

Estimating Subjective Quality of Life in Urban Seniors in Chile

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Abstract: *In recent years, measurement of quality of life has received increased attention. We use the satisfaction with life and subjective happiness scales in older adults living in urban areas in the Maule Region, Chile; generalized linear models are used ($n = 396$). We find that (1) gender is linked to satisfaction with life, (2) satisfaction with one's own economic situation have significant effects on satisfaction with life and happiness, and (3) health, family and satisfaction with food are the most important predictors of both satisfaction with life and happiness.*

Keywords: *Satisfaction, happiness, urban areas, family, food.*

JEL Classification: A14, C21, D78.

Estimando calidad de vida subjetiva en adultos mayores urbanos en Chile

Resumen: *En los últimos años, la medición de la calidad de vida ha recibido una creciente atención. Se utilizan las escalas de satisfacción con la vida y de felicidad subjetiva en adultos mayores residentes en áreas urbanas de la Región del Maule, Chile; se estiman modelos lineales generalizados ($n = 396$). Encontramos que (1) el género está ligado a la satisfacción con la vida, (2) la satisfacción con la propia situación económica tiene efectos significativos sobre la satisfacción con la vida y la felicidad, y (3) la salud, la familia y la satisfacción con la comida son los predictores más importantes tanto de la satisfacción con la vida como de la felicidad.*

Palabras clave: *Satisfacción, felicidad, áreas urbanas, familia, alimentación.*

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Estimation de la qualité de vie subjective des personnes âgées urbaines au Chili

Résumé: *Ces dernières années, la mesure de la qualité de vie a reçu une attention croissante. Les échelles de satisfaction de vie et de bonheur subjectif sont utilisées chez les personnes âgées vivant dans les zones urbaines de la région de Maule, au Chili ; des modèles linéaires généralisés sont estimés ($n = 396$). Nous avons constaté que (1) le sexe est lié à la satisfaction de vivre, (2) la satisfaction de sa propre situation économique a des effets significatifs sur la satisfaction de la vie et le bonheur, et (3) la santé, la famille et la satisfaction avec la nourriture sont les prédicteurs les plus importants de la satisfaction de vie et du bonheur.*







Mots clés: *Satisfaction, bonheur, zones urbaines, famille, nourriture.*

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Estimating Subjective Quality of Life in Urban Seniors in Chile

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–Introduction. –I. Literature review. –II. Data and Methods. –III. Results. –IV. Discussion and Conclusions. –Declarations. –References

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Introduction

The question ‘what is the quality of life (QOL) in seniors?’ has gained academic relevance as the population ages. In Latin America, the number of people over 60 years of age is expected to increase from 82.7 million in 2020 to 115.2 million by 2030. This age group will then comprise 16.6% of the total population, while in Chile the population over 60 will be 23% of the total population (ECLAC, 2019). Researchers and policymakers generally agree that demographic changes and an aging population will put financial pressure on pensions and healthcare systems the world over. Increasingly, the global consensus is that we should not only be interested in living longer lives but we should also be concerned about the meaning of QOL for seniors.

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This leads to the following research question: What are the main variables related to subjective QOL in seniors? Several types of econometric models have been used in the literature to identify these variables and determine their sign and statistical significance. However, for the research problem posed in this study, generalized linear models (GLM) (Nelder & Wedderburn, 1972) were used. An extension of the classic linear model, GLM use non-normal distributions of the errors and non-constant variances. The main findings of this study show that subjective QOL is related to health-related variables, family relations, socioeconomic factors and different elements of food-related life in urban seniors in seniors' centers in Central Chile.

Two aspects considered in this study have not been explored in previous research. First, given that tangible and intangible factors have different patterns in developed and developing countries, most of these previous studies on QOL refer to seniors from developed countries. Second, most of the literature on QOL in seniors has not provided empirical evidence about the relationship between QOL and satisfaction with food-related life as a hedonic dimension of the pleasure of food consumption, but rather only as a nutritional and physical health dimension. As Grunert et al. (2007) says, all experiences and circumstances in relation to buying, preparing and eating food are significant parts of life, but they have received little attention in the literature on QOL.

Thus, the main aim of this research is to identify the determinants of subjective QOL in seniors living in urban areas of a developing country like Chile. Also, this study seeks to contribute with scientific evidence about the role of satisfaction with food-related life in QOL. Finally, we expect to provide insights for policymakers to improve their perceptions and understanding of Chilean seniors living in urban areas.

An important limitation of this study is related to sample representativeness. The people interviewed were seniors living independently in their houses, non-institutionalized and registered in a seniors' center. Therefore, the sample excludes those independent seniors who live in their own houses but are not registered in a seniors' center. A second limitation is that, due to the cross-sectional nature of the data, the results do not permit causal inferences, only relationships between variables.

We assume that subjective QOL and subjective well-being (SWB) are similar concepts. However, in this study we only use the term 'subjective QOL'. As Cella (1994) indicates, subjectivity refers to the fact that subjective QOL can only be understood from the person's perspective. QOL includes two main components (Schimmack et al. 2008): satisfaction with life (or cognitive well-being) and subjective happiness (or affective well-being). Therefore, although life satisfaction and subjective happiness are interrelated, they are not exactly the same (Gray et al. 2008). We measure life satisfaction using the satisfaction with life scale (SWLS) developed by Diener et al. (1985). Subjective happiness is assessed using the subjective happiness scale (SHS) developed by Lyubomirsky and Lepper (1999).

The article has four sections. Section I contains a literature review of the main variables related to QOL in seniors and the relations between subjective QOL, and a set of variables derived from the literature investigated in this study are indicated explicitly. Section II presents the design and sampling, participants, questionnaire application procedure, scales used and socio-demographic variables consulted as well as the statistical analysis, including descriptive statistics, correlations and the regression model used. Section III presents the results, structured in four parts: a confirmatory factor analysis, descriptive statistics, correlations among study variables and the predictions of the econometric model generated. Finally, section IV provides the discussion and conclusions, including the main implications from a public policy point of view.

I. Literature review

QOL in older ages is different from the general population (Netuveli & Blane, 2008): as the years pass, QOL is affected by the changes that occur during the aging process (De Souza et al., 2018; Fisker et al., 2015). Based on a review of selected literature, Netuveli & Blane (2008) concluded that most seniors evaluate their QOL positively on the basis of social contacts, dependency, health, material circumstances and social comparisons. However, two major factors to be considered with regard to QOL in old age are dementia and depression (Netuveli & Blane, 2008). Several empirical

studies show that QOL does not decrease with old age, although in old age there is an increasing risk of limitations or losses in health and competence, social networks and financial means (Pinquart & Sørensen, 2000). Thus, maintaining high levels of QOL is considered a key aspect of successful aging.

At international level there is abundant literature that discusses the relationship between QOL in seniors and a set of tangible factors such as income, education, financial resources and/or working situation (Gray et al., 2008; Schnettler et al., 2014; Xavier et al., 2003), a range of psychosocial and health-related variables in men and women (Berg et al., 2006; Schnettler et al., 2014), change in functional ability in the oldest elderly population (Enkvist et al., 2012; Gray et al., 2008; Smith et al., 2002), social networks or social support (Berg et al., 2006; Gow et al., 2007; Gray et al., 2008; Tomás et al., 2014), self-reported altruistic activity and social capital (Theurer & Wister, 2010), family situation (Silverstein et al., 2006), household composition, availability of neighbors and the role of children (Li et al., 2013; Lou, 2010; Moor et al., 2013; Yunong, 2012), and cross-cultural difference in predictors of life satisfaction between poorer and wealthy nations (Oishi et al., 2009).

According to the socio-environmental theory of aging developed by Gubrium (1973), seniors' life satisfaction is shaped by the interaction between individuals and their environments. The effects of these environments on seniors vary depending on family, health, financial status and social support. The results of Berg et al. (2006), Schnettler et al. (2014), Li et al. (2013), Moor et al. (2013), Tomás et al. (2014) and Yunong (2012) show that when controlling for socio-demographic variables, perceived health status, family relations and social support are important predictors of seniors' life satisfaction.

Some evidence indicates that life satisfaction varies across cultures. Diener et al. (1995), for example, show that there is a relationship between a society's economic development and its average level of subjective well-being. Oishi et al. (2009) conclude that financial satisfaction is more strongly associated with life satisfaction in developing countries, whereas home life satisfaction is more strongly related to life satisfaction in developed ones.

Perceived health is defined as the individual's perception of his or her health status. The results of Smith et al. (2002) and Enkvist et al. (2012)

show that perceived health is an important predictor for quality of life of seniors. In Germany, Steverink et al. (2001) document a negative relationship between subjective health status and subjective well-being in later life. A similar relationship is presented in a Swedish study of about 300 people over the age of 80 by Berg et al. (2006). Li et al (2013) and Silverstein et al. (2006) conclude that seniors with perceived poorer health are more likely to experience lower levels of life satisfaction. Pinquart and Sörensen (2000) indicate that perceived poor health could affect seniors' sense of self-sufficiency and thus limit their involvement in their social support networks. In terms of the relationship between happiness and health status, some studies document a consistent relationship between poor health status and unhappiness in seniors (Okun et al., 1984; Lubin et al., 1988; Agner et al., 2013 and Chyi & Mao, 2012). Other studies, however, find that when other factors are considered, perceived health status has little effect on happiness levels (Diener et al., 1995). For example, Russell & Wells (1994) show that in seniors health status is not a significant predictor of happiness when family satisfaction and relationships with children are assessed. Likewise, Lyubomirsky et al. (2005) finds that perceived health is not a significant predictor of happiness after other variables are controlled.

There is also a growing body of literature examining the impact of family situation on life satisfaction in seniors. According to Li et al. (2013), Moor et al. (2013) and Yunong (2012), family members who offer emotional and financial support to their older relatives show how important family resources are to seniors' QOL. The results of Li et al. (2013) indicate that rural seniors in China who receive assistance from children are more likely to be satisfied with their lives. Moor et al. (2013) show that financial situation does not moderate the relationship between family support and life satisfaction.

Berg et al. (2006), Gow et al. (2007), Lou (2010), Theurer & Wister (2010) and Tomás et al. (2014) examine the relation between social support and life satisfaction in seniors. The general social and emotional support from neighbors and friends are identified by Lou (2010) and Tomás et al. (2014) as factors contributing significantly to life satisfaction. Gow et al. (2007) document that social support explains 23% of life satisfaction variance in a multiple regression model, and Berg et al. (2006) show that quality of

social network explains between 20% and 11% of life satisfaction variance, for women and men, respectively.

Several studies, such as those by Ferrer-i-Carbonell (2005) and Hsieh (2011), have shown a positive correlation between subjective well-being, an individual's income and an individual's perception of income. An individual's perception of income is dependent on their own income in relation to the past as well as to other people's income (George, 1992; Hsieh 2011; Layard 2005). Although most authors also agree on the significant influence of household income on happiness, Hsieh (2011) shows that after controlling for major socio-demographic variables, there is no evidence of a significant relationship between income and happiness for seniors. The results of Selim (2008) and Shams (2014) show the inexistence of significant differences in subjective happiness between senior men and senior women.

There is little evidence about the relation between satisfaction with food and the impact of these variables on QOL indicators (Grunert et al., 2007; Dean et al., 2008; Schnettler et al., 2014). Eating in pleasant surroundings clearly reflects the contribution of foods to hedonic well-being and social construction, as Kniazeva and Venkatesh (2007), and Schnettler et al. (2014) have suggested. According to Lobos et al. (2017), in future studies, the satisfaction with food may serve as a useful dependent variable to analyze how other objective indicators may be associated with that variable. Beyond food consumption as a fundamental aspect of the satisfaction of energy and nutrients needs, in this study we assessed the relation between QOL and a scale of satisfaction with food in terms of the hedonic pleasure associated with its consumption.

II. Data and Methods

A. Design and sampling

Two-stage sampling, stratified by clusters with incidental (casual) sub-samples and (snowball) networks within the cluster were applied. Within each area the affixation is performed per cluster, also in proportion to the size of the sampled population. Seniors' centers were selected within each stratum by

simple random sampling. The expected maximum absolute error level of the questionnaire results was $\pm 5\%$ for a confidence level of 95%. In this study independent seniors were interviewed, non-institutionalized and registered in a seniors' center. A seniors' center is a non-institutionalized center listed in the Chilean National Register of Social Organizations for seniors as part of the National Service for Senior Citizens (SENAMA). Seniors' centers are daily centers of formal groups of elderly people who meet to take part in activities of common interest that promote positive aging. Inclusion criteria were individuals with no physical (functional) or mental (dementia) disabilities, registered in a seniors' center and living in urban areas. This is justified because 67% of the population of the Maule Region is urban.

B. Participants

The sample was composed of 396 seniors (between 60 and 92 years old, including both male and female participants) from 30 communes of the Maule Region in Central Chile, 30.1% are male and 51.2% live alone. Their age range is between 60 and 92 years old with an average age of 71.3 (SD = 6.5). In general, the participants' family are relatively small: 55% of their families are composed of 1-2 members and 20.9% of 3-4 members. In 65.7% there are no children living in the participants' homes while in 4% of their homes there are children under 5 years old. Most of the seniors interviewed completed primary or secondary education (76.7%).

C. Procedure

The Ethics Committee of the Universidad de Talca approved the study protocol. Participants were recruited through seniors' centers to answer the questionnaire either in the Center or in their residence. The participants signed informed consent statements before responding. The consent statements explained the strictly confidential treatment of the information obtained. The questionnaire was personally applied by trained interviewers during May 2013 and January 2014. Application of the questionnaire lasted 20-25 minutes.

D. Measures

Two separate measures of subjective QOL are used as dependent variables: *satisfaction with life* and *perceived happiness*. Although satisfaction with life and happiness are two related constructs and have been grouped together by some researchers (Shams 2014; Veenhoven and Ehrhardt, 1995), they have also been considered separately (Selim 2008; Theurer & Wister 2010; Wu et al. 2014). According to Theurer & Wister (2010), it is useful to separate these concepts because their temporal references differ. Life satisfaction implies a review and judgment of the QOL one has experienced, whereas happiness is an assessment of life at the present time (Cummins, 1998). Socio-demographic information and other variables were entered into the models as control variables. The scales, socio-demographic information and other variables used in this study are presented as follows:

- The SWLS (Diener et al., 1985) is an instrument designed to measure global cognitive judgments of satisfaction with one's life and consists of five items grouped into a single dimension: 1. "In most ways my life is close to my ideal"; 2. "The conditions of my life are excellent"; 3. "I am satisfied with my life"; 4. "So far I have gotten the important things I want in life"; 5. "If I could live my life over, I would change almost nothing". In SWLS the respondents must indicate their degree of agreement with these statements using a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*). A SWLS scale with no midpoint (i.e., 6-point Likert scale) was used as previous testing of the instrument suggested a tendency by respondents to concentrate answers at the midpoint. In order to avoid the indecisive answers that tend to be concentrated at the midpoint, the scale that originally contained seven levels was changed to six. The calculation of the scale is obtained based on the sum score of all items where higher scores reflect greater satisfaction with life. In this study, the SWLS scale presented adequate levels of internal consistency (Cronbach's $\alpha = 0.87$).
- The SHS developed by Lyubomirsky & Lepper (1999) consists of four items that must be answered on a Likert-type scale of 1-7 points. First, "In general, I consider myself: 1 = *not a very happy person*, 7 = *a very*

happy person. Second, “Compared with most of my peers, I consider myself: 1 = *less happy*, 7 = *happier*. Third, “Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?: 1 = *not at all*, 7 = *a great deal*. Fourth, “Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this characterization describe you?: 1 = *not at all*, 7 = *a great deal*. Scores are totaled for the four items, and range from 4 to 28. The calculation of the scale is obtained based on the average score of all items where higher scores reflect greater happiness. The SHS scale presented adequate levels of internal consistency (Cronbach’s $\alpha = 0.80$).

- In order to measure perceived health status, we used the Health-Related Quality of Life Index (HRQoL) developed by Hennessy et al. (1994). The HRQoL consists of four items of healthy day measures. The first (HRQOL1) explores self-perceived overall health based on a personal assessment of current health or disease resistance. Self-perception of health is measured by the question: “How would you say your health is in general?” with a total score from 1 = *very poor* to 5 = *excellent*. The second item (HRQOL2) refers to the physical health state during the past 30 days. The third item (HRQOL3) explores the status of recent mental health. The fourth item (HRQOL4) refers to limitations for common activities during the past 30 days (called common activities). As Hennessy et al. (1994) suggested, to obtain the number of days with physical or mental problems in the last month, we added HRQOL2 and HRQOL3, with a maximum limit of 30 days in order to obtain the ‘unhealthy days’ index. The ‘unhealthy days’ index has been used in previous studies (Lobos et al., 2019; Lobos et al., 2016; Schnettler et al., 2014); in this study it was used as an independent variable in both models. In addition, we used HRQOL1 on its own to describe self-perceived overall health. In this study the Cronbach’s α of three of the four items was 0.67.
- The importance placed on family as a source of individual subjective well-being is measured using the family values questionnaire adapted

by Burroughs & Rindfleisch (2002) from Faver (1981) and Glezer (1984). According to Burroughs & Rindfleisch (2002), this family importance scale (FIS) is a five-item scale that focuses on the importance respondents place on family relations and has solid face validity and acceptable reliability. The respondent had to answer how much they agree with each of the six items on a six-point Likert-type scale scoring from 1 (*strongly disagree*) to 6 (*strongly agree*). A higher score on the FIS means that the person assigns greater importance to family. In this study, the FIS scale presented adequate levels of internal consistency (Cronbach's $\alpha = 0.78$).

- As a measure of how satisfied seniors are with food in their life, we used the Satisfaction with Food-Related Life (SWFL) proposed and tested by Grunert et al. (2007) in eight European countries. This measure of satisfaction with food-related life consists of 5 items grouped in a single dimension, rated on a 6-level Likert-type scale scoring from 1 (*strongly disagree*) to 6 (*strongly agree*). The calculation of the SWFL is obtained based on the total score of all the items, with higher scores reflecting greater satisfaction with food-related life. The SWFL scale presented adequate levels of internal consistency (Cronbach's $\alpha = 0.87$).
- We also asked the respondents about their 'satisfaction with the economic situation' (SWES), which was adapted from the scale proposed by Loewe et al. (2014). The one-item, six-point Likert-type scale scores from 1 (*extremely dissatisfied*) to 6 (*extremely satisfied*). In this study, we recoded this scale into three categories: 1 (*dissatisfied*), 2 (*slightly satisfied*) and 3 (*satisfied*).

The socio-demographic information included was age (in years), gender (1 = *male*, 2 = *female*), living circumstances, (1 = *living alone*, 2 = *living with a partner, i.e., any companion they live with*), education (1 = *no education*, 2 = *primary or secondary education*, 3 = *technical training or university education*), number of children living at home, and quantity of domestic household goods (QGoods). We used the technique proposed by Adimark (2004) to classify the respondents according to their socioeconomic level by crossing the variables education and QGoods. Thus, socioeconomic level (1 = *ABC1 is high and upper-middle*, 2 = *C2 is middle-middle*, 3 = *C3 is middle-low*, 4 = *D is low*, 5 = *E is very low*).

E. Data collection and statistical analysis

The interviewers explained to the respondents the objectives of the survey and the strictly confidential treatment of the information obtained. The respondents were continually asked if they were prepared to answer the questionnaire. The participants signed informed consent statements before answering the questionnaire. The execution of the study was approved by the Ethics Committee of the Universidad de Talca. The results were analyzed using the Statistical Package for Social Sciences (version 22, SPSS, IBM Corp., Armonk, NY, 2014) and MPlus 8.

A descriptive analysis was conducted to compute mean scores with standard deviation (SD) for quantitative variables and frequencies (%) for qualitative variables. A confirmatory factor analysis (CFA) was performed to identify the measurement model. The goodness of fit of the CFA model was assessed through χ^2/df , root mean square error of approximation (RMSEA), comparative fit index (CFI) and the Tucker-Lewis index (TLI). In addition, we determined the convergent validity and the reliability of the constructs. To estimate the effect size (Cohen's d) when testing for gender differences for the SWLS and the SHS, the effect size calculators for the *t*-test from Social Science Statistics (2020) were used. As a correlation measure between quantitative variables the Pearson correlation coefficient was used, Spearman's Rho for correlation between ordinal variables and Kendall's Tau-b for correlation between quantitative and ordinal variables. We used the GLM (Nelder & Wedderburn, 1972) for the estimations.

III. Results

A. Confirmatory factor analysis

In this study a CFA was carried out for all the constructs (Satisfaction with life, subjective happiness, Health-related Quality of Life, family importance and Satisfaction with Food-related Life). The results of this procedure led to the conclusion that this analysis was suitable. Table 1 summarizes CFA results and shows parameters used to test the robustness of the constructs. In relation to the reliability of factor loading, most were above 0.5, and the *t*-values of

each item were significantly associated with specified constructs ($p < 0.001$) (Bagozzi & Phillips, 1991). The internal consistency of the model was assessed through the composite reliability test (CR), in which most of the constructs were close to or above 0.7, and the internal consistency reliability measured by Cronbach's α (CA) (ideally above 0.7) and the average variances extracted (AVE) were close to or above 0.5. Since correlations among constructs did not exceed 0.85, discriminant validity was obtained. Therefore, the scales used in the study presented moderate to high reliability and validity. Consequently, the internal validity of the measurement model was adequate.

B. Descriptive statistics

The sample characteristics are presented in Table 2. The mean score of the quantity of domestic household goods was 7 (SD = 2). The mean score of the unhealthy days was 6.2 (SD = 9.7). The vast majority of respondents belong to the less affluent sectors of society. In fact, the socioeconomic classification indicates that 38.7% belongs to the D stratum (lower), 32.4% to C3 (middle-lower) and 15.4% to C2 (middle-middle). In general, we observed a high satisfaction with the economic situation: 48.5% believes that their current economic situation is adequate and 30.9% believes it is more than adequate. It is noteworthy, therefore, that most of the sample has a low education level, belongs to the lower social classes, but also has a high relative satisfaction with their financial situation.

The mean (SD) satisfaction with life score was 21.7 (4.0) on a 6 to 30-point scale. Also, a male mean score of 20.4 (SD = 4.0) and a female mean score of 22.2 (SD = 2.0) showed that the women's average score was significantly higher than the men's ($t = -4.315$, $p < 0.01$). For the satisfaction with life the effect size estimate was Cohen's $d = 0.57$. The mean (SD) happiness score was 5.2 (1.1) on a 7-point scale. Also, a male mean score of 4.9 (SD = 1.0) and a female mean score of 5.3 (SD = 1.0) showed that the women's average score was significantly higher than the men's ($t = -3.309$, $p < 0.01$). For happiness the effect size estimate was Cohen's $d = 0.4$. The perceived health results indicated that 14.9% of the sample perceived very good overall health, 47.1% good overall health and 33.4% fair overall health.

Table 1. *Reliability and validity of the standardized confirmatory factor analysis (CFA)*

Variables	Standardized Loading	<i>t</i> -value	Cronbach's α	Composite Reliability	Average Variance Extracted
Satisfaction with life scale (SWLS)			0.87	0.90	0.65
SWLS1	0.767	39.875			
SWLS2	0.893	69.606			
SWLS3	0.872	63.014			
SWLS4	0.771	36.004			
SWLS5	0.717	30.362			
Subjective happiness scale (SHS)			0.80	0.85	0.59
SHS1	0.911	41.963			
SHS2	0.838	34.589			
SHS3	0.768	27.768			
SHS4	0.500	13.496			
Health-related Quality of Life (HRQOL)			0.67	0.66	0.40
HRQOL2	0.550	10.137			
HRQOL3	0.707	10.758			
HRQOL4	0.625	10.764			
Family importance scale (FIS)			0.78	0.92	0.65
FIS1	0.727	16.692			
FIS2	0.727	16.692			
FIS3	0.854	52.081			
FIS4	0.747	35.182			
FIS5	0.926	73.696			
FIS6	0.852	54.321			
Satisfaction with Food-related Life (SWFL)			0.87	0.90	0.65
SWFL1	0.766	41.112			
SWFL2	0.895	71.112			
SWFL3	0.874	61.480			
SWFL4	0.771	36.099			
SWFL5	0.693	29.930			
Measurement model		$\chi^2/df = 2.76$	$p = 0.000$	CFI = 0.975 RMSEA = 0.066	TLI = 0.970

Note: CFI: Comparative fit index, TLI: Tucker-Lewis index, RMSEA: Root mean square error of approximation.

Source: own calculations.

Table 2. *Definitions and sample characteristics, older adults living in urban areas*

Variable	Definition	Mean or %	SE
Age	In years	71.3	6.5
Male	Dummy variable (1 = male, 2 = female)	30.1	–
Living alone	Dummy variable (1 = living alone, 2 = living with a partner, i.e., any companion they live with)	51.2	–
Education	Education in three levels		
	1 = no education	7.8	–
	2 = primary or secondary education	76.7	–
	3 = technical training or university education	15.4	–
Children	Children living at home. Number (range: 0-6)	1.6	0.9
QGoods ^a	Possession of domestic goods, number, range: 0-10)	7.0	2.0
SWES	Satisfaction with the economic situation attainment in 3 levels		
	1 = dissatisfied	20.6	–
	2 = slightly satisfied	48.5	–
	3 = satisfied	31.0	–
Unhealthy days	Number (range: 0-30)	6.19	9.7
SWLS	Satisfaction with Life Scale. Number (range: 5-30)	21.7	4.0
	1 = male	20.4	4.0
	2 = female	22.2	2.0
SHS	Subjective Happiness Scale. Number (range: 1-7)	5.2	1.1
	1 = male	4.9	1.0
	2 = female	5.3	1.0
FIS	Family Importance Scale, number (range: 6-36)	26.0	5.6
SWFL	Satisfaction with Food-related Life scale, number (range: 5-30)	22.6	4.1

Note: SE: standard error. ^aIncluding shower, color TV, refrigerator, washing machine, kettles, microwaves, automobile, cable TV, PC and Internet.

Source: own calculations.

Table 3. Correlations among study variables^{a,b}

Variable	-1	-2	-3	-4	-5	-6	-7	-8	-9
(1) Age	1	-0.09	-0.21***	-0.04	-0.07	0.06	0.03	0.01	-0.01
(2) Female		1	-0.09	0.21***	0.17***	0.21***	0.13***	0.20***	0.18***
(3) living with a partner, i.e., any companion they live with			1	0.12**	-0.09	0.04	0.07	-0.00	0.11***
(4) Satisfaction with the economic situation				1	-0.09**	0.32***	0.28***	0.12***	0.28***
(5) Unhealthy days					1		-0.13***	0.038	0.01
(6) Satisfaction with life						1	0.57***	0.29***	0.62***
(7) Subjective happiness							1	0.21***	0.42***
(8) Family importance								1	0.28***
(9) Satisfaction with food- related life									1

Note: ^aPearson correlation coefficient for quantitative variables, Spearman's Rho for ordinal variables and Kendall's Tau-b for quantitative and ordinal variables; ^bSignificant variables at * $p < 0.1$, at ** $p < 0.05$, at *** $p < 0.01$ based on bilateral test.

Source: own calculations.

C. Correlations among study variables

Bivariate correlation coefficients were assessed to understand underlying associations among study variables (Table 3). The Pearson bivariate correlation between satisfaction with life and subjective happiness was 0.57 ($p < 0.01$), between satisfaction with life and Satisfaction with Food-Related Life 0.62 ($p < 0.01$), and between subjective happiness and Satisfaction with Food-Related Life 0.42 ($p < 0.01$). Greater satisfaction with life was observed among the 'happiest' seniors. Satisfaction with life is also positively associated with satisfaction with the economic situation, family and food. Happiness is positively associated with satisfaction with the economic situation, family, food and healthy days. Based on Kendall's Tau-b (T) we observed a statistically significant correlation between age and living alone ($T = -0.21$, $p < 0.01$). Based on Spearman's Rho (Rho) we noted a statistically significant correlation between satisfaction with the economic situation and female gender ($Rho = 0.21$, $p < 0.01$), and living with

a companion ($Rho = 0.12, p < 0.05$). There was a statistically significant correlation between education and the most indicators of quality of life in old age. For example, between education and satisfaction with life ($T = 0.1, p < 0.05$), Satisfaction with Food-Related Life ($T = 0.09, p < 0.05$), and self-perceived overall health ($Rho = 0.11, p < 0.05$). We also observed a statistically non-significant Pearson correlation between age and satisfaction with life ($\rho = 0.09, p > 0.1$) and subjective happiness ($\rho = 0.08, p > 0.1$).

D. Generated generalized linear models

We used GLM (Nelder and Wedderburn, 1972) to examine the relationship between QOL and different study variables. The results of the GLMs are presented in two steps in Table 4. In Step 1 the results shown are those for the null model that includes socio-demographic variables. In Step 2 the results shown are those corresponding to the full model (or saturated model), which adds the variables related to health, family and satisfaction with food to the null model.

The fit of the models is significant at the level of $p < 0.01$ for the likelihood ratio χ^2 . Furthermore, the deviance of the saturated models was 0.44 for satisfaction with life and 0.26 for happiness. The signs of the coefficients show precisely the direction of the relationship of each independent variable with the satisfaction with life and happiness variables. We worked with a significance level of 10% ($p < 0.1$), 5% ($p < 0.05$) and 1% ($p < 0.01$). The signs of the coefficients, in general, agree with the expectations.

The first step in the linear model of seniors' satisfaction with life revealed negative significant relationships for men, and less than adequate and adequate satisfaction with the economic situation. This implies that women and individuals with greater satisfaction with the economic situation are more satisfied with their life compared to men and individuals with less satisfaction with the economic situation. The linear model generated for happiness revealed negative significant relationships for less than adequate and adequate satisfaction with the economic situation. This also implies that those who have more satisfaction with the economic situation are happier than those who are less satisfied with the economic situation. Whether or not

an elderly person is older or younger, male or female (only for the happiness model), lives alone or with a companion, is more or less educated, lives with or without children at home or has more or fewer domestic household goods seems to have no effect on their satisfaction with subjective quality of life.

Table 4. *Regression coefficients from linear models*

	Life satisfaction (cognitive component)			Subjective happiness (affective component)		
	B	SE	Odds	B	SE	Odds
Step 1						
Constant	24.13***	0.34	–	5.81***	0.09	–
Gender ^a						
1= male	-1.29***	0.41	0.28	-0.16	0.11	0.85
Satisfaction with the economic situation ^b						
1: less than adequate	-3.78***	0.54	0.02	-0.90***	0.15	0.41
2: adequate	-2.76***	0.43	0.06	-0.83***	0.12	0.44
Deviance (D)		0.18			0.14	
Likelihood ratio χ^2	(df = 3)	75.906		(df = 3)	61.709	
Step 2						
Constant	9.42***	1.16	–	3.34***	0.36	–
Gender ^a						
1: male	-0.57***	0.35	0.11	-0.10	0.11	0.91
Satisfaction with the economic situation ^b						
1: less than adequate	-1.97***	0.47	0.14	-0.57***	0.15	0.56
2: adequate	-1.50***	0.37	0.22	-0.63***	0.12	0.53
Unhealthy days	-0.02***	0.02	0.21	-0.01**	0.01	0.99
Family importance	0.09***	0.03	1.09	0.02***	0.01	1.02
Satisfaction with food-related life	0.51***	0.04	1.66	0.08***	0.01	1.08
Deviance (D)		0.44			0.26	
Likelihood ratio χ^2	(df = 6)	228.71		(df = 6)	121.285	

Note: B: Coefficient. SE: standard error. a '2 = female' category omitted; b '3 = more than adequate' category omitted. Significance levels: * $p < 0.1$, ** $p < 0.05$, a *** $p < 0.01$. Deviance = $D \frac{Deviance_{n,full} - Deviance_{n,null}}{Deviance_{n,null}}$, $\chi^2 = -2 \ln \frac{\ell_p}{\ell_q}$, where ℓ_p and ℓ_q are the maximum likelihood values of the models obtained. p and q when p = reduced model and q = full model, respectively. The higher the value of likelihood ratio, thus stronger against the null hypothesis, and therefore, the contribution of the variable incorporated at each step is significant.

Source: own calculations.

In the second step, the linear model of satisfaction with life in terms of gender, satisfaction with the economic situation, unhealthy days, family importance and Satisfaction with Food-Related Life revealed negative significant relationships for men, less than adequate and adequate satisfaction with the economic situation, and unhealthy days, and positive significant relationships for family importance and Satisfaction with Food-Related Life. The linear model generated for happiness in terms of satisfaction with the economic situation, unhealthy days, family importance and Satisfaction with Food-Related Life revealed negative significant relationships for less than adequate and adequate satisfaction with the economic situation and unhealthy days, and positive significant relationships for family importance and Satisfaction with Food-Related Life.

The increase in explained variance for the linear models (change in D) from the first to second stage revealed it was significant $p < 0.01$ for satisfaction with life ($\Delta D = 26\%$) and happiness ($\Delta D = 12\%$). This showed that in both satisfaction with life and happiness models the health-related variable (unhealthy days) and food and friends-related variables (family importance and food satisfaction) significantly increased the prediction of satisfaction with life and happiness.

IV. Discussion and Conclusions

Using data from a questionnaire applied to 396 seniors in central Chile, in this paper we analyzed the effect of the set of tangible and intangible factors on subjective QOL. Given that the questionnaire was applied to non-institutionalized seniors registered in SENAMA, we recognize a sample selection bias, which means that the results cannot be extrapolated to the entire senior population in Chile. Hence, the individuals interviewed already have a positive attitude to life due to their participation in activities for seniors, such as workshops grouped in three areas: personal, social and community. In addition, seniors' centers are day centers where adults in the three first quintiles of vulnerability who present slight dependency, cognitive decline or slight depression can participate. They should preferably be resident in the commune where the center is located.

We establish associative relations between subjective QOL and a group of variables linked to aspects such as socio-demographics, economic situation, health (unhealthy days), family importance and satisfaction with food consumption. In this study cognitive QOL (life satisfaction) was measured with SWLS, and affective QOL (subjective happiness) was measured with SHS.

Our results showed that life satisfaction is associated more significantly with gender, SWES, unhealthy days, family importance and SWFL, whereas subjective happiness is associated more significantly with SWES, unhealthy days, family importance and SWFL.

It is interesting to consider the relationship between QOL and SWES. Unlike the findings in the literature regarding financial capacity (Li et al. 2013; Loewe et al., 2014; Lou 2010) or household income (Hsieh 2011; Selim 2008; Shams 2014; Clark et al. 2008), in our study SWES is associated with both cognitive and affective QOL. We infer that urban seniors have a better QOL as they are more satisfied with their economic situation. This finding is consistent with the results of Horstmann et al. (2012), who report a high correlation between life satisfaction and satisfaction with income. We emphasize that the satisfaction with one's own economic situation is a variable that contributes to explaining the QOL, although in our results variables associated with income (i.e., socioeconomic level and expenditure on food consumption) were not statistically significant.

We find a positive and significant relationship between people's food satisfaction and QOL. This result is consistent with the findings of Dean et al. (2008), Grunert et al. (2007), Schnettler et al. (2012), Schnettler et al. (2013) and Schnettler et al. (2014). Daily basic needs like food can be an important source of life satisfaction for people, mainly because eating is not only a biological act, but also an act of subjective and social significance that binds individuals who need affection and recognition as part of their identity.

The findings of this study also provide evidence that unhealthy days are associated with QOL. These results are also consistent with some previous empirical findings (Horstmann et al. 2012; Li et al. 2013; Moor et al. 2013; Sok 2010; Tomas et al. 2014; Yunong 2012). As suggested by Angner et al.

(2013), our results support the notion that the functional relationship between objective health status and subjective happiness must be understood in terms of approaches that incorporate additional psychological and social elements. The relationship between happiness and the number of unhealthy days can be explained by considering this variable a subjective indicator of health which contributes, as Angner et al. (2013) suggest, to disrupting seniors' daily functioning. This has implications for the affective component of well-being as well as other biological, psychological and social factors. Moreover, the statistical significance of the recent state of physical or mental health observed in our happiness model is in line with works by Ferrer-i-Carbonell & Frijters (2004) and Veenhoven (2008). Beyond how health status is measured, the consequences of these findings on public health policy for the elderly are that the emphasis should be on prevention, by establishing policies to promote active and healthy aging and strengthening overall lifestyles that contribute to a healthier life for seniors.

Our results suggest that gender plays a significant role in the model produced for life satisfaction: male seniors are less satisfied with their lives than female seniors. However, gender does not play a significant role in the model generated for subjective happiness, which is consistent with findings from previous studies (Selim 2008; Shams 2014). These results differ from findings of some previous studies on seniors in European countries (Angelini et al. 2012; Moor et al. 2013) and Korea (Sok 2010). The discrepancy between our results and those of Angelini et al. (2012), Moor et al. (2013) and Sok (2010) could be because these studies describe seniors living in developed countries, where seniors not only have more and better social services, but are also embedded in places and pension systems where the income distribution is significantly more egalitarian.

The results in this paper indicate that the number of children at home is not an important factor related to seniors' quality of life. This result is consistent with those obtained by Lou (2010) and Li et al. (2013), but they differ from other results reported in the literature (for example, Selim 2008; Chyi & Mao 2012; Shams 2014). We could propose one hypothesis to explain this situation: In Chile seniors do not necessarily need to have children living at home to feel more satisfied with life as they already frequently share moments with them.

In this work, we also show that satisfaction with food achieves an important role as a factor related to subjective QOL in seniors. As the literature suggests, in this sense we postulate that the satisfaction with food is associated with hedonic pleasure (Hausman, 2005), celebrations and social interaction (Hargreaves et al., 2002) and the pleasure of enjoying the company of family and friends. This aspect of our work can contribute to the design of public policies associated with an elderly citizen's food, associating quality of life in old age with hedonic welfare in the consumption of food.

Finally, the results of this work confirm the importance of SWES, health-related variables, family importance and satisfaction with food as factors related to subjective QOL. These factors appear to be more significant than factors associated with money, such as income or socioeconomic status. It is important for policymakers to design public policies and social intervention strategies considering the perception of seniors with respect to the factors that influence their subjective QOL.

Declarations

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