. The target population includes persons living in private households, both inside and outside municipal areas, throughout the country. These households were selected as sample households based on the enumeration criteria using the sampling methodology of the National Statistical Office, which employs the Stratified Two-stage Sampling method.

Therefore, this study will focus on using data from the first aspect—basic demographic data of the elderly, particularly in terms of health status and other demographic characteristics, such as socioeconomic status—to examine the dynamics of transitions into worse health statuses, specifically from a normal state to a moderate state, and from a moderate state to a severe (health-dependent) state, across various aging population characteristics of interest. However, to demonstrate the dynamics and future trends of the risk of worsening health conditions from 2007 to 2030 over a consistent 3-year period calculations, this research utilizes only five rounds of the survey of older persons in Thailand—2007, 2011, 2014, 2017, and 2021—instead of all seven waves.

Research method

Given the limitation of lacking longitudinal data, this research utilizes cross-sectional data from multiple waves to estimate the risk of transitioning to worse health statuses among the elderly. A Multistate model in the form of a three-state model is employed, excluding the death state. The three states are: 1) normal state, 2) moderate state, and 3) severe (health-dependent) state. The approach of Van de Kassteele and colleagues (2012) is applied to estimate the net transition probabilities for moving into a worse health state. This calculation will be repeated across several waves, with a 3-year interval based on the available data, to study the dynamics from past to present. Projections also will be made for the future to explore potential trends. In addition, to highlight potential health disparities arising from the different characteristics of the elderly, the analysis will not be limited to the overall population, but will also be conducted separately based on the available characteristics.

Expected findings

This study is expected to reveal significant variability in the risk of transitioning to worse health statuses among Thailand's elderly population. It is anticipated that the transition from a normal state to a moderate or severe (health-dependent) state will show distinct patterns based on socioeconomic and demographic characteristics, such as income level, education, and geographic location. The analysis will likely highlight disparities in health outcomes, with certain subgroups of the elderly population, particularly those from lower socioeconomic backgrounds, facing higher risks of health deterioration. Additionally, in the context of the absence of formal longitudinal data collection, the use of cross-sectional data in a multistate model is expected to provide valuable insights into the dynamics of health transitions, projecting increasing rates of severe health dependency in future years, particularly in 2024, 2027, and 2030. These findings will underscore the need for targeted health interventions and social services tailored to the diverse health trajectories of Thailand's aging population. Moreover, the results are expected to inform policy decisions aimed at addressing the growing demand for healthcare and support services as the elderly population continues to expand.

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