With Health and Good Food, Great Life!
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With Health and Good Food, Great Life! Gender Differences and Happiness in Chilean Rural Older Adults

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Abstract The interest to study the well-being in older adults notices the process of population aging that exists in different parts of the world, especially in developed and emerging countries such as Chile. In this research we explore the differences between gender in determinants of affective component of well-being, i.e. happiness in older adults, both women and men, living in rural areas in the Maule Region, Chile. A subjective happiness scale was applied across female (N = 241) and male (N = 144) older adults (age range 60–90). Statistical analysis included comparison of means for independent samples and multiple comparison tests. Ordered logit models were computed to examine the determinants of happiness. We find that satisfaction related to food, perception of health and functionality are significantly linked to individual happiness within both gender groups. An influential predictor of female's happiness is the frequency of having dinner with companion. An increased quantity of goods at home implied more happiness. A positive coefficient for age and a negative coefficient for age-squared seem to support the idea of an inverted U-shaped relationship between age and happiness in the female group with an inflection point at the age of 77.5 years. This research suggests that the design and formulation of public policies on rural older adults should consider subjective welfare

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factors they perceive as predictors of happiness and not only objective factors related to well-being.

Keywords Well-being · Ordered logit · Perception health · Functionality · Public policy

1 Introduction

1.1 Happiness and Subjective Well-Being

Interest in studying subjective happiness in the elderly has been rising due to the increasing proportion of senior citizens in the population in different parts of the world. This phenomenon is not only significant in developed countries, but also in developing countries like Chile. Although we can establish a structural relation between life's domains and happiness, the literature provides few studies about this relation in the elderly living in rural areas. Studying happiness can provide insights into the way a country's overall development is measured. It is also important for the design of public policies for an aging society (Calvo and Martorell 2008) in many of life's domains, such as public health, family planning, or public employment policies. For example, Veenhoven (2008) suggests that public health can also be promoted by policies that aim at greater happiness. According to González et al. (2012), countries and leaders have begun to value the considerations associated with the assessment that people make about their lives as a politically relevant objective. The authors suggest rethinking development based on people's subjectivity by focusing on the notion of "subjective well-being". In a policy brief, Beytía and Calvo (2013) provide evidence-based recommendations for Chile on how to measure happiness in a way that is valid, reliable, efficient, and consistent with international standards.

Happiness is considered an affective component of subjective well-being (SWB) and satisfaction with life is the cognitive component (Diener et al. 1985; Moyano and Ramos 2007; Pavot and Diener 2008). Considering that the analysis of happiness helps to better analyze the net impact of economic policy (Frey and Stutzer 2002), the design and formulation of public policy should therefore be informed by an analysis of the predictor variables influencing the affective component of SWB. Moreover, considering the sharp increase in the number of people over age 60 in Chile, information must be provided on the factors that influence the happiness of the elderly. This will make it possible to offer senior citizens social intervention programs that meet their requirements. Thus the Chilean elderly population will be able to continue enjoying an important role in social construction.

At an international level, recent studies have focused on identifying the factors that influence happiness in the elderly (Angner et al. 2013; Chyi and Mao 2012; Godoy-Izquierdo et al. 2013; Knight et al. 2009; Kousha and Mohseni 2000; Ku et al. 2014; Lou 2010; Patrick et al. 2001; Shams 2014; Selim 2008; Theurer and Wister 2010; Wang and Sunny Wong 2014). Research on the aging process in Chile is still limited, particularly with regard to the elderly living in rural areas. Some studies on happiness among the Chilean population in general are those of Moyano and Ramos (2007) and Vera-Villarroel et al. (2011). Also, the more recent works by Schnettler et al. (2012, 2014) suggest that satisfaction with food-related life is a strong predictor of the cognitive component of SWB.

1.2 Happiness Scale and Evidence

The most frequently used scale to measure the affective component of SWB is the subjective happiness scale (SHS) developed by Lyubomirsky and Lepper (1999). The SHS consists of four items to be answered on a 7-point Likert scale. Scores totaled for the four items range from 4 to 28, which is calculated based on the average score of all items, where higher scores reflect greater happiness. Some recent studies on happiness and the elderly have shown dispersed values. For example, the mean (SD) of happiness reported by Angner et al. (2013) was 5.67 (1.36) in a study about people of at least 50 years of age for a sample of 383 people. For the Thai elderly population (age range 55–80) Gray et al. (2008) estimated the mean happiness to be between 5.5 and 5.8 depending on the age range, 5.5 (2.05) for female and 5.8 (1.91) for male. The authors reported increasing happiness according to functional ability and number of household possessions as variables. For institutionalized and non-institutionalized Spanish seniors Godoy-Izquierdo et al. (2013) indicated that most participants reported a current happiness value between 5 and 8 (mean = 6.59) on a 10-point scale. Chyi and Mao (2012) reported that the mean value of self-rated happiness was 3.41 on a 5-point scale among the sampled elderly of which men are slightly happier (3.45) than their female counterparts (3.37). Moreover, Shams (2014) estimated a happiness index with an average value of 2.11 (1.41) on a 4–point scale (range 1–4). Vera-Villarroel et al. (2011) reported a mean score of 5.33 (1.11) for a sample of 517 Chilean adults with an age mean of 39.5 (age range 18–77).

Some authors suggest that the most influential predictors of older adults' happiness are indicators of health status (Angner et al. 2013; Chyi and Mao 2012; Gray et al. 2008; Hsieh 2011). Patrick et al. (2001) concluded that only emotional support from family and friends emerged as a significant predictor of well-being and that women were more likely to report high levels of negative affect.

The literature does not provide any conclusive evidence regarding the contribution of living with children or grandchildren on the happiness of older adults. For example, for Gray et al. (2008) living with children does not contribute to explaining happiness in the elderly. However, Chyi and Mao (2012) found that 'living with children' has a negative effect and 'living with grandchildren' has a positive effect on the elderly's happiness. The authors found a statistical significance and positive correlation between happiness and good health and family income, and a negative correlation with poor health in both models. Also, they suggested, only for the male model, a statistically significant and positive relation between happiness and age and education. For Shams (2014) age is an important determinant of well-being and results seem to support the idea of an inverted U-shaped relationship between age and happiness with a theoretical turning point at 65.5 years of age.

Hsieh (2011) concluded that marital status is a significant predictor of happiness, where seniors (65[+]) have a decreasing probability of happiness when they are widowed or separated. Also, the difference in income equality between those seniors who were happy and those who were not was not statistically significant. The latter results confirm the idea that for seniors *money does not buy happiness*.

There is no consistent difference in happiness between genders. Over time, however, women's happiness declines relative to men in every cohort. In the 1970s women were usually happier than men. By the 1990s the opposite was the case (Easterlin 2001). According to the author, there is evidence that women are generally slightly happier than

men, but this evidence on average applies to people in developed countries (Frey and Stutzer 2002). Stevenson and Wolfers (2009) found that happiness has increased across the European Union for men and women; however, increases in happiness have been greater for men than women, leading to a decline in European women's happiness compared European men's. Knight et al. (2009) showed that rural women in China are happier than rural men. For the population 55 years and older (age range 55–80) Gray et al. (2008) examined the level of happiness of the Thai elderly population and its relationship to various external and internal factors. According to multiple regression analyses, men are more likely to be happy than women, as are people who live alone. However, according to Gray et al. (2008) one of the most important predictors of happiness is consumerism, which is measured as number of household possessions (more household possessions implies more happiness). Graham and Chattopadhyay (2012) found no significant difference between male and female happiness in low-income countries; however, they suggested that women are happier in developed countries. Zweig's (2014) work provided evidence that women are either happier than men or that there is no significant difference between women and men in nearly all of the 73 countries examined. The magnitude of the female–male happiness gap is not associated with economic development or women's rights, and there are no systematic patterns by geography or primary religion.

Finally, the literature suggests there are no associations between seniors' happiness and race/ethnicity (Angner et al. 2013; Hsieh 2011), gender (Angner et al. 2013; Hsieh 2011; Kousha and Mohseni 2000; Theurer and Wister 2010), age (Angner et al. 2013; Gray et al. 2008; Kousha and Mohseni 2000; Patrick et al. 2001), education (Angner et al. 2013; Hsieh 2011; Moor et al. 2013; Patrick et al. 2001), education of rural women (Chyi and Mao 2012), marital status (Angner et al. 2013; Patrick et al. 2001), employment status (Hsieh 2011), or income (Angner et al. 2013; Moor et al. 2013).

1.3 Current Study

As summarized above, some previous relevant studies have indicated the main predictors of older adults' happiness (Angner et al. 2013; Chyi and Mao 2012; Godoy-Izquierdo et al. 2013; Knight et al. 2009; Kousha and Mohseni 2000; Shams 2014; Selim 2008; Theurer and Wister 2010; Wang and Sunny Wong 2014). However, some previous studies on happiness in Chile have referred to the population in general and not to the elderly specifically (Moyano and Ramos 2007; Vera-Villarroel et al. 2011). Calvo et al. (2009) explored the factors that affect an individual's happiness while transitioning into retirement. The results revealed that what really matters is not the type of transition (gradual or immediate retirement), but whether people perceive the transition as chosen or forced. In this research, we analyzed the relationships between rural elderly men and women's happiness and their main predictors in the Maule Region, Chile. The Maule Region has the highest rate of rurality in Chile (33 %). Also, the regional aging index indicates there are 71 seniors per 100 children under 15 years of age with a higher proportion of women than men. The main aim of this research was to explore the gender differences in the determinants of subjective happiness in the elderly living in rural areas. Thus, we expected to provide insights for policy makers to improve their perceptions and understanding of the Chilean elderly. This was done by testing the following research questions:

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Question 1   Are women more or less happy than men?
Question 2   Is spending on food consumption higher or lower between women and man and what is the relationship between spending and happiness?
Question 3   Which variables are associated with happiness of rural seniors in terms of gender?
Question 4   Is satisfaction with diet associated with happiness for people of different gender?
Question 5   What is the relationship between perceived health and happiness?

2 Data and Methods

2.1 Sample

389 seniors (241 women, 144 men) living in rural areas of the Maule Region in central Chile were interviewed. Within the conglomerate a two-stage sampling was used, stratified by clusters with incidental (casual) sub-sampling and by (snowball) networks. A stratified random sample with affixation proportional within each of the 30 communes of the Maule Region was carried out. In order to conduct a comparative analysis on food spending between women and men, only one half of a couple was interviewed. Centers for the Elderly (CAM) listed in the National Register of Social Organizations for the Elderly of the National Service for Senior Citizens (SENAMA) were used as clusters. CAM were selected within each stratum by simple random sampling, with the "random sample of cases" SPSS function. The maximum absolute error level expected of the questionnaire results was ±5 % for a 95 % confidence level.

2.2 Instrument

Considering the relation between happiness and satisfaction with food and health-related indicators, the questionnaire applied included the following scales: SHS, Satisfaction with Food-related Life (SWFL), Health-Related Quality of Life Index (HRQoL), and Index of Independence in Activities of Daily Living (known as the Katz ADL).

   The SHS consists of four items that must be answered on a 7-point Likert scale. The first item asks respondents whether, in general, they consider themselves to be (1) 'not a very happy person' to (7) 'a very happy person'. The second item asks if, compared to their peers, they consider themselves to be (1) 'less happy' to (7) 'happier'. Both the third and fourth items give descriptions and ask: 'to what extent does this characterization describe you?' with responses ranging from 'not at all' to 'a great deal'. For item three, the description is 'some people are generally very happy, they enjoy life regardless of what is going on, getting the most out of everything', and item four is 'some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be'. SHS scores are totaled for the four items, and range from 4 to 28. The scale is calculated based on the average score of all the items, with higher scores reflecting greater happiness. However, the SHS was converted to an ordinal qualitative variable using a Visual Binning Technique to identify suitable cut-off points to break the SHS into three approximately equal groups, using equal percentiles based on scanned cases (equal intervals with two cut-off points). Thus, this study considered happiness as a multinomial ordinal-dependent variable (1 = *not happy*, 2 = *quite happy*, and 3 = *very happy*).

Following this definition, *happiness* was used as an independent variable in the estimates for male and female.

SWFL was proposed and tested by Grunert et al. (2007) in eight European countries. The five items on the scale are grouped into a single dimension (1. Food and meals are positive elements. 2. I am generally pleased with my food. 3. My life in relation to food and meals is close to ideal. 4. With regard to food, the conditions of my life are excellent. 5. Food and meals give me satisfaction in daily life). On each scale the respondents must indicate their degree of agreement with these statements using a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*). In Chile this scale has been used by, among others, Schnettler et al. (2012, 2013) and Schnettler et al. (2014).

Perceived health or HRQoL, developed by Hennessy et al. (1994), consists of four items of healthy day measures: The first explores self-perceived health in general based on a personal assessment of the current health or disease resistance. The second item refers to the state of physical health during the past 30 days. The third item explores the status of recent mental health. The fourth item refers to limitations for common activities during the last 30 days. The 'self-perceived general health' (or perceived health) answers the question, '*Do you believe your health, in general, is excellent, very good, good, fair or poor?*', which is subsequently recoded into three categories: 1 = *very good or excellent*, 2 = *good*, and 3 = *fair or poor*. Additionally, the questionnaire includes two questions about objective health, and subjects are asked about the number of days, within the last 30 days, during which their physical health, including physical illnesses and injuries, and mental health, including stress, depression, and emotional diseases, was not well. These two questions enable the construction of the variable 'unhealthy days index', and the 'healthy days index' variable was added to positively complement the number of unhealthy days. The range of unhealthy and healthy days is 0–30.

Finally the Katz ADL, developed by Katz et al. (1963), assesses six basic functions in terms of dependence or independence, which are then grouped into one overall index. Respondents must indicate the degree of difficulty using a 4-point Likert scale (1 = *I can't do it*, 2 = *It is very difficult to do*, 3 = *It is little difficult to do* and 4 = *I can do it without difficulty*). Subsequently 0 points are assigned to responses 1 or 2 and 1 point to response 3 or 4, and with this a new discrete quantitative variable functionality can be constructed (range 0–6 points). Finally, the Katz ADL variable as constructed is scored as: 1 = *severe o moderate functionality* (range 0–4 points) and 2 = *independent* (range 5–6 points).

Demographic and socioeconomic data were coded as binary or multinomial variables. We coded 'marital status' as 1 = *live alone (either single, separated, divorced or widowed)* and 2 = *living together (either married or cohabiting)*. We separated participants into three groups based on their 'education': 1 = *no education*, 2 = *primary or secondary education* and 3 = *technical or college education*. We coded 'main person responsible for household income' and 'responsible for purchase food' as 1 = *no* or 2 = *yes*. We separated participants into four groups with respect to their 'occupation': 1 = *self-employed or entrepreneur*, 2 = *employee private or public*, 3 = *retired* and 4 = *other (seasonal work)*. With regard to the possession of goods in the home, a set of ten goods was selected to measure the 'household domestic goods quantity' (QGoods). This variable was added to the models as a discrete quantitative variable and also as an ordinal multinomial variable, which we assigned as follows: 1 = *3 or less*, 2 = *between 3 and 7*, and 3 = *between 8 and 10*. Combining QGoods and education variables in a matrix determines the 'socioeconomic level', classified as 1 = *ABC1 (high and upper middle)*, 2 = *C2 (middle–middle)*, 3 = *C3 (middle–low)*, 4 = *D (lower)*, and 5 = *E (very low)*. According to Adimark (2004) these variables are conceptually related to income, cultural level and the

stock of wealth accumulated by the family group, allowing a simple but adequate estimate of the socioeconomic level of Chilean households.

The 'discrepancy between real-self and ideal-self' was obtained as the simple average of the seven domains of personality. We asked about 'household monthly food expenditure', but as this variable does not take into account the household size (Yang 2008), we included 'equalized household monthly food expenditure' as an independent variable which divides monthly household food expenditure by the square root of the size of the household (Hsieh 2011). This was done for both comparisons. Besides working with discrete quantitative variables, we separated 'household members' (number) and 'household children' (number) into three groups: 1 = *1–2 members*, 2 = *3–4 members*, and 3 = *5 or more*. Additionally, five Likert-type responses were included from 1 (*strongly disagree*) to 5 (*strongly agree*) in order to evaluate beliefs about the importance of five sources of happiness: family, work, leisure, friends and food. Also, questions on frequency were included (1 = *daily*, 2 = *2–3 times a week*, 3 = *weekends only*, 4 = *occasionally*, and 5 = *other frequency*), about how often the respondent eats accompanied by others, such as 'frequency of breakfast in company', 'frequency of lunch in company', and 'frequency of dinner in company'. The variables used in the analysis are itemized with their categories in Tables 1 and 2.

2.3 Data Collection

The questionnaire was personally administered by trained interviewers during the months of May 2013 and January 2104 in the 30 municipalities of the Region of Maule, Chile. Before the respondents were asked if they were prepared to answer the questionnaire, the interviewers explained to the respondents (>60 years) the objectives of the survey and the strictly confidential treatment of the information obtained. The participants signed informed consent statements before responding. The execution of the study was approved by the Ethics Committee of the University of Talca.

2.4 Statistical Analysis

The scales factors were extracted using a principal component analysis (PCA), considering *eigenvalues* greater than 1. To determine the adequacy of the factor analysis, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were used (Hair et al. 1999). Given that the psychometric properties of the SHS have not previously been studied in Chile, a confirmatory factor analysis (CFA) was carried out using LISREL 8.8 (Scientific Software International, Inc. Chicago, 2007). The parameters in the CFA were estimated by robust maximum likelihood (Hair et al. 1999). A CFA model fits reasonably well if the Chi square (χ^2) is not significant, if the goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI) are greater than 0.90, and if the root mean square error of approximation (RMSEA) is lower than 0.08 (Hu and Bentler 1999).

Then a descriptive analysis was performed. Differences of means between men and women were analyzed using a one-way analysis of variance (ANOVA) F test and t test for independent samples after first applying the Levene's test of variance homogeneity. To compare qualitative variables by age group and category of happiness multiple comparison tests based on Tukey's HSD (Honest Significant Difference) and Tamhane's T2, after applying Levene's test, were carried out. Finally, ordinal logistic regression models were estimated to identify determinants of happiness in Chilean senior citizens living in rural areas.

Table 1 Percent distribution and standard deviation (SD) of independent variables

Variable	Female				Male				Factor analysis	
	N	%	Mean	SD	N	%	Mean	SD	KMO[a]	BS test[b]
Marital status										
1: living alone (single, separated, divorced or widowed)	103	42.9	5.4	0.11	44	30.8	5.3	0.19		
2: living together (married or cohabiting)	137	57.1	5.4	0.09	99	69.2	5.5	0.10		
Education level										
1: no education	20	8.3	5.1	0.26	11	7.6	5.1	0.33		
2: primary or secondary education	206	85.5	5.4	0.07	126	87.5	5.4	0.10		
3: technical or college education	15	6.2	5.7	0.26	7	4.9	5.9	0.28		
Main person responsible for household income										
1: no	140	59.1	5.3	0.09	17	12.2	5.3	0.33		
2: yes	97	40.9	5.5	0.11	122	87.8	5.4	0.10		
Responsible for purchasing food										
1: no	53	22.0	5.1	0.16	92	63.9	5.3	0.12		
2: yes	188	78.0	5.5	0.08	52	36.1	5.6	0.14		
Occupation										
1: self-employed or entrepreneur	22	9.2	5.1	0.21	30	21.0	5.4	0.21		
2: employee (private or public)	7	2.9	5.3	0.44	11	7.7	5.7	0.30		
3: retired	144	60.3	5.6	0.09	97	67.8	5.3	0.11		
4: other (seasonal work)	66	27.6	5.2	0.14	5	3.5	6.1	0.25		
Quantity of goods in home										
1: 3 or less	10	4.1	5.0	0.27	12	8.5	4.6	0.36		
2: between 3 and 7	120	49.8	5.3	0.92	102	72.3	5.5	0.11		
3: between 8 and 10	111	46.1	5.6	0.11	27	19.1	5.8	0.20		
Socioeconomic level										
1: ABC1 (high and upper middle)	5	2.1	5.6	0.61	3	2.1	5.8	0.44		
2: C2 (middle–middle)	22	9.1	5.6	0.18	11	7.6	5.9	0.34		
3: C3 (middle–lower)	57	23.7	5.4	0.16	31	21.5	5.6	0.18		
4: D (lower)	136	56.4	5.4	0.09	82	56.9	5.3	0.12		
5: E (very low)	21	8.7	5.4	0.23	17	11.8	5.2	0.32		
Subjective Happiness Scale									0.76	599.1***
1: not happy	96	39.8	4.4	0.08	56	38.9	4.3	0.09		
2: quite happy	91	37.8	5.7	0.03	50	34.7	5.7	0.04		
3: very happy	54	22.4	6.7	0.04	38	26.4	6.7	0.05		
Satisfaction with food-related life									0.80	990.9***
1: strongly disagree	0	0.0	–	–	0	0.0	–	–		
2: disagree	0	0.0	–	–	7	4.9	3.3	0.52		

Table 1 continued

Variable	Female				Male				Factor analysis	
	N	%	Mean	SD	N	%	Mean	SD	KMO[a]	BS test[b]
3: slightly disagree	45	18.8	5.0	0.18	28	19.4	4.4	0.26		
4: slightly agree	131	54.8	5.3	0.09	76	52.8	5.3	0.16		
5: agree	63	26.4	5.8	0.14	33	22.9	5.5	0.12		
6: strongly agree	0	0.0	–	–	0	0.0	6.1	0.15		
Health-Related Quality of Life									0.66	183.4***
Self-perceived general health										
1: very good or excellent	24	9.9	5.9	0.17	20	14.0	6.1	0.18		
2: good	95	39.4	5.3	0.09	60	42.0	5.3	0.13		
3: fair or poor	122	50.6	5.3	0.11	63	44.1	5.4	0.14		
Index of Independence in Activities of Daily Living										
1: severe or moderate functional impairment	43	17.8	4.8	0.19	20	13.9	4.2	0.23	0.85	1461.1***
2: independent	198	82.2	5.5	0.07	124	86.1	5.6	0.09		

[a] KMO: Kaiser, Meyer and Olkin test

[b] BS test: Bartlett's test of sphericity; the significance level at *** $p < 0.01$

Table 2 Tests of means of independent variables

	Female		Male		Variance homogeneity test[a]	t test[b]	p value[c]
	Mean	SD	Mean	SD			
Age	70.5	6.4	72.8	6.3	0.756	3.418	0.001***
Happiness score	5.4	1.1	5.4	1.1	0.567	0.224	0.823
Equivalized household food expenditure	104.4	49.7	112.6	64.1	12.563***	1.237	0.217
Household domestic goods quantity (0–10)	6.3	1.8	5.9	2.1	2.067	−2.254	0.025**
Household members (number)	2.6	1.3	2.9	1.6	2.908*	1.785	0.076*
Household children (number)	0.4	0.7	0.5	1.0	5.062**	0.690	0.491
Height (cm)	156	0.1	169	0.1	0.718	12.113	0.000***
Weight (kg)	65.8	12.2	77.3	11.5	0.961	9.121	0.000***

[a] Levene's test of variance homogeneity. F value is presented in parentheses. Not significant suggests that the population variances of the two samples (female and male) are equal

[b] t test for mean equality (t value)

[c] Significant difference at * $p < 0.1$; ** $p < 0.05$; at *** $p < 0.01$ based on t statistics

2.5 The Econometric Model

We used an ordered logit model, introduced by McKelvey and Zavoina (1975). In this model the parameters are estimated by the maximum likelihood method associated with

random variables density functions (Greene 1999). Denoting y_i^* (ranging from $-\infty$ to $+\infty$) as the subjective happiness perceived by individual $i = 1, 2, \ldots n$ and assuming that it is a linear function of the observed variables x_i and a standard logistic distribution of the error term ε_i:

$$y_i^* = \beta' x_i + \varepsilon_i$$
$$\varepsilon_i x_i \sim \log(a, \pi^2 b^2 / 3)$$
(1)

In Eq. (1) β is the parameter vector. As in the standard ordered logit model we do not observe y_i^* directly, but only the responses to a question on subjective happiness recorded as an ordered categorical variable, which goes from 1 ('not happy') to 7 (''very happy''). The conditional probabilities of each observed value of y are obtained as follows:

$$p(y = 0) = \Lambda(\gamma_1 - \beta' x),$$
$$p(y = 1) = \Lambda(\gamma_2 - \beta' x) - \Lambda(\gamma_1 - \beta' x),$$
$$\ldots$$
$$p(y = (J - 1)) = 1 - \Lambda(\gamma_{J-1} - \beta' x)$$
(2)

In Eq. (2) J refers to the number of ordered categories and the coefficient γ is called the *limit parameter*. Also, $\Lambda(.)$ represents the logistic distribution function. For j response categories there are j equations which be solved $(j = 0, 1, 2, \ldots J)$ and $(J - 1)$ *limit parameters*. As all probabilities must be greater than zero, it must be verified that $0 < \gamma_1 < \gamma_2 < \ldots < \gamma_{J-1}$. Thus, the estimators obtained are consistent, asymptotically efficient and possess asymptotic distribution logistics. The joint estimation of β is carried out by maximizing the log-likelihood function and implemented with SPSS versus 15.0 for Windows in Spanish. Finally, the following were used to measure the goodness-of-fit of the model: Wald χ^2, -2 logarithm of likelihood ($-2LL$) and Nagelkerke's adjusted R^2.

3 Results

Of all the participants in the sample $N = 389$ 62.6 % were women and 37.4 % were men. As shown in Table 1, generally most live with a companion, either married or cohabiting, and both genders have mainly a secondary-level education. Only 41 % of women claim to be primarily responsible for household income, but 78 % say they are responsible for the purchase of food. For men it was observed that 88 % are primarily responsible for household income and only 36 % are responsible for the purchase of food. Most seniors are retired from the labor market (in Chile women retire at 60 and men at 65), and reside in predominantly low (56–57 %) and middle–lower (22–24 %) socioeconomic households.

The SWFL has adequate levels of internal consistency (Cronbach's α: 0.86) and the existence of a single factor for all items (65.7 % explained variance). The factor model as a whole is significant [KMO test 0.80, BS test = 990.9($p < 0.01$)]. This research the HRQoL presents adequate levels of internal consistency for three of the four items (Cronbach's α = 0.72). The factor model as a whole is significant [KMO test 0.66, BS test = 183.4($p < 0.01$)]. HRQoL revealed one factor accounting for 60.7 % of the explained variance. The Katz ADL has adequate levels of internal consistency (Cronbach's α: 0.89) and

the existence of a single factor for all items (64.5 % explained variance). The factor model as a whole is significant [KMO test 0.85, BS test = 1461.1($p{<}0.01$)].

The SHS scale presented an adequate level of internal consistency (Cronbach's α: 0.74). The results of the PCA revealed the existence of a single factor for all the items (explained variance: 64.1 %). The value of the KMO sample adequacy test was considered good (0.76), and Bartlett's test of sphericity was significant ($BS\ test = 599.1, p{<}0.01$). The CFA performed to the SHS scale indicating a good goodness-of-fit ($\chi^2 = 2.66, p\ value = 0.264, RMSEA = 0.029, GFI = 1.00, AGFI = 0.98$). The standardized factor loadings for the six items were statistically significant; therefore, it may be concluded that there is convergent validity.

Although most women and men declare themselves happy or very happy it is interesting that about 40 % declare not to be happy in both groups. More frequently women had a fair or poor perceived health than men, although the vast majority of both groups showed high levels of functionality. The average age of the women was 70.5 (6.4) and of the men 72.8 (6.3). As Levene's test of homogeneity of variance was not significant, the population variances of the two groups (men and women) were equal. From the above we can obtain the p value for the case of equal variances, which turned out to be significant ($p < 0.01$), which subsequently allows it to be inferred that the men were significantly older than women (Table 2). Following the same analytical procedure for the results in Table 2, we see that the women are just as happy as the men, and that the discrepancy mean value of current self and ideal self are equal between women and men. Although the women reported a mean value of 6.3 unhealthy days during the past 30 days and men 5.4 days, it can be inferred that these results are not statistically different and therefore both rural elderly women and men have an equal unhealthy days index. The same holds for the equivalent cost of food consumption, which makes it possible to infer that there is a statistically significant difference in spending by each group. In households where elderly women reside there is a higher number of household goods ($p < 0.05$), but the households where elderly men reside are larger in terms of number of household members, although its significance is weak ($p < 0.1$). Finally, the results shown in Table 2 show that rural elderly men are taller than women ($p < 0.01$) and are significantly heavier ($p < 0.01$).

In both gender groups no statistically significant differences were observed in happiness scores by age group. Also, multiple comparisons of the different age groups did not show any significant differences (Table 3). Rural seniors who are 'very happy' scored 6.71 (0.12) and those who are 'quite happy' scored 5.71 (0.03–0.04). Within the group 'not happy' women scored 4.35 (0.08) and men 4.29 (0.09). A slight discrepancy was observed between the actual self and the ideal self in the group of women aged 70–79 compared to the group aged 60–69. Finally, no significant differences were observed in the number of unhealthy days and the equivalent spending on food consumption among seniors by age group.

Before analyzing the results of the ordinal logit models for women and men and in order to assess possible effects of multicollinearity, a PCA was performed. A first step was the analysis of the correlation matrix that identified generally low or no significant correlation between the predictor variables. No significant correlation between happiness and gender was observed; in fact, a value close to zero for the Eta coefficient ($\eta = 0.011$) was obtained, indicating no association between the variables considering happiness as the dependent variable. The second step was the analysis of components (extraction method: PCA), which indicated that the items making up the scale are grouped into a single factor and therefore suggests no multicollinearity between the predictor variables.

Table 3 Multiple comparison tests of independent variables

	Female				Male			
	Mean[a]	SD	Variance homogeneity test[b]	Multiple comparison tests[c]	Mean[a]	SD	Variance homogeneity test[b]	Multiple comparison tests[c]
Happiness by age group	5.40 (0.16)	1.08	0.76		5.42 (0.42)	1.10	2.13	
60–69	5.37	0.09		−0.07 0.05	5.37	0.16		−0.05 −0.26
70–79	5.44	0.12		0.07 0.12	5.42	0.13		0.05 −0.21
80–90	5.32	0.26		−0.05 −0.12	5.64	0.18		0.26 0.21
Happiness by category[d]	5.40*** (352.49)	1.08	29.38***		5.42*** (293.63)	1.10	23.50***	
Not happy	4.35	0.08		−1.36*** −2.37***	4.29	0.09		−1.42*** −2.43***
Quite happy	5.71	0.03		1.36*** −1.01***	5.71	0.04		1.42*** −1.01***
Very happy	6.72	0.04		2.37*** 1.01***	6.72	0.05		2.43*** 1.01***
Equivalized household food expenditure	104.42 (0.40)	49.72	1.80		112.58 (1.43)	64.09	1.28	
60–69	103.11	4.10		−0.92 −9.68	99.54	8.91		−20.74 −10.91
70–79	104.03	5.31		0.92 −8.76	120.29	7.40		20.74 9.84

Table 3 continued

	Female				Male			
	Mean[a]	SD	Variance homogeneity test[b]	Multiple comparison tests[c]	Mean[a]	SD	Variance homogeneity test[b]	Multiple comparison tests[c]
80–90	112.79	13.61		9.68 8.76	110.46	14.59		10.91 −9.84

[a] ANOVA results are presented in parentheses (F value). ** and *** suggest that the mean values of the three groups or categories are statistically different at $p < 0.05$ or $p < 0.01$ level, respectively, based on a one-way ANOVA F test

[b] Levene's test of variance homogeneity. *** suggest that the population variances of the three categories are not equal at $p < 0.01$ level based on F test

[c] Multiple post hoc comparison tests for difference between two means. Results are Tukey's HSD (honest significant difference) test for equal variances and Tamhane's T2 for not equal variances. ** and *** indicates that pairs of means in all three categories are different from each other at $p < 0.01$ or $p < 0.01$ level, respectively, based on paired-sample t test

[d] The polynomial contrast F test suggests an increasing linear trend in happiness across three categories for female ($F = 5.618, p = 0.019$) and male ($F = 5.62, p = 0.019$) at $p < 0.05$ level

The results of the ordered logit models generated for happiness are presented in Table 4. The fit of the models was significant at the level of $p < 0.01$ for the Wald χ^2 and $-2LL$. Furthermore, the predictive power of the models was 30.5 % for women and 34.5 % for men according to Nagelkerke's R^2. The signs of the coefficients of the generated logit models show the direction of the relationship of each independent variable with the happiness variable. The Wald statistical values show the individual significance of the coefficients, which when associated with their probability, make it possible to accept or reject the no significance (null hypothesis). In this study, 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, were consistent with the expectations.

For the model generated for women the positive coefficient of the QGoods variable ($\beta = 0.230$) indicated that more goods in the home increases the probability of being very happy. The same goes for Age ($\beta = 0.775$), which showed that it is more likely to find happier women as age increases, although that would likely form an inverted U due to the negative sign and statistical significance of the variable Age-squared ($\beta = -0.005$), with an inflection point at the age of 77.5 years. The probability of being happier decreases when the woman is not primarily responsible for household income ($\beta = -0819$) or when the woman is not responsible for buying food ($\beta = 1029$), both compared with women who are responsible for income or food purchase. The frequency with which the women had dinner with a companion was a source of happiness in rural areas, since the probability of being 'very happy' increases when women have dinner with a companion on a daily basis ($\beta = 610$), 2–3 times a week ($\beta = 2.751$), weekends only ($\beta = 2.410$), or occasionally ($\beta = 2.349$), compared to any other frequency less than that. Although the statistical significance is relatively weak, leisure is a source of happiness for elderly rural men ($\beta = 1.337$); however, this does not hold for women.

Perceived health had significant effects for both genders. Given that the comparison category is 'very good or excellent', it is possible to infer that rural seniors who describe their state of health by any of the other two categories will see a reduced probability of being very happy. From the point of view of the functional activities of rural seniors who suffer from severe or moderate functional impairment, these are less likely to be very happy compared to those who are independent. No other variables were observed as having a statistically significant effect, such as the discrepancy between the actual self and the ideal self, marital status, education level, employment status, number of goods in the household, number of household members or number of children living at home, socioeconomic status and food consumption expenditure.

4 Discussion

Using data from a questionnaire administered to 241 elderly women and 144 elderly men living in rural areas of the Region of Maule, Chile, information was obtained to respond to the following questions: (1) Are women more or less happy than men? (2) Is spending on food consumption more or less between women and men and what is the relationship between spending and happiness? (3) Which variables are associated with happiness of rural seniors in terms of gender? (4) Is satisfaction with diet associated with happiness for people of different gender? (5) What is the relationship between perceived health and happiness?

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Table 4 Estimated effects on happiness: an ordered logit model

	Female			Male		
	β^a	Odds[b]	SE[c]	β^a	Odds[b]	SE[c]
Limit parameters[d]						
γ_1	29.084		15.451*	−3.331		0.709***
γ_2	31.178		15.470**	−1.376		0.653**
Quantity of goods in home	0.230	1.259	0.082**			
Age[e]	0.775	2.171	0.424*			
Age-squared[e]	−0.005	0.995	0.003*			
Satisfaction with food-related life (SWFL)						
1: slightly disagree				−2.386	0.092	1.259*
2: slightly agree	−1.708	0.181	0.426***	−2.008	0.134	0.552***
3: agree	−1.176	0.309	0.324***	−1.060	0.346	0.422**
4: strongly agree	0	1	–	0	1	–
Main person responsible for household income						
1: no	−0.819	0.441	0.307***			
2: yes	0	1	–			
Responsible for food purchase						
1: no	−1.029	0.357	0.343***			
2: yes	0	1	–			
Self-perceived general health						
1: very poor or fair	−0.897	0.401	0.456**	−1.096	0.334	0.536**
2: good	−1.156	0.315	0.471**	−1.540	0.214	0.537***
3: very good or excellent	0	1	–	0	1	–
Index of Independence in Activities of Daily Living						
1: severe or moderate functionality impairment	−1.324	0.266	0.380***	−2.288		0.675***
2: independent	0	1	–	0		–
Frequency of having dinner with companion						
1: daily	2.610	13.599	0.743***			
2: 2–3 times a week	2.751	15.658	0.834***			
3: weekends only	2.410	11.134	0.975**			
4: occasionally	2.349	10.475	0.809***			
5: other frequency	0	1	–			
Leisure as source of happiness						
1: strongly disagree				1.337	3.808	2.827*
2: disagree				0.235	1.265	0.152
3: indifferent				−0.736	0.479	2.265
4: agree				0.553	1.738	1.362
5: strongly agree				0	1	–
Dependent variable: happiness	0: not happy, 1: quit happy, 2: very happy					
Number of observations	241				144	
Nagelkerke adjusted R^2	0.305				0.345	

Table 4 continued

	Female			Male		
	β[a]	Odds[b]	SE[c]	β[a]	Odds[b]	SE[c]
Wald χ^2 (14 *female*, 10 *male*)[f]		73.424***			52.229***	
−2 logarithm of likelihood (−2LL)[f]		422.428***			147.172***	

[a] The parameter is at zero because it is redundant

[b] Odds: These are the proportional odds ratios for the ordered logit mode

[c] Significant variables at * $p < 0.1$; at ** $p < 0.05$; at *** $p < 0.01$ based on Wald statistics

[d] Value of the limit parameter. There are two parameters because there are three response categories

[e] The theoretical turning point of 77.5 years of age was obtained as: $\beta_{Age}/(-2 \times \beta_{Age\text{-}squared})$

[f] The significance level for the models as a whole at *** $p < 0.01$

   With regard to the first question the results of this research show there is no statistically significant difference in happiness between senior women and men living in rural areas. There is also no difference in happiness between men and women by age group. This research provides evidence that women are equally as happy as men, which is in line with the findings of Graham and Chattopadhyay (2012), who reported no significant difference between male and female happiness in low-income countries like Chile. The results of this research are consistent with Zweig (2014) in that there is no significant difference between women and men in nearly all of the 73 countries examined, Chile included. As suggested by Angner et al. (2013), Hsieh (2011) and Theurer and Wister (2010), in this work we observed no association between happiness in seniors and gender. However, we did observe an increasing linear trend in happiness across the three categories of happiness defined for both women and men. In addition, the ranges of reported happiness scores for both groups are consistent with the estimates of various authors (Angner et al. 2013; Chyi and Mao 2012; Gray et al. 2008; Vera-Villarroel et al. 2011).

   Regarding the second question, the results indicate that men spend more than women on food consumption, but no significant differences between men's and women's expenditure equivalent to consumption by age group were observed. This seems to suggest that no significant changes in the amount of spending occurs with increasing age and also that such spending does not significantly influence the level of happiness in either gender. Considering that consumer spending represents a large percentage of income, particularly in families with lower incomes, our work also agrees with the notion that "*money doesn't buy happiness*".

   Concerning the third question, the results show that happiness in rural seniors is related to several variables across multiple domains of life. In our model consumerism, as reported by Gray et al. (2008), is also an important predictor of happiness in rural elderly women. This may be because in rural areas in Chile women spend most of the time at home and benefit directly from the flow of services associated with each of the goods available in the home. It must also be considered that for women QGoods is part of a person's social capital, and underscores one's not feeling poor compared to neighbors (Gray et al. 2008) and contributes to happiness, following the report by Knight et al. (2009) and Theurer and Wister (2010). Even though the statistical significance is relatively low, age is a predictor of happiness for rural elderly women, as Shams (2014) suggests. In accordance with the hypothesis of Chyi and Mao (2012) and Shams (2014), we observed a statistically significant and positive relation between happiness and age until 77.5 years. From this age the happiness of women begins to decrease, confirming the hypothesis of an inverted-U, similar to the one reported by Shams (2014), but with a theoretical turning point at

65.5 years. In accordance with Angner et al. (2013), Gray et al. (2008), Hsieh (2011) and Patrick et al. (2001), this research on age does not contribute to explaining the level of happiness in rural elderly men.

Our results show that SWFL contributes strongly to explaining subjective happiness in rural senior citizens. According to Veenhoven (2008), there is a lot of research into the effects of nutrition on physical health, but hardly any research into the effects of diet on satisfaction with life. In general, these effects have not received much attention in the literature, with the exception of the works of Schnettler et al. (2012, 2014), who also found that satisfaction with food is an important predictor of SWB in central Chile and the Mapuche ethnic group. Further, as suggested by Dean et al. (2008), in this study SWFL was predicted by health and functionality measures, actual economic situation and, for rural elderly women, living circumstances (dinner alone versus in company).Therefore, we could infer that for rural seniors: "*with good food, great life!*"

The self-perception of health is an important predictor of happiness for rural seniors, which confirms the idea presented by various authors with respect to perceived health as a source of happiness (Angner et al. 2013; Chyi and Mao 2012; Gray et al. 2008; Hsieh 2011; Veenhoven 2008). As concluded by Veenhoven (2008) with respect to "happy people live longer, probably because happiness protects physical health", our results also suggest that "*with health, great life!*" Unhealthy days were not significant in our models, although women had a higher number of unhealthy days than men. No statistically significant differences in unhealthy days by age group for men and women were observed. In this vein, the statistical significance of the Katz ADL on the happiness of men and women could be reaffirming the implementation of preventive actions by local governments in order to protect the functionality of the elderly and maintain their independence in undertaking the activities of daily living.

Food satisfaction, health perception and independence in daily activities are sources of happiness for rural Chilean seniors. The elderly who are less satisfied with their diet are less likely to be very happy, compared to those who are completely satisfied with their diet. This study reaffirms the causality reported in the literature, in that SWFL contributes to explaining the subjective happiness of the rural elderly. Moreover, following Dean et al. (2008), we evaluated the sum of resources as predictors of elderly people's SWFL. Our results imply that rural elderly women who are in good physical health, who have dinner more frequently in company, and who are more satisfied with their economic situation are more satisfied with their food-related life compared to those in poor physical health, who dine alone and who are less satisfied with their current economic situation. Our results also point to rural elderly men who are in good physical health, functionally independent and more satisfied with their economic situation being more satisfied with their food-related life compared to those in poor physical health, with severe or moderate functionality impairment and less satisfied with their current economic situation.

Family and social networks are fundamental to improving the QoL for rural elderly women considering the significant influence of the variable on happiness FDinnerA consistent with those reported by Patrick et al. (2001). It is therefore very important to implement programs and projects that contribute to the creation of networks for rural women, and to design and develop related gender policies to present the positive association between happiness and family and social networks as also reported by Moyano and Ramos (2007) for Chilean seniors.

For rural elderly men leisure and happiness seem to move in the opposite direction. There is a negative assessment of leisure as a commodity that provides positive marginal utility. However, there are some leisure activities that can be negatively associated with

happiness (Wang and Sunny Wong 2014), which could explain our results, such as the shortage of activities to spend on during leisure time or the identification of leisure as unproductive by elderly men in rural Chile. However, given that leisure has the greatest potential to enhance seniors' well-being (Ku et al. 2014), public policies could be explored to attract new activities and alternatives for productive leisure by rural elderly men.

The equivalent consumption expenditure, as a proxy for personal income, and socioeconomic level were not statistically significant in our models, despite the positive relationship between happiness and family income as reported by Chyi and Mao (2012) and as suggested in previous studies reporting a positive association between pecuniary variables and happiness (Clark et al. 2008; Selim 2008). However, our results are in line with those of Hsieh (2011), who found that income does not contribute to happiness in the elderly.

In our models living with children or grandchildren did not contribute to the happiness of seniors of either gender, contradicting the results of Chyi and Mao (2012), Lou (2010) and Selim (2008), who established both a positive or negative relation between SWB and the relative number of children or grandchildren. However, our results reinforce what was reported by Gray et al. (2008) in that living with children has no effect on the level of happiness in later life. The insignificant coefficient on children might be due to the fact that in the estimations "number of children" was used as discrete quantitative variable. This could be explained by a discontinuous relation: between 0 and 1 children increase happiness, due to reduced feelings of loneliness and lack of purpose, whereas a higher number of children has a negative effect because it might reflect a lack of resources. An indicator of overcrowding, measured as more than a certain number of people per bedroom, might account for this. In accordance with other authors, education had an insignificant effect on happiness (Angner et al. 2013; Hsieh 2011; Patrick et al. 2001; Selim 2008) and marital status was not significantly associated with happiness (Patrick et al. 2001).

From a theoretical point of view, our results may aid in developing a more complete theory about the importance of SWFL as a life domain. This means recognizing the role of satisfaction with food on the affective component of subjective well-being, because eating also contributes to hedonic pleasure. Therefore, in future studies, SWFL could be considered a dependent variable, which could be explained with its own vector of independent variables contributing indirectly to people's subjective well-being. Our central hypothesis is that there are *hidden* variables which indirectly influence subjective happiness through SWFL.

Finally, this study provides sufficient evidence of the importance of perceived health and satisfaction with diet on subjective happiness. The rural elderly who report a better perception of their health and are also more satisfied with their food are probably happier. Therefore, policy decision makers need to contribute to the design and implementation of public policies for senior citizens based on the main predictors of subjective happiness and considering also gender differences for other variables reported in this study. Definitely better public policies should result in greater subjective welfare and quality of life of our rural elderly.

5 Limitations

Consistent with some international studies from Western societies, this research shows a statistically significant relationship between age and female happiness. But as Xing and Huang (2014) suggested, the findings in this study are based on a cross-sectional study; therefore, they must still be verified by longitudinal studies. Another limitation of this study is related to sample representativeness for two reasons: first, we worked with a small

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sample where 62.6 % of respondents were women. Although official statistics indicate that in the Maule Region 55 % of the elderly are women, the proportion of women interviewed seems too high. The second reason is that the average age of men exceeds largely (more than 2 years) the average age of women, which is not consistent with women's higher life expectancy. Both reasons might reflect sample selection bias. This limitation may be because the interviews might have occurred during normal working hours and therefore women were more likely to answer the survey due to the traditional household division of tasks or the fact that women retire at 60 and men at 65. Therefore our suggestion is that the conclusions of the survey research need to be verified by a bigger sample.

In addition, because of the way the survey was constructed, we do not have information about some standard variables. For example, divorce and widowhood as separate states, recent negative and positive events, or whether the person is receiving a pension or not. We also recognize as a limitation the number of pleasurable activities. This means that independent variables used in this study are limited by the survey questions.

Finally, it is not possible to state there was no endogeneity problem (i.e. when explanatory variables are correlated with the error), either by simultaneity, a measurement error or omitted variables. This is a problem of cross-sectional data in general. One way to tackle this problem could be to correct endogeneity through the instrumental variables method. However, we believe this issue is beyond the objectives of this study and therefore these solutions were not analyzed.

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