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Original Article

Subjective Life Expectancy and Cognitive Functioning among Community-Dwelling Older Adults in Thailand: Results of a Longitudinal National Survey in 2017-2022

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A B S T R A C T

Introduction: Longitudinal studies on the association between subjective life expectancy (SLE) and cognitive functioning are scarce, particularly in low- and middle-income countries. Thus, the purpose of this study was to determine the association between SLE and cognitive functioning longitudinally.

Methods: Health, aging, and retirement in Thailand (HART) provided longitudinal national data with n = 6747 from 2017 (wave 2) to 2022 (wave 4). HART includes questions on (1) General Information; (2) Family and Support; (3) Health Status; (4) Work Status; (5) Income and Expenditure; (6) Asset and Debt; (7) Life Expectation; and (8) Exit Interview. SLE and cognitive functioning were assessed with established measures. The time-varying factors and results were evaluated using linear fixed effects regression.

Results: Increases in SLE were associated with higher cognitive functioning. Increases in age were associated with decreases in cognitive functioning, and increases in subjective economic status were associated with increased cognitive functioning, while changes in marital status, work status, physical functioning, and physical illnesses were not associated with cognitive functioning.

Conclusion: The study's findings contribute to the literature by demonstrating, over a longitudinal period, that higher SLE was associated with higher cognitive functioning among older adults. The results of the study must be validated by additional longitudinal research using panel data techniques.

Keywords: Subjective Life Expectancy, Cognition, Aged, Thailand

Introduction

Life expectancy in Thailand has been increasing rapidly (1-3). In 2022, 13 million people aged ≥ 60 years constituted approximately 19% of the population. This number is projected to rise to 19 million (31.4%) by 2042 (4). In Thailand, the prevalence of dementia is increasing consistently among older age groups, ranging from 9.9% (5) to 18% (6), in tandem with the current increase in life expectancy.

Subjective life expectancy (SLE), defined as an individual's perception of their own remaining lifespan (7), reflects an optimistic or pessimistic outlook on life (8). According to this viewpoint, a person's emotions and moods have an impact on their health through SLE (7, 9). SLE is associated with various health outcomes, including poor self-rated health (10, 11), mortality (11), low life satisfaction (12, 13), and higher depressive

symptoms (10, 12, 13). Yet little is known about the impact of SLE on cognitive functioning. One longitudinal study in a high-income country, South Korea, found that low SLE was positively associated with mild cognitive impairment and dementia (14). However, to our knowledge, no studies have investigated SLE and cognitive functioning in low- and middle-income countries, which prompted the study.

A significant challenge in large survey research is unobserved heterogeneity, which can be addressed by using fixed-effects (FE) regression analysis to examine the relationship between SLE and cognitive functioning across time (15). For instance, in survey studies, it is frequently impossible to account for individual variability in genetic variables (for a number of reasons). FE regressions account for these time-constant unobserved factors, thereby mitigating potential bias (15).

Thus, the purpose of this study was to examine the long-term association between SLE and cognitive functioning in a national sample of Thai individuals aged 60 and above.

Methods

Participants and procedures

Three waves of health, aging, and retirement in Thailand (HART) studies conducted in 2017 (wave 2), 2020 (wave 3), and 2022 (wave 4) were analyses. The cognitive functioning module was only introduced in 2017 (wave 2) onwards. One person (≥ 45 years) was randomly selected from each household (as the inclusion criterion) and interviewed at home using a multi-stage national sample method; more information is provided elsewhere (16). The analytical sample was restricted to participants aged 60 years and older who completed the cognitive functioning assessment, resulting in a pooled sample of 6,747 observations and 4334 individuals across the three waves.

Measures

Dependent variable

A short cognitive function test from the US Health and Retirement Study was used to evaluate cognitive functioning. It included four items on mental status, orientation (0 – 4 points), serial 7's test (0 – 5), backward counting from 20 (0 – 2), and episodic memory was assessed by immediate and delayed recall of a 10-word list (0 – 20 points) (total 0-31) (17). All participants were given the measure from wave two to wave four. Scores range from 0-31, with higher scores indicating better cognitive functioning. This measure's construct validity is supported by research (18).

Independent variables

SLE was assessed by asking participants to estimate the percentage chance (0-100%) that they would live to a specific target age, which was adjusted based on their current age (19).

Age, work status (yes/no), living situation (living alone/living with others), marital status (married or cohabiting = 0 and widowed, single, divorced or separated = 1) and subjective economic status were among the sociodemographic characteristics that varied over time. "How satisfied are you with your economic situation?" was the question used to assess the latter. Scores range from 0 to 10, with higher scores indicating greater economic satisfaction. Time-constant factors including sex, urban/rural residency, and educational achievement were utilized as sample descriptions.

Health behaviour

To determine the frequency of physical activity or exercise, participants were asked, “How often do you exercise?” (“1 = 0 days, 2 = 1-2 days, 3 = 3-4 days, 4 = 5-6 days or 5 = 7 days per week”).

Alcohol use frequency. Response options ranged from 0 = none to 5 = 'Drinks a lot (such as drinking more than 6 small cans of beer or more than 6 glasses of wine/spirits)'. The higher the score (0 - 5), the higher the frequency of alcohol use.

Tobacco use was evaluated using the inquiry, “Have you ever smoked cigarettes?” (response options: “1 = yes, and still smoke now, 2 = yes, but quit smoking, and 3 = never”), and those who were currently smoking were asked about the average amount smoked per day (number).

Meal skipping (0 - 6) was assessed with the question: “How many meals have you had in the last 2 days?” “Yesterday (breakfast, lunch, dinner; yes/no) and the day before yesterday (breakfast, lunch, dinner; yes/no).” (20).

Physical health status

The question, "In general, how would you rate your physical health status?" was used to construct the self-rated physical health status, given a score between 0 (extremely poor) and 10 (outstanding) (21).

Functional limitations were assessed with a modified 5-item Activities of Daily Living (ADL) scale (dress, wash, eat, bathing or showering, and other) (22). Response options were 0) ‘Can do every step myself without needing help,' 1) 'Need help sometimes with some steps,' 2) 'Need help with some steps,’ 3) ‘Need help sometimes with every step,’ and 4) ‘Need help every time with every step.’ Higher scores indicated greater functional limitations; total scores varied from 0 to 20. It has a Cronbach's α of 0.95.

Healthcare providers identified the following chronic conditions (0–14): diseases of the liver, gastrointestinal tract, kidneys, lungs, prostate, uterine or ovarian, cancer, diabetes, hypertension, bone diseases, cardiovascular disease, mental or emotional disorders, neurological disease, visual or auditory impairment.

Mental health status

Depression symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D-10), which has a total score range of 0 to 30. Higher scores on the scale correspond to more depressive symptoms (23). 0.69 was Cronbach's alpha.

On a visual analogue scale of “0 (extremely poor) to 10 (excellent)”, the self-rated mental health status was measured with the item, "In general, how would you rate

your mental health status?" Research has demonstrated the validity of single item self-rated health metrics (24).

Data analysis

Unobserved time-constant factors, such genetic predispositions, are nearly impossible to account for in large surveys. If these unobserved factors are correlated with the independent variables, they can cause omitted variable bias in standard regression models. However, fixed effects (FE) regression produces consistent estimates even when time-constant unobserved factors are systematically associated with the independent variables. Between the fixed-effects and random-effects models, the Hausman specification test validated the selection of FE regression (134.80, $p < 0.001$). A key feature of the FE estimator is that it models only within-person changes over time. As a result, variables that remain constant throughout time, such sex or education, cannot be used as predictors in FE regression calculations. Standard Errors (SEs) that were cluster-robust were calculated. Covariates were selected based on a review of the literature, including age (25), physical inactivity (26-28), alcohol use (29), smoking (30), depression (31, 32), functional disability (33), hearing loss (34), and sensory impairment (35). In addition, the model included a categorical variable for "study wave" to control for secular trends. The threshold for significance was fixed at $P < 0.05$. In this investigation, Stata 18.0 (StataCorp, College Station, TX) was utilized.

Ethical considerations

The study received ethical approval from the ―Ethics Committee in Human Research, National Institute of Development Administration – ECNIDA (ECNIDA2020/00012) Ⅱ, and participants provided written informed consent. Data is publicly available at Health, Aging, and Retirement in Thailand (HART): https://hart.nida.ac.th/download-center

Results

Sample characteristics

Table 1 displays the observations that were part of the FE regression analysis. The average age of the analytic sample was 68.3 years (SD = 11.9 years), with men making up 43.6% of the sample. The average cognitive functioning score was 12.7 (SD = 5.8), and the average SLE score was 64.6% (SD = 26.7).

Regression results

In the main regression analysis (see Table 2), which included 6,747 observations, higher SLE was associated with higher cognitive functioning ($\beta = 0.17$, $p < 0.001$). Regarding covariates, increases in age were associated with decreases in cognitive functioning, and increases in subjective economic status were associated with increased cognitive functioning, while changes in marital status, work status, living arrangement, meal skipping, exercise frequency, cigarettes smoked a day, alcohol use frequency, self-rated physical and mental health status, functional disability, number of physical chronic conditions and depressive symptoms were not associated with the outcome measure.

In addition, an interaction between sex and SLE on cognitive functioning was also tested; however, the interaction term was not statistically significant.

Table 1. Analytic sample characteristics, pooled descriptive statistics waves (2, 3 and 4), HART 2017-2022

Variable (range)	N (%)/Mean (SD)[a]
Observations	6747
Dependent variable	
Cognitive functioning (0-31)	12.7 (5.8)
Independent variables	
Subjective life expectancy (0-100)	64.6 (26.7)
Depressive symptoms (0-30)	4.3 (3.7)
Self-rated mental health status (0-10)	8.1 (1.7)
Self-rated physical health status (0-10)	7.1 (1.8)
Functional limitations (0-20)	0.5 (2.2)
Number of chronic conditions (0-14)	1.4 (1.3)
Exercise frequency (1-5)	2.6 (1.8)
Alcohol use frequency (0-5)	0.3 (1.0)
Number of cigarettes per day	1.2 (4.3)
Meal skipping frequency (0-6)	0.3 (0.9)
Control variables	
Age (60-107 years)	68.3 (11.9)
Subjective economic status (0-10)	6.5 (2.0)
Work status (working)	25.1
Living alone	17.6
Marital status (married/cohabiting vs. widowed, single, divorced or separated)	53.1
Time-invariant variables	
Sex (male)	43.6
Education (> primary)	12.5
Residence (urban)	51.0

[a] Data are presented as Mean (Standard Deviation) for continuous variables and % for categorical variables

Table 2. Determinants of cognitive functioning, HART, 2017-2022, 60 years and older. Results of fixed-effects linear regression

Independent variables	β (CRSE)[1]	p
Subjective life expectancy	0.17 (0.04)	< 0.001
Sociodemographic factors		
Age	-0.12 (0.03)	< 0.001
Marital status		
Married/cohabiting	(Reference)	
Widowed/single/divorced/separated	-0.18 (0.45)	0.682
Work status		
Working	(Reference)	
Not working	0.12 (0.27)	0.651
Living arrangement		
Living with others	(Reference)	
Living alone	-0.37 (0.29)	0.198
Subjective economic status	0.11 (0.05)	0.029
Health behaviour		
Meal skipping	-0.15 (0.12)	0.219
Exercise frequency	0.04 (0.06)	0.482
Cigarettes a day	-0.02 (0.02)	0.389
Alcohol use frequency	0.07 (0.14)	0.846
Physical health status		
Self-rated physical health	0.04 (0.07)	0.547
Functional disability	-0.17 (0.12)	0.145
Number of physical chronic conditions	-0.07 (0.06)	0.568
Mental health status		
Depressive symptoms	-0.01 (0.03)	0.730
Self-rated mental health	0.14 (0.07)	0.059
Constant	3.63 (2.53)	0.151
Observations	6747	
Individuals	4334	
R^2	0.12	

β=Unstandardised beta coefficient with CRSE=Cluster Robust Standard Errors in parentheses; [1]Model adjusted for all variables listed and study wave

Discussion

This study used national community-based data on older persons in Thailand to examine the long-term association between SLE and cognitive functioning. Increases in SLE were associated with improvements in cognitive functioning, according to FE regressions. Regarding covariates, increases in age were associated with decreases in cognitive functioning, and increases in subjective economic status were associated with increases cognitive functioning. Other covariates, including health behaviours and physical health status, were not significantly associated with cognitive functioning in the adjusted model.

There is a moderate correlation between SLE and mild cognitive impairment and dementia, according to a prior longitudinal study conducted in a high-income nation (14). In this study from a middle-income nation, a within-person (intraindividual) association between SLE and cognitive functioning was found. By using an FE design, all time-invariant confounders were controlled for, thereby strengthening the evidence for this longitudinal association. The association between higher SLE and better cognitive functioning may be mediated psychological, behavioural, and physiological pathways that support brain health (14). The mechanisms may include that SLE acts as a self-fulfilling prophecy in part: expecting a longer, healthier life motivates individuals to adopt habits and maintain psychological states that make that outcome more likely, including better cognitive functioning (14). In addition, a strong positive relationship has been established between SLE and sense of control (36), and a stronger sense of control is associated with better cognitive function, including enhanced memory, strategy use, and reduced cognitive decline, particularly in older adults (37, 38). On a related concept of SLE, subjective ageing, in a systematic review, better cognition and a lower risk of cognitive decline were consistently associated with younger subjective ages, more favorable views about one's own aging, and self-perceptions of aging (39). In a longitudinal research conducted in England, for instance, participants who reported an older subjective age were more likely to have poorer cognition for memory, executive function, and incident dementia than those who claimed a younger subjective age (40).

Furthermore, the study found that increasing age was associated with lower cognitive functioning due to a combination of brain changes, such as shrinking brain regions, reduced neuronal communication, and decreased blood flow (41). Consistent with previous research (42), higher subjective economic status was associated with

better cognitive functioning. This may be explained by greater access to resources, which support brain health, and reduced stress. This can be explained by a cycle where higher status provides more opportunities for education and cognitively engaging activities, while also buffering against the chronic stress and resource scarcity that negatively impact cognitive performance (42).

Study limitations

This study is one of the few longitudinal investigations evaluating the relationship between SLE and cognitive functioning. The study utilized a national, community-based sample of older adults in Thailand. A key strength was the use of FE regressions, which mitigate the issue of unobserved time-invariant heterogeneity, a common limitation in survey studies. Both our dependent variable (cognitive functioning) and main independent variable (SLE) were assessed using established measures. The analysis adjusted for a range of potential time-varying confounders. Because of the loss to follow-up, selection bias cannot be completely ruled out. The use of self-reported measures may have introduced social desirability or recall bias. Despite the longitudinal design and use of fixed-effects models, the possibility of reverse causality cannot be ruled out. It is plausible that declining cognitive function leads to a more pessimistic outlook, including lower SLE.

Conclusion

Based on a national sample of older adults in Thailand and utilizing the panel data structure, the study findings extend current knowledge by showing that increasing SLE is associated with increases in cognitive functioning longitudinally. Future, longitudinal investigations based on panel data are needed to validate the study findings. Strategies to increase SLE may help in reducing cognitive deficits.

Conflict of interests

The author declares that they have no competing interests.

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Authors' contributions

All authors fulfill the criteria for authorship. KP conceived and designed the research, performed statistical analysis, drafted the manuscript, and made critical revisions of the manuscript for key intellectual content. All authors read and approved the final version of the manuscript.

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