



## Research Article

# Establishment of Normative Self-Rated Health Status Data and Association between Ideal Life Expectancy and Social Wellness of General Population in Korea



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## ABSTRACT

**Purpose:** The purpose of this study was to establish normative data for holistic health parameters in the general Korean population and to investigate the factor associated with ideal life expectancy (ILE) among these holistic health parameters and sociodemographic variables.

**Methods:** This study used a questionnaire to obtain self-reported physical, mental, social, spiritual, and general health status and then evaluated their association with ILE. A total of 1,241 individuals responded to the questionnaire, from which we established a multidimensional health status reference data set representing the Korean population. To explain factors associated with ILE, we stratified results by age and gender and performed multiple logistic regression of sociodemographic variables and multidimensional health status.

**Results:** Women reported poor health status more frequently for all five health categories. The average ILE was 87.46 years versus 84.42 years of life expectancy in the general Korean population. Single marital status, higher income, and better social health were significantly associated with higher ILE.

**Conclusion:** ILE could be a good indicator reflecting social wellness in a certain society. Comprehensive social health promotion programs can improve individuals' attitudes toward life expectancy, especially for vulnerable groups.

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## Introduction

In 2013, a research center in the United States (US) conducted a survey with 2,000 participants, asking what they thought the ideal life expectancy (ILE) should be; the median answer was 90 years, approximately 11 years longer than the average US life expectancy [1]. With the inclusive economic development and technological

advancements, the life expectancy of the general population in Korea has remarkably improved [2]. However, owing to the population aging and lifestyle changes (i.e., poor nutrition, physical inactivity, and obesity), the actual age of death does not meet that high expectation [3,4].

Even though there is still some difference between an individual's actual life span and ILE, the latter one could provide better information about what an individual thinks about the wellness of his/her health status. The trends of ILE evaluation form the foundation for concepts such as positive health practices and optimism [5]. Those who believe that something positive happens in their lives will exhibit better health behaviors and actually appreciate their health status; both of these attributes affect the performance of their actual health outcomes [6–8]. The person who has health optimism also exhibits greater resilience when

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facing stress, which can prevent negative health consequences [9,10]. All these factors produce a higher ILE.

Several studies have investigated the association between subjective life expectancy (SLE) and self-rated health to predict factors associated with the risk of mortality [11–13]. Regardless of whether they resided in eastern or western regions, participants reporting “poor” health and lower SLE were at significantly greater risk of dying [11–13]. However, whereas SLE is defined as the age till which an individual would live, then ILE is the age till which most people would like to live, which is a more appropriate concept reflecting the optimism of health. Therefore, assessing ILE by self-rated health status is important, but only a few studies have focused on the effects of ILE. Moreover, the predictive power of self-rated health for subsequent mortality risk varied by socioeconomic status. Thus, subjective health status and ILE may not be directly comparable without considering their societal characteristics [14].

This study hypothesized that people with better socioeconomic status and who have a positive perception of their life maintain a healthier lifestyle and consequently report a better health status with a higher ILE. In this study, we first established reference data for holistic health status parameters (physical, mental, social, spiritual, and general) in the general Korean population. These data will be used to assess the level of wellness in the general population and to establish the importance of each of the parameters to overall health. Subsequently, we investigated the association of these holistic health parameters in the general population with the subjective ILE and sociodemographic variables.

### Conceptual framework

#### Normative data for self-rated health status

Because self-rated health can help measure general health, authors used a questionnaire that can be a reliable measurement of a respondents' physical, mental, social, and spiritual health [15,16]. However, we did not have any population-based normative data to compare against so far. These data would increase the utility within Korean population, considering multiple previous studies focusing on the predictive power of self-rated health (Figure 1) [13,17].

#### Sociodemographics and ILE

Authors hypothesized that the demographic and socioeconomic predictors of ILE may consist of gender, age, education, or income level. In a previous study, a trial was conducted to identify

modifiable factors associated with health optimism, including sociodemographic variables [18]. Because the hypothesis is based on health optimism and multidimensional wellness, we similarly proceeded to examine who experiences health optimism, under what conditions they experience it, and how it affects a higher ILE.

#### Self-rated health status and ILE

Self-rated health status has been theorized to contribute to a higher ILE. Individuals who rated their health status more positively had positive goals and showed better health outcomes [19,20]. Because their self-rated health statuses are considered to be more positive, these participants have a greater tendency to think their ILE will be higher.

### Methods

#### Study design

This is a cross-sectional study designed to examine the perception of ILE and self-rated health of the Korean population. The survey was conducted in two strata, age and gender, according to the guidelines of the 2015 Census of Korea [21]. The study consisted of a distribution of age and gender in Korea: participants aged 20–29 years constituted 12.9%, 30–39 years constituted 14.9%, 40–49 years constituted 17.1%, 50–59 years constituted 16.1%, 60–69 years constituted 9.9%, and older than 70 years constituted 8.9%. Men comprised 50.1% of study participants, whereas 49.9% were women. Individuals younger than 19 years and older than 80 years were not included in this survey. Therefore, the sum of the aforementioned proportion of ages was adjusted to 100% and then used as data in these strata.

#### Setting and sample

The survey was designed to recruit more than 1,000 participants in Korea. Potential participants were contacted by phone or visited randomly by a survey assistant to obtain consent. Individuals included in the study 1) aged  $\geq 20$  years; 2) agreed to take part in the survey; and 3) understood the purpose and intention of the survey. Individuals who could not speak, understand, or read Korean or whose physical or mental condition was considered to be clinically too poor to conduct this survey were excluded. The sample was heterogeneous and did not include potentially biased

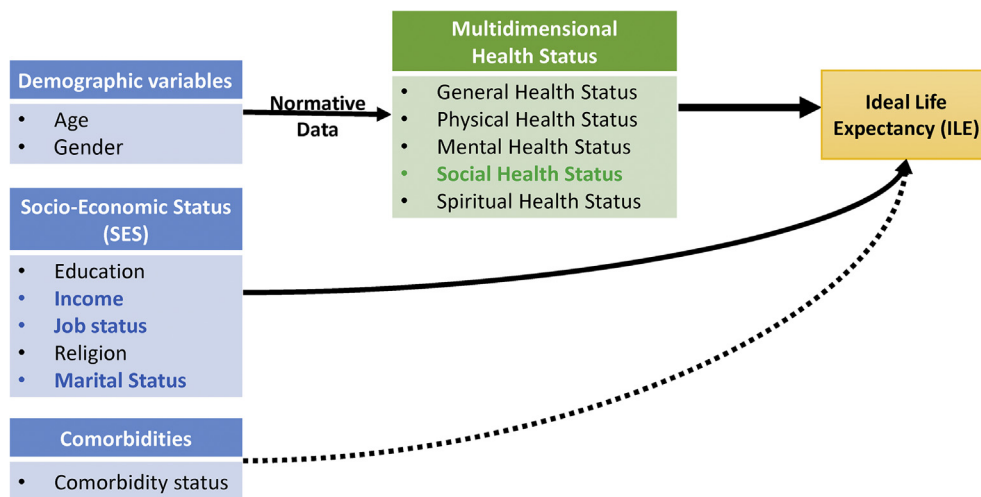


Figure 1. Conceptual framework.

Note. ILE = ideal life expectancy. Bold variables mean final significant predictors for higher ILE.

individuals associated with a certain organization or employee sector, students, etc.

#### Ethical consideration

Before giving the consent, the participants voluntarily took part in the research and were informed that they could refuse to participate or withdraw from the study at any time. This study was approved by the Institutional Review Board of the Seoul National University (Approval no. 1607-107-777). Personally identifiable information was not collected, and a small reward was provided after completing the questionnaire.

#### Measurement

Authors used a questionnaire to measure self-rated health status. The response scale, developed by Sim and Yun [16] in 2016, was defined in a previous study, and the participants used a 5-point scale, involving excellent, very good, good, poor, and bad, to respond to the following questions that were used to assess the five health parameters:

- 1) "Physical health is the state of having normal physical strength, without diseases and injuries. What do you think about your physical health status?"
- 2) "Mental health is the state of being mentally stable, able to overcome stress. What do you think about your mental health status?"
- 3) "Social health is the state of having good social relationships, carrying out one's work properly. What do you think about your social health status?"
- 4) "Spiritual health is the state of having a meaning in life through volunteering, religious experiences, and meditation. What do you think about your spiritual health status?"
- 5) "Considering your physical, mental, social, and spiritual health status, what do you think about your health status in general?"

In addition, the participants were asked about their ILE after being informed about Korean life expectancy and wrote their desired answers on a provided paper. The following question was asked: "Currently, the average of Korean health-adjusted life expectancy is 84.42 years [22] and is expected to increase to around 100 years old in the future. What do you think about what the ideal life expectancy would be?"

The participants also provided their sociodemographic characteristics: age (years), gender, education (graduated elementary school or less; graduated middle school; graduated high school; graduated university/college or higher), employment (employed; seeking a job; retired; housewife; other including students), religion (Christian; Buddhist; Catholic; none; other), monthly income (every million KRW), and marital status (married; bereaved; divorced; separated; unmarried).

#### Data collection

The survey was administered by well-trained interviewers using the questionnaire that was developed by the Smart Management Strategy for Health research team. Potential participants were visited by interviewers who ensured questionnaire completion. First, individuals in the general population aged 20–85 years and residing in over 17 major cities and local districts were contacted. Authors used a probability proportional to size technique for sample selection to represent a nationwide sample [23]. Because all 17 major cities and local districts were not in the same size, sampling was conducted with random time-balanced quota selection

from a stratified area. Sample weights accounted for the probability of selection, calibrated by age, gender, and place of residence [21]. To assign probabilities proportional to districts' size, the larger units were expected to make greater contribution to the population total. More valid response rates for national surveys ranged from 5% to 54% [24], especially for customers or a lot of the unspecified general population, and because it is difficult to achieve a response rate higher than 10–15%. Therefore, approximately 10,000 individuals were contacted, assuming a response rate of 10%. A total of 1,005 participants gave consent to be surveyed and completely filled out the questionnaire between August and September 2016.

#### Data analysis

Authors first reported descriptive statistics for the sociodemographic variables. Among other sociodemographic factors, there were missing data regarding education (0.4%) and income (0.8%); therefore, those who had missing data were not included in the analyses. The proportions of the five health parameters according to age and gender were also determined to establish the reference data. Chi-squared test was used to evaluate the impact of age and gender on the health parameters.

In addition, we addressed the age-adjusted proportion of "problematic group" by gender for each of the five health status parameters in the groups responding with a poor or bad rating. The concept of the problematic group regarding the quality of life was suggested by another health-related quality-of-life study. [25] By defining a problematic group regarding health status, a meaningful percentage of individuals who needed management for health improvement was identified. Mantel–Haenszel Chi-square test was used in the calculation of age-adjusted prevalence of each problematic health status.

Univariate analysis of each covariate was performed to identify which factors had the most significant correlation with ILE. Factors that were determined to be significant in univariate analyses were used to examine the association between sociodemographic variables, health status, and ILE. Multiple regression analyses were conducted using the backward-selected method and this model included variables that were identified as statistically significant independent predictors in each univariate analysis of ILE correlates with significant level entry = .05 and stay = .05. The results were reported as the adjusted odds ratio (aOR) with a 95% confidence interval (CI). Regarding the answer to multidimensional health, "excellent" or "very good" was defined to "≥Very good" group.

In all analyses, authors used *p*-values for two-tailed tests and considered a *p*-value less than .05 to be significant. All statistical analyses were performed using SAS, version 9.3 (SAS Institute, Cary, NC, USA).

#### Results

The sociodemographic characteristics of the participants are demonstrated in Table 1. Among the participants, 233 respondents were aged ≥ 60 years (23.2%) and nearly half of the participants graduated from university or college (45.1%) and lived in metropolitan areas (45.0%). Of 1,005 participants, there were 321 (31.9%) who were unemployed and 119 (11.9%) who were earning a monthly income of less than 2 million KRW (1 USD = 1,150 KRW).

The percentage of each of the self-rated health parameters varied by gender and age; these data are shown in Table 2. There were rates of physical, mental, social, spiritual, and general health status in the range of age and gender. With every health status parameter measured, a ranking of "good" was the most frequent, followed in order by "very good", "poor", "excellent", and "bad". In

**Table 1** Sociodemographic Characteristics for the Responding General Population (N = 1005).

Characteristics	Man	Woman	Total
	(n = 494)	(n = 511)	(n = 1005)
	n (%)		
<b>Age (yrs)</b>			
20-29	99 (20.0)	90 (17.6)	189 (18.8)
30-39	90 (18.2)	87 (17.1)	177 (17.6)
40-49	105 (21.3)	104 (20.4)	209 (20.8)
50-59	98 (19.8)	99 (19.4)	197 (19.6)
60-69	59 (12.0)	64 (12.4)	123 (12.2)
≥ 70	43 (8.7)	67 (13.1)	110 (11.0)
<b>Education</b> (missing 0.4%)			
≤ Middle school	54 (11.0)	98 (19.3)	152 (15.2)
High school	170 (34.5)	227 (44.6)	397 (39.7)
University/College	268 (54.5)	184 (36.1)	452 (45.1)
<b>Income (1000 KRW/mo)<sup>a</sup></b> (missing 0.8%)			
<2000	42 (8.5)	77 (15.3)	119 (11.9)
2000-2999	78 (15.8)	84 (16.7)	162 (16.3)
3000-3999	169 (34.2)	132 (26.3)	301 (30.2)
4000-4999	137 (27.7)	151 (30.0)	288 (28.9)
>5000	68 (13.8)	59 (11.7)	127 (12.7)
<b>Residence</b>			
Metropolitan	219 (44.3)	233 (45.6)	452 (45.0)
Urban	215 (43.5)	221 (43.2)	436 (43.4)
Rural	60 (12.2)	57 (11.2)	117 (11.6)
<b>Marital Status</b>			
Married	353 (71.5)	380 (74.4)	733 (72.9)
Widowed	4 (0.8)	36 (7.0)	40 (4.0)
Divorced	10 (2.0)	6 (1.2)	16 (1.6)
Single	127 (25.7)	89 (17.4)	216 (21.5)
<b>Religion</b>			
Christian	85 (17.2)	103 (20.2)	188 (18.7)
Buddhist	68 (13.8)	93 (18.2)	161 (16.0)
Catholic	28 (5.7)	40 (7.8)	68 (6.8)
Others	1 (0.2)	2 (0.4)	3 (0.3)
None	312 (63.1)	273 (53.4)	585 (58.2)
<b>Public Insurance</b>			
National health insurance	485 (98.2)	494 (96.7)	979 (97.4)
Medicaid	9 (1.8)	17 (3.3)	26 (2.6)
<b>Private Insurance</b>			
Yes	422 (85.4)	428 (83.8)	850 (84.6)
No	72 (14.6)	93 (16.2)	155 (15.4)
<b>Job</b>			
Unemployed	54 (10.9)	267 (52.3)	321 (31.9)
Employed	440 (89.1)	244 (47.7)	684 (68.1)

Note. mo = months; yrs = years.

<sup>a</sup> 1 USD = 1,150 KRW.

both men and women, the percentage of people who answered “poor” or “bad” to their self-rated health increased with age. Generally, “excellent” and “very good” responses were most prevalent in men, whereas a higher proportion of “poor” and “bad” responses were found in the woman group. Only a few participants (1.5%) rated all dimensions of their health status as “excellent”. The ranking of “bad” was noted for four men and 20 women. Physical health was the largest problematic group among the five dimensions of health status assessed (9.2%). Within the woman problematic group of social health, the ratio of over 60 years old accounted for high percentage (75.7%).

Regarding the problematic groups (Figure 2), which included the “poor” and “bad” scales, women were represented more frequently than men in every component of health adjusted by age. The ranking differences for general health ( $p = .004$ ) were statistically significant; there was no significant difference between men and women regarding other dimensions of health. Specifically, ratings of general health status in the problematic groups showed the largest difference between men (5.0%) and women (11.3%).

Table 3 shows how each sociodemographic factor and health parameter influences ILE. Authors stratified sociodemographic factors and the five health parameters into two groups. Income level, marital status, and social health status were independently associated with the perception of ILE according to the results of this study. Age > 60 years was the cutoff for the elderly group [26], and an income of < 2 million KRW was considered a low monthly income [27]. We divided binary groups for ILE by the average self-reported ILE obtained in this study (87.46 years). Based on the odds ratio, the following factors were significant: age, income, marital status, social health, and general health. After multivariate analyses with the significant factors and by backward selection, three factors remained, as follows: earning more than 2 million KRW per month (aOR = 1.48; 95% CI, 1.00–2.20), being married (aOR = 0.70; 95% CI, 0.53–0.94), and rates of “very good” and “excellent” regarding social health status (aOR = 1.39; 95% CI, 1.08–1.79).

## Discussion

This study is the first to establish reference data according to not only general health but also multidimensional health for the Korean general population and to investigate the association between sociodemographic status, health status, and ILE. Because we hypothesized that multidimensional health parameters may be significant predictors for ILE, we analyzed the difference in ILE according to the status of multidimensional health and socio-demographic parameters.

An improved level of wellness was conceptualized as a balance of physical, mental, emotional, spiritual, and social components [16]. Thus, taking a holistic approach by balancing the physical, mental, social, spiritual, and general health components might affect an individual's wellness [28,29]. However, only 1.96% of men and 0.48% of women responded “excellent” in all five health categories. This result indicates that these five different components of health are not balanced in the Korean general population. Both sexes reported increased risk of mental disorder with increasing age, whereas depression and anxiety initially increased and then decreased with increasing age [30]. Furthermore, in those older than 60 years in the woman subgroup, the proportion of poor or bad social health was notably higher than other dimensions, so that group might have needs to get attention and to overcome or solve the social crisis. Therefore, there is an urgent need to change our understanding of health, extending the concept to attain a public awareness of holistic health.

In this study, we also determined the proportions of poor or bad health status proportion (“problematic groups”) in each of the components of health. The tendency for women to report age-adjusted problematic groups for general health was significantly higher than that for men, whereas there was no significant difference in the percentage of individuals with poor health status in other health dimensions between both genders. To the best of our knowledge, there was an opposite result in a previous study conducted in China. Despite also being a country in Asia, the problematic group ratio of Chinese men was higher than that of women for a self-rated health response corresponding to general health [31]. Therefore, additional research to confirm social differences and various causes is needed.

The findings also suggest that the status of several socioeconomic and health factors, including income, and social health, may be significant predictors for ILE. The individuals with a higher monthly income and better social health have a greater tendency to report a higher ILE.

The specific culture also should be considered when interpreting the negative association of marriage with ILE. [32] Some

**Table 2** Crude Rate of Multidimensional Health by Gender and Age Groups (N = 1,005).

	Total	Woman (n = 511), n (%)						Man (n = 494), n (%)							
		All	20-29	30-39	40-49	50-59	60-69	>70	All	20-29	30-39	40-49	50-59	60-69	>70
<b>Physical health</b>															
Excellent	45 (4.5)	15 (2.9)	9 (10.0)	1 (1.1)	2 (1.9)	1 (1.0)	2 (3.1)	0 (0.0)	30 (6.1)	13 (13.1)	7 (7.8)	5 (4.8)	3 (3.1)	0 (0.0)	2 (4.7)
Very good	422 (42.0)	197 (38.5)	49 (54.4)	36 (41.4)	48 (46.2)	38 (38.4)	17 (26.6)	9 (13.4)	225 (45.5)	60 (60.6)	51 (56.7)	47 (44.8)	41 (41.8)	17 (28.8)	9 (20.9)
Good	445 (44.3)	242 (47.4)	30 (33.3)	47 (54.0)	51 (49.0)	55 (55.6)	25 (29.1)	34 (50.7)	203 (41.1)	24 (24.2)	32 (35.6)	47 (44.8)	45 (45.9)	33 (55.9)	22 (51.2)
Poor	87 (8.6)	52 (10.2)	2 (2.2)	3 (3.4)	3 (2.9)	5 (5.1)	17 (26.6)	22 (32.8)	35 (7.1)	2 (2.0)	0 (0.0)	6 (5.7)	9 (9.2)	9 (15.3)	9 (20.9)
Bad	6 (0.6)	5 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.7)	2 (3.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)
				$\chi^2 = 131.56 (p < .001)$						$\chi^2 = 82.23 (p < .001)$					
<b>Mental health</b>															
Excellent	56 (5.6)	20 (3.9)	8 (8.9)	4 (4.6)	4 (3.8)	2 (2.0)	2 (3.1)	0 (0.0)	36 (7.3)	13 (13.1)	6 (6.7)	10 (9.5)	5 (5.1)	0 (0.0)	2 (4.7)
Very good	383 (38.1)	189 (37.0)	38 (42.2)	40 (46.0)	45 (43.3)	35 (35.4)	17 (26.6)	14 (20.9)	194 (39.3)	47 (47.5)	44 (48.9)	38 (36.2)	36 (36.7)	19 (32.2)	10 (23.3)
Good	480 (47.8)	249 (48.7)	35 (38.9)	40 (46.0)	52 (50.0)	56 (56.6)	33 (51.6)	33 (49.3)	231 (46.7)	37 (37.4)	36 (40.0)	49 (46.7)	53 (54.1)	31 (52.5)	25 (58.1)
Poor	85 (8.4)	52 (10.2)	9 (10.0)	3 (3.4)	3 (2.9)	6 (6.1)	11 (17.2)	20 (29.9)	33 (6.7)	2 (2.0)	4 (4.4)	8 (7.6)	4 (4.1)	9 (15.3)	6 (14.0)
Bad	1 (0.1)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
				$\chi^2 = 69.58 (p < .001)$						$\chi^2 = 38.95 (p = .001)$					
<b>Social health</b>															
Excellent	52 (5.2)	17 (3.3)	7 (7.8)	2 (2.3)	5 (4.7)	0 (0.0)	2 (3.1)	1 (1.5)	35 (7.1)	15 (15.2)	5 (5.6)	7 (6.7)	5 (5.1)	1 (1.7)	2 (4.7)
Very good	392 (39.0)	180 (35.2)	38 (42.2)	36 (41.4)	38 (36.5)	39 (39.4)	19 (29.7)	10 (14.9)	212 (42.9)	54 (54.5)	46 (51.1)	37 (35.2)	48 (49.0)	18 (30.5)	9 (20.9)
Good	497 (49.4)	277 (54.2)	42 (46.7)	49 (56.3)	58 (55.8)	57 (57.6)	33 (51.6)	38 (56.7)	220 (44.5)	29 (29.3)	35 (38.9)	55 (52.4)	40 (40.8)	36 (61.0)	25 (58.1)
Poor	61 (6.1)	34 (6.7)	3 (3.3)	0 (0.0)	3 (2.9)	3 (3.0)	7 (10.9)	18 (26.9)	27 (5.5)	1 (1.0)	4 (4.4)	6 (5.7)	5 (5.1)	4 (6.8)	7 (16.3)
Bad	3 (0.3)	3 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
				$\chi^2 = 98.16 (p < .001)$						$\chi^2 = 52.65 (p < .001)$					
<b>Spiritual health</b>															
Excellent	26 (2.6)	9 (1.7)	4 (4.4)	1 (1.1)	2 (1.9)	0 (0.0)	1 (1.6)	1 (1.5)	17 (3.5)	4 (4.0)	4 (4.4)	5 (4.8)	2 (2.0)	0 (0.0)	2 (4.7)
Very good	349 (34.7)	168 (32.9)	39 (43.3)	29 (33.3)	35 (33.7)	34 (34.3)	20 (31.3)	11 (16.4)	181 (36.6)	50 (50.5)	31 (34.4)	34 (32.4)	40 (40.8)	18 (30.5)	8 (18.6)
Good	533 (53.0)	283 (55.4)	44 (48.9)	50 (57.5)	60 (57.7)	59 (59.6)	32 (50.0)	38 (56.7)	250 (50.6)	42 (42.4)	48 (53.3)	56 (53.3)	47 (48.0)	33 (55.9)	24 (55.8)
Poor	94 (9.4)	49 (9.6)	3 (3.3)	7 (8.0)	7 (6.7)	6 (6.1)	10 (15.6)	16 (23.9)	45 (9.1)	2 (2.0)	7 (7.8)	10 (9.5)	9 (9.2)	8 (13.6)	9 (20.9)
Bad	3 (0.3)	2 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	1 (1.5)	1 (0.2)	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
				$\chi^2 = 44.42 (p = .001)$						$\chi^2 = 34.21 (p = .025)$					
<b>General health</b>															
Excellent	21 (2.1)	8 (1.6)	2 (2.2)	1 (1.1)	3 (2.9)	1 (1.0)	1 (1.6)	0 (0.0)	13 (2.6)	3 (3.0)	3 (3.3)	3 (2.9)	2 (2.0)	0 (0.0)	2 (4.7)
Very good	388 (38.6)	179 (35.0)	49 (54.4)	36 (41.4)	34 (32.7)	32 (32.3)	18 (28.1)	10 (14.9)	209 (42.3)	67 (67.7)	46 (51.1)	35 (33.3)	38 (38.8)	14 (23.7)	9 (20.9)
Good	533 (53.0)	280 (54.8)	37 (41.1)	47 (54.0)	65 (62.5)	63 (63.6)	29 (45.3)	39 (58.2)	253 (51.2)	28 (28.3)	40 (44.4)	64 (61.0)	56 (57.1)	39 (66.1)	26 (60.5)
Poor	60 (6.0)	42 (8.2)	2 (2.2)	3 (3.4)	2 (1.9)	3 (3.0)	15 (23.4)	17 (25.4)	18 (3.7)	1 (1.0)	1 (1.1)	3 (2.9)	2 (2.0)	5 (8.5)	6 (14.0)
Bad	3 (0.3)	2 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	1 (1.5)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.7)	0 (0.0)
				$\chi^2 = 91.65 (p < .001)$						$\chi^2 = 74.95 (p < .001)$					



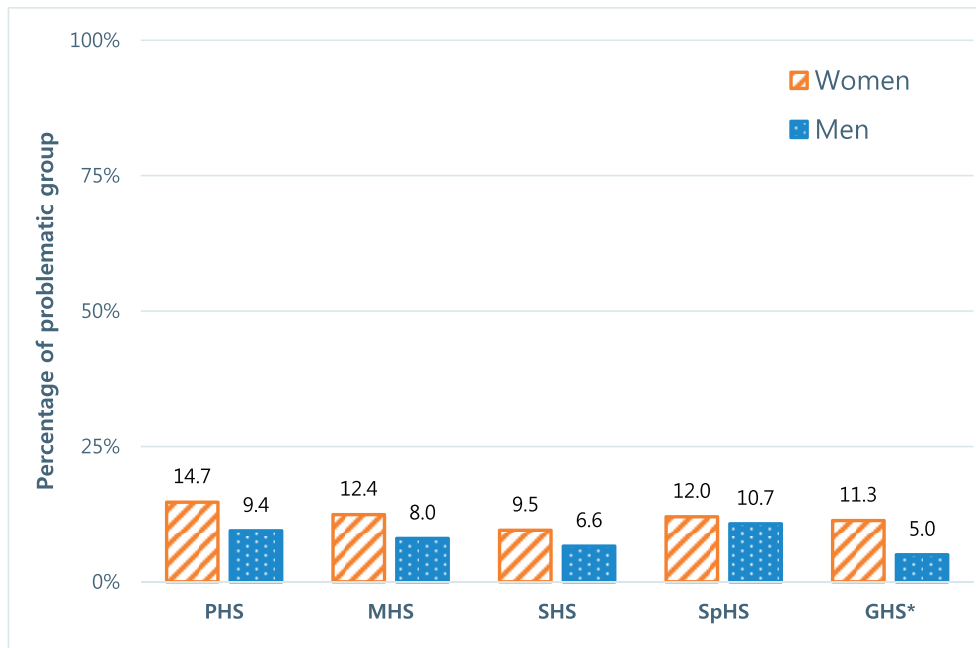


Figure 2. Adjusted<sup>a</sup> differences of problematic<sup>b</sup> health between sex.

Note. GHS = general health status; MHS = mental health status; PHS = physical health status; SHS = social health status; SpHS = spiritual health status. <sup>a</sup> Adjusted for age in Mantel-Haenszel chi-square test. <sup>b</sup> Including poor and bad groups in each health status. \*  $p$ -value < .05.

previous studies have shown that marital status has a positive association with health and longevity [33]. However, other studies support our results, suggesting that bad marriage could negatively impact health because it may contribute to stress, emotional disorders, and poor lifestyle habits. [34,35] Whether single or married, it may be important to consider the quality of a relationship, in agreement with our study results where participants who had better social health reported higher ILE. Previous studies found that social isolation and loneliness were associated with increased adverse health outcomes. [36] For that reason, creating an environment for alleviating loneliness and resolving social isolation is important for supporting social wellness [37].

Authors also confirmed the disparity in ILE between different levels of economic status as has been shown in other studies. Similarly, SLE also increased more in the high-income group than in the low-income group in another study [38]. Therefore, targeted intervention programs are needed for vulnerable subgroups of individuals, including those with low socioeconomic status level.

Consequently, the ILE and its association with diverse factors are important for understanding an individual's attitude towards life and death and obtaining insight into their wellness of society. In some developed countries, such as Japan and Korea, the life expectancy at birth for women (84.42 years in 2011) has already exceeded or is approaching 85 years [22] and does not appear to be decreasing. [2] In our study, the average ILE in the Korean population surveyed is 87.46 years, which is 3.11 years higher than the life expectancy at birth in 2011. ILE is unlike existing life expectancy, which depends on the state of hygiene, disease, and medical development of a country. ILE acts as an indicator rather than a provider of useful information for identifying persons with an increased risk of health deterioration and is enhanced when it is related to multidimensional wellness based on health optimism

[6,29]. These findings could be a breakthrough for understanding the trends in ILE as an indicator of aging and may help prepare society for the burden of an aging population.

There are several implications for nursing practice and research that appears to follow these results. First, Korean normative data for multidimensional health suggest that providing personalized holistic care is a viable approach within nursing. According to the World Health Organization, health is defined as 'a state of complete physical, mental, and social well-being' [39] and should be considered according to the importance of holistic components of health. Given the general populations' proportions of poor or bad health, nurses and health-care providers should approach patients in a manner that considers holistic care. [28].

Then, authors investigated the association between ILE and self-rated multidimensional health. The concept of ILE is relatively easily explained as successful aging and well-calibrated reactions to life events [40,41]. Average ILE was dependent on sociodemographic and multidimensional components of health; therefore, individuals could have a more positive attitude toward health and longevity by improving personal health-related factors. Nurses should be encouraged to take leadership roles in public health campaigns that educate the general population about the perception of ILE related to multidimensional wellness [29].

Some limitations should be considered when interpreting the data. First, our cross-sectional study showed an association between health status and ILE, but not causality. Cohort studies or randomized controlled trials are needed to further clarify this issue. This study was performed via self-reported questionnaires, which might not have correctly or adequately evaluated the health status and ILE of the respondents. In addition, owing to the lack of previously published studies, validation of the ILE hypothesis was difficult. Further studies using more validated methods are needed to confirm these findings and concept.

**Table 3** Crude and Adjusted Odds Ratio of Health Status Scores by Ideal Life Expectancy (N = 1,005).

Variables	n (%)	Longer than average ideal life expectancy <sup>a</sup>				p-value
		Crude OR	95% CI	p-value	Adjusted OR <sup>b</sup>	
<b>Gender</b>						
Man	494 (49.2)	1 (Ref)				
Woman	511 (50.8)	0.98	0.76-1.25	.468	-	
<b>Age</b>						
<60	772 (76.8)	1 (Ref)				
≥60	233 (23.2)	0.75	0.56-0.99	.049	NS	
<b>Education</b> (missing 0.4%)						
<University graduate	549 (54.8)	1 (Ref)				
≥University graduate	452 (45.2)	1.20	0.94-1.539	.153	-	
<b>Employment</b>						
No	321 (31.9)	1 (Ref)				
Yes	684 (68.1)	0.97	0.74-1.26	.805	-	
<b>Religion</b>						
No	420 (41.8)	1 (Ref)				
Yes	585 (58.2)	1.28	0.99-1.64	.058	-	
<b>Income (1000 KRW<sup>c</sup>)</b> (missing 0.8%)						
<2,000	119 (11.9)	1 (Ref)			1 (Ref)	
≥2,000	878 (88.1)	1.57	1.07-2.32	.022	1.48	1.00-2.20
<b>Marital status</b>						
Single	272 (27.1)	1 (Ref)			1 (Ref)	
Married	733 (72.9)	0.68	0.51-0.90	.007	0.7	0.53-0.94
<b>Physical health</b>						
<very good	538 (53.5)	1 (Ref)				
≥very good	467 (46.5)	1.12	0.88-1.44	.365	-	
<b>Mental health</b>						
<very good	566 (56.3)	1 (Ref)				
≥very good	439 (43.7)	1.27	0.99-1.62	.066	-	
<b>Social health</b>						
<very good	561 (55.8)	1 (Ref)			1 (Ref)	
≥very good	444 (44.2)	1.45	1.13-1.86	.004	1.39	1.08-1.79
<b>Spiritual health</b>						
<very good	630 (62.7)	1 (Ref)				
≥very good	376 (37.3)	1.13	0.88-1.46	.347	-	
<b>General health</b>						
<very good	596 (59.3)	1 (Ref)				
≥very good	409 (40.7)	1.39	1.08-1.79	.011	NS	

Note. CI = confidence interval; NS = nonsignificant; OR = odds ratio.

<sup>a</sup> Average life expectancy = 87.53 years old.

<sup>b</sup> Adjusted for age: < 60 vs. ≥ 60; educational status, high-school graduate or below vs. university graduate; monthly income, < 2,000 (1000 won) vs. ≥ 2,000 (1000 won); religion; gender: men vs. women; job status, yes vs. no; and marriage, single vs. married.

<sup>c</sup> 1 USD = 1,150 KRW.

## Conclusion

As the health status measurements are diverse, choosing the appropriate tools for analysis becomes a difficult task. [42] ILE can be a good and simple indicator of subjective health, social circumstances, and ones' attitudes toward life events. Raising awareness about the concept of holistic health and importance of social health, the government can develop comprehensive health promotion programs at the population level, especially for low-income, and married groups to improve their positive attitudes toward life expectancy.

## Conflict of interest

None declared.

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## References

- Lugo L, Cooperman A, Funk C, O'Connell E, Stencel S. Living to 120 and beyond: Americans' views on aging, medical advances and radical life extension [Internet]. Washington DC: Pew Research Center; 2013 [cited 2018 Jun 10]. Available from: <http://www.pewresearch.org/wp-content/uploads/sites/7/2013/08/Radical-life-extension-full.pdf>
- Kontis V, Bennett JE, Mathers CD, Li G, Foreman K, Ezzati M. Future life expectancy in 35 industrialised countries: projections with a Bayesian model ensemble. *Lancet*. 2017;389(10076):1323–35. [https://doi.org/10.1016/S0140-6736\(16\)32381-9](https://doi.org/10.1016/S0140-6736(16)32381-9)
- Lim S, Shin H, Song JH, Kwak SH, Kang SM, Yoon JW, et al. Increasing prevalence of metabolic syndrome in Korea: the Korean National Health and Nutrition Examination Survey for 1998-2007. *Diabetes Care*. 2011;34(6):1323–8. <https://doi.org/10.2337/dc10-2109>
- Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012;380(9838):219–29. [https://doi.org/10.1016/s0140-6736\(12\)61031-9](https://doi.org/10.1016/s0140-6736(12)61031-9)

5. Ayres CG, Atkins R, Mahat G. Factors related to performance of health practices among Asian adolescents in the United States. *Asian Nurs Res*. 2010;4(2): 64–74. [https://doi.org/10.1016/S1976-1317\(10\)60007-2](https://doi.org/10.1016/S1976-1317(10)60007-2)
6. Conversano C, Rotonondo A, Lensi E, Della Vista O, Arpone F, Reda MA. Optimism and its impact on mental and physical well-being. *Clin Pract Epidemiol Ment Health*. 2010;6:25–9. <https://doi.org/10.2174/1745017901006010025>
7. Scheier MF, Carver CS. Dispositional optimism and physical health: A long look back, a quick look forward. *Am Psychol*. 2018;73(9):1082–94. <https://doi.org/10.1037/amp0000384>
8. May Barry K, Woods M, Martin A, Stirling C, Warnecke E. A randomized controlled trial of the effects of mindfulness practice on doctoral candidate psychological status. *J Am Coll Health*. 2018. <https://doi.org/10.1080/07448481.2018.1515760>. Forthcoming.
9. Diehl M, Hay EL, Chui H. Personal risk and resilience factors in the context of daily stress. *Annu Rev Gerontol Geriatr*. 2012;32(1):251–74. <https://doi.org/10.1891/0198-8794.32.251>
10. Keyes CL, Westerhof GJ. Chronological and subjective age differences in flourishing mental health and major depressive episode. *Aging Ment Health*. 2012;16(3):67–74. <https://doi.org/10.1080/13607863.2011.596811>
11. Kim JH, Kim JM. Subjective life expectancy is a risk factor for perceived health status and mortality. *Health Qual Life Outcomes*. 2017;15:190. <https://doi.org/10.1186/s12955-017-0763-0>
12. DeSalvo KB, Fan VS, McDonnell MB, Fihn SD. Predicting mortality and healthcare utilization with a single question. *Health Serv Res*. 2005;40(4):1234–46. <https://doi.org/10.1111/j.1475-6773.2005.00404.x>
13. DeSalvo KB, Bloser N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health question. A meta-analysis. *J Gen Intern Med*. 2006;21(3):267–75. <https://doi.org/10.1111/j.1525-1497.2005.00291.x>
14. Dowd JB, Zajacova A. Does the predictive power of self-rated health for subsequent mortality risk vary by socioeconomic status in the US? *Int J Epidemiol*. 2007;36(6):1214–21. <https://doi.org/10.1093/ije/dym214>
15. Bombak AE. Self-rated health and public health: a critical perspective. *Front Public Health*. 2013;1:15. <https://doi.org/10.3389/fpubh.2013.00015>
16. Yun YH, Sim JA, Park EG, Park JD, Noh DY. Employee health behaviors, self-reported health status, and association with absenteeism: comparison with the general population. *J Occup Environ Med*. 2016;58(9):932–9. <https://doi.org/10.1097/JOM.0000000000000830>
17. Kim SH, Jo MW, Ahn J, Ock M, Shin S, Park J. Assessment of psychometric properties of the Korean SF-12 v2 in the general population. *BMC Public Health*. 2014;14:1086. <https://doi.org/10.1186/1471-2458-14-1086>
18. Rai R, Jongenelis M, Pettigrew S, Jackson B, Newton RU. Identifying modifiable factors associated with health optimism in older adults. *Aging Ment Health*. 2017;1–9. <https://doi.org/10.1080/13607863.2017.1416589>
19. Choi NG, DiNitto DM, Kim J. Discrepancy between chronological age and felt age: age group difference in objective and subjective health as correlates. *J Aging Health*. 2014;26(3):458–73. <https://doi.org/10.1177/0898264314523449>
20. Westerhof GJ, Miche M, Brothers AF, Barrett AE, Diehl M, Montepare JM, et al. The influence of subjective aging on health and longevity: A meta-analysis of longitudinal data. *Psychol Aging*. 2014;29(4):793. <https://doi.org/10.1037/a0038016>
21. Statistics Korea. 2015 Population and housing census [Internet]. Seoul, Korea: Statistics Korea; 2015 [cited 2016 Aug 22]. Available from: <http://www.census.go.kr>
22. Lee JY, Ock M, Kim SH, Go DS, Kim HJ, Jo MW. Health-adjusted life expectancy (HALE) in Korea: 2005–2011. *J Kor Med Sci*. 2016;31(Suppl 2):S139–45. <https://doi.org/10.3346/jkms.2016.31.S2.S139>
23. Levy PS, Lemeshow S. *Sampling of Populations: Methods and Applications*. 4th ed. Hoboken, NJ: John Wiley & Sons; 2013. p. 616.
24. Holbrook AL, Krosnick JA, Pfent A. The causes and consequences of response rates in surveys by the news media and government contractor survey research firms. In: Lepkowski JM, Tucker NC, et al., editors. *Advances in Telephone Survey Methodology*. Hoboken, NJ: John Wiley & Sons; 2007. p. 499–528.
25. Yun YH, Kim SH, Lee KM, Park SM, Kim YM. Age, sex, and comorbidities were considered in comparing reference data for health-related quality of life in the general and cancer populations. *J Clin Epidemiol*. 2007;60(11):1164–75. <https://doi.org/10.1016/j.jclinepi.2006.12.014>
26. Forman DE, Berman AD, McCabe CH, Baim DS, Wei JY. PTCA in the elderly: the “young-old” versus the “old-old”. *J Am Geriatr Soc*. 1992;40(1):19–22. <https://doi.org/10.1111/j.1532-5415.1992.tb01823.x>
27. Morris JN, Donkin AJ, Wonderling D, Wilkinson P, Dowler EA. A minimum income for healthy living. *J Epidemiol Community Health*. 2000;54(12):885–9. <https://doi.org/10.1136/jech.54.12.885>
28. Fullen MC, Granello DH. Holistic wellness in older adulthood: group differences based on age and mental health. *J Holist Nurs*. 2018;36(4):395–407. <https://doi.org/10.1177/0898010118754665>
29. Strout KA, Howard EP. Five dimensions of wellness and predictors of cognitive health protection in community-dwelling older adults: a historical COLLAGE cohort study. *J Holist Nurs*. 2015;33(1):6–18. <https://doi.org/10.1177/0898010114540322>
30. Reynolds K, Pietrzak RH, El-Gabalawy R, Mackenzie CS, Sareen J. Prevalence of psychiatric disorders in U.S. older adults: findings from a nationally representative survey. *World Psychiatr*. 2015;14(1):74–81. <https://doi.org/10.1002/wps.20193>
31. Nipp RD, El-Jawahri A, Fishbein JN, Eusebio J, Stagl JM, Gallagher ER, et al. The relationship between coping strategies, quality of life, and mood in patients with incurable cancer. *Cancer*. 2016;122(13):2110–6. <https://doi.org/10.1002/cncr.30025>
32. van den Berg GJ, Gupta S. The role of marriage in the causal pathway from economic conditions early in life to mortality. *J Health Econ*. 2015;40:141–58. <https://doi.org/10.1016/j.jhealeco.2014.02.004>
33. Robards J, Evandrou M, Falkingham J, Vlachantoni A. Marital status, health and mortality. *Maturitas*. 2012;73(4):295–9. <https://doi.org/10.1016/j.maturitas.2012.08.007>
34. Smith TW, Cribbet MR, Nealey-Moore JB, Uchino BN, Williams PG, Mackenzie J, et al. Matters of the variable heart: respiratory sinus arrhythmia response to marital interaction and associations with marital quality. *J Pers Soc Psychol*. 2011;100(1):103–19. <https://doi.org/10.1037/a0021136>
35. Uecker JE. Marriage and mental health among young adults. *J Health Soc Behav*. 2012;53(1):67–83. <https://doi.org/10.1177/0022146511419206>
36. Steptoe A, Shankar A, Demakakos P, Wardle J. Social isolation, loneliness, and all-cause mortality in older men and women. *Proc Natl Acad Sci U S A*. 2013;110(15):5797–801. <https://doi.org/10.1073/pnas.1219686110>
37. Yi ES, Hwang HJ. A study on the social behavior and social isolation of the elderly Korea. *J Exerc Rehabil*. 2015;11(3):125–32. <https://doi.org/10.12965/jer.150215>
38. Bae J, Kim YY, Lee JS. Factors associated with subjective life expectancy: comparison with actuarial life expectancy. *J Prev Med Public Health*. 2017;50(4):240–50. <https://doi.org/10.3961/jpmph.17.036>
39. Larson JS. The conceptualization of health. *Med Care Res Rev*. 1999;56(2): 123–36. <https://doi.org/10.1177/107755879905600201>
40. Wurm S, Warner LM, Ziegelmann JP, Wolff JK, Schüz B. How do negative self-perceptions of aging become a self-fulfilling prophecy? *Psychol Aging*. 2013;28(4):1088–97. <https://doi.org/10.1037/a0032845>
41. Martin P, Kelly N, Kahana B, Kahana E, Willcox BJ, Willcox DC, et al. Defining successful aging: a tangible or elusive concept? *Gerontologist*. 2015;55(1): 14–25. <https://doi.org/10.1093/geront/gnu044>
42. Terwee CB, Bot SD, de Boer MR, van der Windt DA, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. *J Clin Epidemiol*. 2007;60(1):34–42. <https://doi.org/10.1016/j.jclinepi.2006.03.012>