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Factors Affecting Subjective Life Expectancy: Analysis of Korean Longitudinal Study of Aging

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Subjective life expectancy (SLE) is the predictive value of actual life expectancy. SLE has been notably associated with mortality. The 2006 Korean Longitudinal Study of Aging (KLoSA) representative sample of 10,254 Koreans aged over 45 years to assess the associations between factors of SLE. Descriptive analysis, correlations, and age-adjusted regression analyses were used to examine the relationship between SLE and demographic, socioeconomic, and health factors. We also linked the 2018 KLoSA death statistics to the 2006 data to evaluate the association between actuarial life expectancy and SLE. We found that chronic illnesses and limitations in activities of daily living affect the life expectancy of individuals. Marriage, gainful employment, and high educational qualifications increase life expectancy. People who exercise expect to live longer, while those who smoke and drink expect to live somewhat shorter lives. Better self-rated health is associated with higher SLE. People who own a house expect to live longer than non-owners, and individuals living in metropolitan cities and urban areas assume a longer life expectancy than those living in rural areas. Participants who died between 2006 and 2018 had previously predicted a lower life expectancy than those who survived until 2018. The results of the study suggest that current health status, health behaviors, socioeconomic status, and actual life expectancy showed significant associations with SLE in the expected directions. These findings imply that we could use SLE as a database of health status, health behavior, and actual life expectancy. This information could help us intervene and improve policies related to SLE.

Keywords: Activities of daily living, Health behavior, Life expectancy, Social class

Introdution

The concept of time plays a fundamental role in decision-making and goal achievement as we navigate through life [1]. Therefore, predicting and understanding the trajectory of individuals' lives is essential for shaping their future plans and behaviors. Subjective life expectancy (SLE) refers to the remaining years of life an individual anticipates based on family longevity, particularly their family's mortality experiences [2,3,4]. Recently interests in SLE has been increasing. People currently engage in health behaviors such as cancer screening, quitting smoking, following up with a specific treatment plan, and maintaining a physical activity routine based on predictions of their future health levels [5]. Additionally, as chronic diseases tend to increase with age and it becomes challenging for the elderly to perform daily activities [6], it has become significantly important to predict their future health to ensure their well-being.

SLE has been studied in association with a broad range of factors, such as socioeconomic factors, psychosocial factors, human behavior, and health status. In particular, studies on retirement, pensions, consumption, and health behaviors

were conducted because predicting the remainder of one's life is directly related to their later years and retirement planning [7-9]. People who have a positive outlook on life expectancy retire later, consume more [8,9], are more likely to receive screenings, exercise more, and have supportive families or friends [10,11].

Empirical research shows a positive correlation between SLE and actuarial life expectancy, self-rated health, and mortality [3,12,13]. In instances of actual diseases or disabilities, life expectancy, SLE, and self-rated health are notably lower. van Solinge and Henkens [14] found that psychological variables were the pathway linking SLE with mortality. Kim and Kim [15] also identified SLE as a predictor of mortality and perceived health status. Lee et al. [16] revealed that self-rated health was perceived as easier than SLE, but it covered a narrower spectrum. Additionally SLE was more strongly associated with family longevity history, life situations, and lack of control than self-rated health.

A few previous studies have identified a correlation between SLE and health status. Only one study has explored the connection between self-rated health, mortality, and health status factors [15]. Since the study primarily focused on the relationship between factors and mortality, specifically self-rated health without addressing limitations in activities of daily living (ADL), it is crucial to analyze the impacts of demographic, socioeconomic, health, and behavioral factors on SLE.

This study seeks to contribute to the literature in two ways. First, we explore the role of demographic, socioeconomic, and health-related factors in the predictive process underlying SLE. Second, we will examine the relationship between SLE and mortality in Korea [6].

Methods

Sample

A nationwide panel survey of 10,254 adults aged over 45 years was conducted by the Korean Longitudinal Study of Aging (KLoSA). The KLoSA was first conducted in 2006, with biennial follow-ups. The seventh survey was completed in 2018, and the survey is currently in progress. The interviews have been conducted by trained interviewers using the computer-assisted personal interviewing technique. This database includes multistage, stratified sampling based on geographic areas. The KLoSA database includes questionnaires on demographic factors, socioeconomic factors, health status, and health behavior. The data includes biennial records of deaths since 2008, detailing the date, cause, and location of each death. All participants provided written informed consent, and the survey protocol was approved by the Institutional Review Board (IRB) of Statistics Korea.

In this study, we analyzed the 2006 database of 10,254 participants. We linked a 2018 death database to the 2006 data to investigate the association between SLE and various factors, including mortality.

Measures

1) Subjective life expectancy

The survey questionnaires about SLE are as follows.

If the participant was 64 or younger, the questionnaire asked, "Do you think you can live to be 75 years old?" was provided. If the participant was 65 to 69 years old, the questionnaire asked, "Do you think you can live to be 80 years old?" No information was provided. If the participant was 70 to 74 years old, the questionnaire asked, "Do you think you can live to be 85 years old?" The information was provided. If the participant was 75 to 79 years old, the questionnaire asked, "Do you think you can live to be 90 years old?" was given. If the participant was 80 to 84 years old, the questionnaire asked, "Do you think you can live to be 95 years old?" was given. If the participant was 85 to 94 years old, the questionnaire asked, "Do you think you can live to be 100 years old?" was given. If the participant was 95 to 99 years old, the questionnaire asked, "Do you think you can live to be 105 years old?" was given. If the participant was 100 or older, the questionnaire asked, "Do you think you can live to be 110 years old?" was given. Responses were scored on a scale of 0 to 100. We coded on a scale ranging from 0 to 30 (low), 40 to 80 (medium), and 90 to 100 (high).

2) Demographic factors

Sex, age, and marital status were included in this category. Sex was classified as male and female. Age was measured as a continuous variable in years and classified into groups of 45-49 years, 50-59 years, and 60 years or older. The status of marriage was categorized as either living with a spouse or not living with a spouse.

3) Socioeconomic factors

Variables within this category include educational qualifications, occupation, type of real estate contract, and residential area. The educational qualifications were classified based on the final education level as follows: middle school diploma or lower, high school diploma, and bachelor's degree or higher. Occupation was classified as either currently employed or cur-

rently unemployed. The types of real estate contracts are classified into ownership, lease, and monthly rental agreements. Residential areas were classified into metropolitan areas, urban areas, and rural areas.

4) Health status and health behavior factors

Variables within this category include chronic illness, ADL limitations, smoking status, alcohol consumption, exercise, self-rated health, and death. Chronic illnesses were assessed based on the presence of hypertension, diabetes mellitus, cancer, chronic pulmonary disease, chronic liver disease, cardiac disease, and psychiatric disorders. We classified chronic illness into three groups: 0, 1-2, and 3 or more. The ADL restrictions included 7 questions related to dressing, washing face, brushing teeth, washing hair, showering, eating, getting out of the room, using the toilet, and managing incontinence. ADL limitations were categorized based on the number of participants, divided into three groups according to the number of limitations: 0, 1-4, 5 or more.

Smoking status was classified as either a current smoker or a non-smoker. Alcohol consumption was categorized as "yes" (drinks occasionally or often) or "no", while exercise was categorized as "yes" (exercise more than once a week) or "no". The question about self-rated health asked, "How would you rate your health?" Responses were coded on a scale of 10, ranging from 0 to 100. We classified self-rated health as 0-30 (poor), 40-70 (medium), and 80-100 (good). Death was classified into deceased and living individuals.

Statistical analysis

Initially, we analyzed the baseline characteristics of the participants, considering demographic, socioeconomic, health status, and health behavior factors to assess the correlations of individual variables with SLE. The chi-square test was performed for categorical variables. The descriptive statistics of the samples and chi-square test analyses for each set of factors are provided in Table 1.

Secondly, the correlation between SLE and self-rated health was evaluated using Pearson correlation coefficient (Table 2). Self-rated health is correlated with psychological state [11]. We controlled for age and sex when matching SLE and self-rated health.

Finally, we utilized multinomial logistic regression to examine the relationship between SLE and categorical variables. We estimated the age-adjusted regression, considering age as the most crucial factor for socioeconomic and health factors.

All analyses were performed using STATA version 15 (Stata Corp.). The statistical testing was conducted with an alpha level of 0.05.

Results

Descriptive results

The general characteristics of 10,254 participants in the study are as follows (Table 1). In terms of demographic factors, males comprised 43.5% of all participants, while females comprised 56.5%. Males tended to estimate life expectancy higher than females. The most frequent age group was over 60 years (51.4%). However, people over the age of 60 years predicted the lowest longevity of life. 77.7% of participants had a partner. In the married group, 19.1% of people estimated high levels of SLE, while in the unmarried group, the percentage was 9.4%.

In terms of socioeconomic factors, regarding educational qualifications, there were 6,406 (62.5%) middle school graduates, 2,703 (26.4%) high school graduates, and 1,145 (11.2%) individuals with a bachelor's degree or higher. Participants with higher education qualifications tended to estimate a longer life expectancy. Among the middle school graduates, 29.2% of people answered their SLE as 'low', while in the bachelor's degree or higher group, the percentage was 9.1%. Only 38.6% of participants had jobs, as most of them were elderly. Unemployed individuals are predicted to have a shorter lifespan than those who are employed. On the type of real estate contract, 76.3% of participants owned their house, whereas 11.6% leased, and 12.1% rented monthly. In the ownership group, 17.6% of people answered SLE as 'high,' while in the monthly rent group, this percentage was 13.4%. 55.3% of participants lived in a metropolitan city or urban area, while 44.7% lived in a rural area. People who live in metropolitan cities and urban areas predicted their life satisfaction level (SLE) to be higher than those who lived in rural areas.

In terms of health status and health behavior, 60.6% of participants did not have a chronic illness, whereas 37.4% had 1-2, and 2.0% had 3 or more chronic illnesses. The more chronic illnesses present, the shorter the predicted life expectancy. On ADL limitations, the group with zero limitations comprised 85.2%, the group with 1-4 limitations comprised 11.6%, and the group with 5 or more limitations comprised 3.2%. (More than 100%) people with 5 or more ADL limitations estimated a significantly lower life expectancy than people without ADL limitations. Regarding smoking and drinking, 66.9% of participants were smokers, and 37.3% were categorized as part of the drinking group. The smokers and drinkers made rather high estimates of life expectancy. 38.7% of participants exercised

Table 1. Baseline characteristics of study participants

Characteristic	Total	Subjective life expectancy			Chi-square
		Low	Medium	High	
General information	10,254 (100)	2,300 (22.4)	6,217 (60.6)	1,737 (16.9)	
Bottom-up factors					
Demographic characteristics					
Age at baseline (yr)	61.7 (61.5, 61.9)				
45–50	2,102 (20.5)	176 (8.4)	1,367 (65.0)	559 (26.6)	<0.0001
51–60	2,883 (28.1)	313 (10.9)	1,927 (66.8)	643 (22.3)	<0.0001
>60	5,269 (51.4)	1,811 (34.4)	2,923 (55.5)	535 (10.2)	<0.0001
Sex					
Male	4,463 (43.5)	788 (17.7)	2,765 (62.0)	910 (20.4)	<0.0001
Female	5,791 (56.5)	1,512 (26.1)	3,452 (59.6)	827 (14.3)	<0.0001
Marital status					
Living with spouse	7,970 (77.7)	1,416 (17.8)	5,032 (63.1)	1,522 (19.1)	<0.0001
Not living with spouse	2,284 (22.3)	884 (38.7)	1,185 (51.9)	215 (9.4)	<0.0001
Socioeconomic position					
Educational attainment					
Middle school diploma or lower	6,406 (62.5)	1,872 (29.2)	3,810 (59.5)	724 (11.3)	<0.0001
High school diploma	2,703 (26.4)	324 (12.0)	1,757 (65.0)	622 (23.0)	<0.0001
Bachelor's degree or higher	1,145 (11.2)	104 (9.1)	650 (56.8)	391 (34.2)	<0.0001
Occupation					
Yes	3,960 (38.6)	355 (9.0)	2,662 (67.2)	943 (23.8)	<0.0001
No	6,294 (61.4)	1,945 (30.9)	3,555 (56.5)	794 (12.6)	<0.0001
Type of real estate contract					
Monthly rent	1,244 (12.1)	397 (31.9)	680 (54.7)	167 (13.4)	<0.0001
Lease	1,186 (11.6)	284 (24.0)	710 (59.9)	192 (16.2)	<0.0001
Ownership	7,824 (76.3)	1,619 (20.7)	4,827 (61.7)	1,378 (17.6)	<0.0001
Residential area					
Rural area	2,324 (22.7)	612 (22.4)	6,217 (60.6)	1,737 (16.9)	<0.0001
Urban area	3,343 (32.6)	619 (18.5)	2,058 (61.6)	666 (19.9)	<0.0001
Metropolitan area	4,587 (44.7)	1,069 (23.3)	2,727 (59.5)	791 (17.2)	<0.0001
Health					
Chronic illnesses**					
0	6,211 (60.6)	1,075 (17.3)	3,893 (62.7)	1,243 (20.0)	<0.0001
1–2	3,835 (37.4)	1,122 (29.3)	2,233 (58.2)	480 (12.5)	<0.0001
3+	208 (2.0)	103 (49.5)	91 (43.8)	14 (6.7)	<0.0001
Activity of daily living					
0	8,739 (85.2)	1,569 (18.0)	5,519 (63.2)	1,651 (18.9)	<0.0001
1–4	1,186 (11.6)	498 (42.0)	611 (51.5)	77 (6.5)	<0.0001
5+	329 (3.2)	233 (70.8)	87 (26.4)	9 (2.7)	<0.0001
Health behavior factors					
Current smoking					
Yes	1,977 (66.9)	337 (17.1)	1,221 (61.8)	419 (21.2)	<0.0001
No	978 (33.1)	217 (22.2)	574 (58.7)	188 (19.1)	<0.0001
Alcohol consumption					
Yes	3,823 (37.3)	549 (14.4)	2,450 (64.1)	824 (21.6)	<0.0001
No	6,431 (62.7)	1,751 (27.2)	3,767 (60.6)	913 (14.2)	<0.0001
Physical activity					
Yes	3,932 (38.3)	558 (14.2)	2,433 (61.9)	941 (23.9)	<0.0001
No	6,322 (61.7)	1,742 (27.6)	3,784 (59.9)	796 (12.6)	<0.0001
Psychological variables					
Satisfaction with life					
Self-rated health					
Poor	2,300 (22.4)	676 (39.4)	1,283 (55.8)	341 (14.8)	<0.0001
Fair	6,217 (60.6)	536 (8.6)	3,936 (63.3)	1,745 (28.1)	<0.0001
Good	1,737 (16.9)	86 (5.0)	805 (46.3)	846 (48.7)	<0.0001
Death					
Yes	538 (5.3)	182 (33.8)	281 (52.2)	75 (13.9)	<0.0001
No	9,716 (94.7)	2,118 (21.8)	5,936 (61.1)	1,662 (17.1)	<0.0001

Values are presented as number (%).
**$p<0.01$.

regularly. The group that exercised tended to estimate a longer life expectancy. On self-rated health, only 16.9% evaluated their health as good. People who believed they were healthy predicted a longer life expectancy. Participants who died between 2006 and 2018 accounted for 5.3%. The deceased participants had predicted a life expectancy lower than that of the living.

Table 2 displays the correlation between SLE and self-rated health. The Pearson correlation coefficient was 0.48, indicating a moderate correlation between SLE and self-estimation of health.

Regression results

The results of the multinomial logistic regression analyses are presented in Table 3. As shown, SLE is correlated with demographic factors, socioeconomic factors, health status, and health behavior. On demographic factors, males, younger individuals, and married people expected a longer lifespan. In terms of socioeconomic factors, highly educated individuals, those who are employed, and homeowners tended to estimate a higher life expectancy. No significant effects were found based on residential area. In terms of health status and health behavior, individuals with chronic diseases and limitations in ADL anticipate a shorter lifespan. Smokers and drinkers, on the other hand, had high self-reported life events, while individuals who exercised regularly also had high self-reported life events. Estimated self-rated health was positively associated, and actual lifespan had an effect on self-reported life events.

The results indicated that individuals with a high socioeconomic status and those in good health were significantly more optimistic about their chances of survival.

Discussion

In this article, we discovered that the actual risk factors for mortality were linked to the perceived life expectancy through a 12-year follow-up study involving 10,254 older adults in Korea who were over 45 years old at the baseline in 2006. These factors included age, sex, marital status, educational qualification, occupation, residential area, type of real estate contract, presence of chronic illness, ADL limitations, smoking status, alcohol consumption, physical activity, self-rated health, and mortality.

Table 2. Correlation between subjective life expectancy (SLE) and self-rated health

	Pearson correlation coefficient
SLE vs. self-rated health	0.48***

***$p < 0.001$.

Although there is little research in this area, our study did not align with previous research on some factors but was consistent with almost all other factors. Prior studies have found that females tend to be more accepting of the reality of death than males [17], and males tend to have a more optimistic belief about their life expectancy. In our study, we also observed that males estimated their SLE to be higher than females. However, the life expectancy for newborns in 2019 was 80.3 years for males and 86.3 years for females in Korea [18,19]. Females tend to live 6 years longer than males. We speculate that the difference between actual life expectancy and SLE is due to the Korean patriarchal society. Especially in older adults, females had lower social participation, while males exhibited more masculine traits than females. Perhaps this is a factor in why males tend to overestimate their life expectancy. Mirowsky [20] reported SLE had positive associations with the sense of control over one's life, while age was negatively associated with this sense of control. This study found that individuals over the age of 60 years tended to estimate their life expectancy more negatively than those under 60 years. Marriage has been reported to contribute to the life expectancy of older adults. This is because of emotional support and the relief that someone provides when one is sick [21].

Even though Griffin et al.'s study [22] found that education was not associated with SLE, we observed that educational qualifications affect SLE in the expected direction. In addition, employment status, residential area, and the type of real estate contract played a significant role in estimating SLE. Educational qualifications and employment are closely related to health and mortality [23]. Especially in Korea, residential areas (large cities and rural areas) and the type of real estate contract (ownership, lease, monthly rent) are currently very sensitive topics. The birth rate and marriage rate are also influenced by real estate prices. Given that the SLE is an indicator of hope for the future, individuals with low socioeconomic status tend to predict their SLE to be low, putting them at risk of undervaluing their health. In addition, individuals with low socioeconomic status are more likely to face challenges in preparing for their retirement and may underestimate the significance of saving for their old age.

Kobayashi et al.'s study [24] reported that diagnoses of cancer and diabetes were related to SLE. Additionally, we found that health status and health behavior positively affected SLE. The more people have chronic diseases, the lower their

Table 3. Multivariate analyses of subjective life expectancy (SLE) and 7-year mortality

	Coefficients (SE)	Age-adjusted coefficients (SE)
Subjective life expectancy		
Demographic characteristics		
Age (yr)		
45–50	NA	NA
51–60	0.18 (0.22)***	NA
> 60	−1.83 (0.17)***	NA
Sex (1 = male)	0.13 (0.02)***	0.13 (0.02)***
Marital status (1 = yes)	1.23 (0.03)***	0.75 (0.85)***
Socioeconomic position		
Educational attainment		
Middle school diploma or lower	NA	NA
High school diploma	1.11 (0.12)***	0.48 (0.13)***
Bachelor's degree or higher	1.48 (0.21)***	0.95 (0.21)***
Occupation (1 = yes)	2.40 (0.16)***	1.88 (0.17)***
Type of real estate contract		
Monthly rent	NA	NA
Lease	0.45 (0.14)***	0.39 (0.15)***
Ownership	0.79 (0.10)***	0.82 (0.11)***
Residential area		
Metropolitan area	NA	NA
Urban area	0.57 (0.12)***	0.35 (0.12)**
Rural area	−0.07 (0.10)	−0.28 (0.10)**
Health		
Chronic illnesses**		
0	NA	NA
1–2	−0.63 (0.08)***	−0.25 (0.09)***
3+	−1.33 (0.20)***	−0.77 (0.20)***
Activity of daily living		
0	NA	NA
1–4+	−1.36 (0.10)***	−1.21 (0.14)***
5+	−2.70 (0.13)***	−2.27 (0.13)***
Health behavior factors		
History of smoking (1 = yes)	1.09 (0.27)***	0.53 (0.25)***
Alcohol consumption (1 = yes)	0.27 (0.03)***	0.85 (0.11)***
Physical activity (1 = yes)	0.91 (0.09)***	0.79 (0.10)***
Psychological variables		
Self-rated health		
Poor	−1.93 (0.13)***	−1.66 (0.13)***
Fair	−0.49 (0.11)***	−0.35 (0.12)***
Good	NA	NA
Death (1 = yes)	−0.70 (0.14)***	−0.36 (0.14)***

SE, standard error; NA, not available.
**p<0.01, ***p<0.001.

self-rated health and life expectancy [15]. ADL limitations affect chronic obstructive pulmonary disease, cardiovascular disease, obesity, falls, and suicidal ideation, and are also linked to self-rated health [25-28]. As Korea transitioned into an aged society in 2017, the number of patients with chronic illnesses is rising, and ADL limitations have become more relevant recently. Chronic disease patients and individuals with ADL limitations often exhibit pessimism regarding life expectancy, which may lead to mental health crises. Therefore, it is crucial to provide social support and proper management for these patients and older adults.

Adams et al.'s study [29] reported that smoking and physical

activity were related to SLE, but not alcohol consumption. Ross and Mirowsky [21] found that diet and physical activity had a positive association with SLE. In our study, we found that cigarette smoking and alcohol consumption were negatively associated with SLE. Non-smokers and non-drinkers were found to have lower SLE scores. This is believed to be associated with the relationship between alcohol consumption, acute coronary syndrome, and overall mortality, which follows a J-shaped curve [30]. Particularly in older adults, this phenomenon is attributed to the inability to consume cigarettes or alcohol due to underlying health conditions and medications. Siegel et al.'s study [3] reported that self-rated health and mortality were associated with SLE, and self-rated health was a predictor of mortality. We found that self-rated health had a moderate association with SLE, and death also affected SLE. People who predicted lower SLE had shorter lives. Therefore, the integration of SLE as an indicator in promoting health policies will be highly beneficial in the future.

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Ethics approval

All participants provided written informed consent, and the survey protocol was approved by the Institutional Review Board (IRB) of Statistics Korea (DAUHIRB-EXP-21-128).

Conflict of interest

The authors have nothing to disclose.

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