QUALITY OF LIFE AMONG ETHNIC MINORTY ELDERLY IN VIETNAM: IMPLICATIONS FOR PUBLIC HEALTH POLICY

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Abstract. The study explored the quality of life of ethnic minority elderly in Vietnam and associated factors employing a cross-sectional design. Elderly of 12 main ethnic minorities were recruited across domains of socioeconomic information and all dimensions in an EQ-5D-5L questionnaire. Overall quality of life index of ethnic minority elderly was 0.81, with 30% of the elderly reporting no problems in each dimension. Advancing age, having communicable diseases and non-communicable diseases are significantly associated with a negative impact on EQ-5D-5L score (β = -0.011, 95% confidence interval (CI): -0.013 to -0.008, *p*-value <0.001; β = -0.098, 95% CI: -0.162 to -0.035, *p*-value = 0.002; and β = -0.092, 95% CI: -0.134 to -0.051, *p*-value <0.001, respectively). In conclusion, notably high quality of life index in ethnic minority older people should be of great interest in public health policy and further studies are needed to address possible explanations to enable the most appropriate intervention model be developed for optimal quality of life of the elderly in Vietnam.

Keywords: elderly, EQ-5D-5L questionnaire, quality of life, ethnic minority, Vietnam

INTRODUCTION

The world's population is aging rapidly and by 2050 the number of people over 60 years old is expected to be nearly two billions, triple of that in 2000 (WorldAtlas, 2017). Vietnam is also experiencing an aging population, with people over 60 years of age rapidly increasing from 6.7% in 1979 to 8.9% in 2009 and will continue to rise to 30% by 2050 (UN DESA, 2011). Although life expectancy in Vietnam has increased dramatically in the last decade, epidemiological evidence shows prevalence of both communicable and non-communicable diseases in elderly are still profound (Baudon *et al*, 2018; Nguyen *et al*, 2018; Spencer *et al*, 2020).

Aging is a multifaceted phenomenon, requiring viewpoints from different perspective. Ultimately, an assessment of quality of life (QoL) is considered to be the most reliable indicator of successful ageing(Scocco *et al*, 2006). QoL is defined by the World Health Organization (WHO) as "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation

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to their goals, expectations, standards, and concerns" and can be presented in different domains including physical and mental health, social functioning, and emotional well-being (Anonymous, 1995). With rapid economic development in urban areas, young people tend to move to cities for employment, leaving the elderly in rural areas; in Vietnam the proportion of family with only elderly and elderly living alone increased from 12.7 and 4.9% in 1998 to 21.5 and 6.1% in 2008 and to 40.0 and 9.4% in 2011, respectively (UN FPA, 2011; HelpAge International, 2020). The increased percent elderly living alone is probably due in part to economic development, industrialization and urbanization within the country (Nguyen and Nguyen, 2010; Puschmann and Solli, 2014; Srivastava, 2009). There have been different intervention programs for the elderly all over Vietnam; however, while these programs are implemented mainly in urban areas more than 70% of elderly people reside in rural areas where limited financial resources, facilities and access to healthcare pose major public service concerns (General Statistics Office of Vietnam, 2020). Among the rural elderly, about 5% are ethnic minorities living in remote areas, adding to existing problems of financial resources, facilities and access to healthcare (WorldAtlas, 2019), leading to distinct characteristics of this subpopulation in terms of socioeconomic status and culture.

The elderly QoL outcomes is generally believed to be associated with such factors as demographics, social interactions, resources, and chronic conditions (Baernholdt *et al*, 2012). Regarding demographic factors, studies show age, gender, ethnicity, education, income, and marital status to be significant determinants of QoL (Bandiera *et al*, 2008; Zahran *et al*, 2005; Zaninotto *et al*, 2009). Bang *et al* (2017) reported age, self-rated health status, body mass index, and number of noncommunicable diseases (NCDs) generally influence QoL (Bang *et al*, 2017). Mudey *et al* (2011) noted on the elderly in urban and rural regions of India that separation from a spouse, poor socioeconomic status, lack of regular exercise, sleep or hearing difficulty, and suffering any kind of illness are negatively associated with QoL (Mudey *et al*, 2011). In Nigeria, factors associated with good QoL are traditional lifestyle, educational level, socioeconomic status, gender and marital stability (Fajemilehin and Odebiyi, 2011). Nilsson *et al* (2012) identified religion and beliefs as additional associated factor for good QoL among senior citizens in Vietnam and Bangladesh (Nilsson *et al*, 2012). On the other hand, QoL tends to be lower among elderly smokers and better among consumers of alcohol (Chan *et al*, 2009; Vogl *et al*, 2012).

Given the significant increase in numbers of the elderly in the last decade, assessing QoL to provide proper intervention for an aging population is a crucial need and a high priority public health issue. To date, there have been two studies determining QoL in older adults in Vietnam: Bang *et al* (2017) assessed QoL of the elderly in areas close to Hanoi and Le *et al* (2011) QoL of senior citizens in a rural area, Bavi. However, as the studies did not evaluate QoL of ethnic groups in Vietnam, the study filled in this gap in information in a survey of QoL in 12 ethnic groups including an analysis of factors associated with QoL status.

MATERIALS AND METHODS

Study design and participants

This was a cross-sectional study of

the ethnic population in Vietnam and formed part of a large-scale cross-sectional population study (Van Minh *et al*, 2020). Participants were ethnic minority people ≥60 years of age from 12 different ethnic groups living in 12 provinces of four socio-economic regions, namely, the northern midland and mountainous region comprising Cao Bang province (Tay ethnicity), Ha Giang province (Mong ethnicity), Lai Chau province (La Hu ethnicity), and Quang Ninh province (Dao ethnicity); the north central and central coast region comprising Binh Dinh province (Banah ethnicity), Ninh Thuan province (Cham Ninh Thuan ethnicity), Quang Tri province (Bru Van Kieu ethnicity), and Thua Thien Hue province (Ta Oi ethnicity); the central highland region comprising Dak Lak province (Mnong ethnicity) and Kon Tum province (Gie Trieng ethnicity); and the Mekong River delta region comprising An Giang province (Cham An Giang ethnicity) and Soc Trang province (Khmer ethnicity).

Sample size and sampling method

Formula and parameters used for the sample size calculation are based on those used for a large-scale study to estimate proportion of people using health services in the previous 12 months (Van Minh *et al*, 2020). With an expected proportion of 0.50, width of 95% confidence interval of 0.10 and design effect of 1.5, at least 576 participants from each ethnic group are calculated to be needed. Total sample size for 12 ethnicities in 12 provinces was 6,912 people (from 1,400 households). In each province, one or two communes with the highest numbers of ethnic minorities were chosen after consulting with local health authorities. Study households were randomly selected from a list of all the households from each chosen commune and all members of the chosen households were included, a total of 873 elderly people present in a population of 6,912 from 1,400 selected households.

Research protocols were approved by the Institutional Review Board, Hanoi University of Public Health (no 435/2018/YTCC-HD3, 01/10/2018). Prior written consent was obtained from each participant who was informed of the right to withdraw from the study at any time without prejudice.

QoL outcomes

Outcomes of QoL were based on dependent and independent variables.

Dependent variables. Dependent variables of QoL outcome were measured by an EQ-5D-5L questionnaire, one of the most widely used instruments to assess QoL (EuroQoL, 2017), which consists of five categories, namely, mobility, self-care, normal activities, pain/discomfort, and anxiety/depression. Each category has five response levels, *ie* no, slight, moderate, severe, and extreme problem, designated level 1 to 5, respectively. The participant was requested to indicate his/her health state by choosing the most appropriate statement in each of the 5 dimensions, in which each dimension is denoted by one code from 1 to 5 and the 5-digit number combining the digits of 5 dimensions represents the respondent's health state. While state 11111 indicates no problems on any dimension, state 12345 indicates no problems with mobility, slight problems with washing or dressing, moderate problems with doing usual activities, severe pain or discomfort and extreme anxiety or depression. There are 3,125 possible health state designations ranging from 11111 (most healthy state) to 55555 (least healthy state) (EuroQoL, 2017). These states are then converted

into a single index 'utility' score using a scoring algorithm based on a Vietnamese value set ranging from "0" to "1", where "0" is defined as a state equivalent to "death" and "1" to "full health" using the time trade-off method (Dolan, 1997). The Vietnamese EQ-5D-5L value set was estimated using both composite time trade-off (C-TTO) and discrete choice experiment (DCE) with potential values ranging from -0.5115 to 1 (Mai *et al*, 2020).

Independent variables. Independent variables of QoL consist of demographic characteristics of the study participants: age groups (60-64, 65-69, 70-74 , 75-79, and ≥80 years of age), gender (male, female), body mass index (BMI, kg/m^2), marital status (single, married, or separated/divorced/widowed), education (none, primary, secondary, or upper secondary), health insurance (yes, no), employment status (employed, unemployed, retired, or others), religion (yes or no), contracted communicable diseases (yes or no), contracted non-communicable diseases (yes or no), smoking (yes or no), alcohol consumption (yes or no), region of residence (northern midlands and mountainous, central coast, central highlands, Mekong River Delta), living in disadvantaged area (yes or no), and household economic classification (poor, near-poor or non-poor). According to guidelines of the Vietnamese Ministry of Labor, War Invalids and Social Affairs, near-poor in rural areas is defined as having an income between VND700-1000 (USD32-46)/month) and poor an income <VND700 (USD32)/month) (Hoi le, 2015).

Data collection

Data were collected through household interview using a structured questionnaire carried out by trained interviewers and local health collaborators who are familiar with culture and participants in the study commune and are able conversant with the local language and Vietnamese. Control of data quality was maintained by supervisors and investigators of the study.

Statistical analysis

Descriptive statistics were used to summarize data, expressed as frequency and percentage for categorical variables and mean ± standard deviation (SD) for quantitative variables. Chi-square tests were employed to detect differences in EQ-5D-5L health state of each factor between gender and age groups. Multivariate tobit regression analysis was carried out to identify factors related to EQ-5D-5L scores and independent variables were included in a multivariable model based on review of the literature. A p-value <0.05 is considered significantly different in all statistical tests. All analyses were carried out using Stata v16 (Stata Corp, College Station, TX).

RESULTS

Participants (n = 873) had a mean (SD) age of 70 (8), 52.2% in the 60-69 years of age group (45.0% males and 55.0% females),74.6% with normal BMI (18.5-24.9 kg/m^2), 60.5% married, 60.6% with no formal education, 97.3% without health insurance, 67.0% non-religious, 77.6% smokers, 75.9% alcohol drinkers, 72.5% categorized as non-poor, 89.7 and 50.7% with communicable and non-communicable disease respectively, 34.5% from the northern midlands and mountainous region of Vietnam, and 12.5% living in disadvantaged areas of the country (Table 1).

Comparison based on gender of the five EQ-5D-5L health categories, significantly more males were observed

Table 1
General characteristics of ethnic minority elderly participants in Vietnam.

Characteristic	Total Number (%) (n = 873)	Male Number (%) (n = 357)	Female Number (%) (n = 516)
Age in years, mean ± SD	70 ± 8	69 ± 8	71 ± 9
Age group			
60-64	250 (28.6)	120 (34)	130 (25)
65-69	206 (23.6)	86 (24)	120 (23)
70-74	192 (22.1)	74 (21)	118 (23)
75-79	99 (11.3)	37 (10)	62 (12)
>80	126 (14.4)	40 (11)	86 (17)
BMI			
Underweight (<18.5 kg/m^2)	153 (17.5)	57 (16)	96 (19)
Normal (18.5-24.9 kg/m^2)	651 (74.6)	272 (76)	379 (73)
Overweight (>24.9 kg/m^2)	69 (7.9)	28 (8)	41 (8)
Marital status			
Single	12 (1.4)	5 (2)	7 (1)
Married	528 (60.5)	287 (80)	241 (47)
Separated/divorced/widowed	333 (38.1)	65 (18)	268 (52)
Education			
None	529 (60.6)	185 (52)	344 (67)
Primary school	200 (22.9)	86 (24)	114 (22)
Secondary school	99 (11.3)	57 (16)	42 (8)
High school or above	45 (5.2)	29 (8)	16 (3)
Having health insurance			
No	24 (2.7)	16 (4)	8 (2)
Yes	849 (97.3)	341 (96)	508 (98)
Employment status			
Employed	571 (65.4)	249 (70)	322 (62)
Unemployed	32 (3.7)	12 (3)	20 (4)
Retired	150 (17.2)	62 (17)	88 (17)
Others	120 (13.7)	34 (10)	86 (17)
Religious			
No	585 (67.0)	236 (66)	349 (68)
Yes	288 (33.0)	121 (34)	167 (32)
With communicable disease			
No	775 (89.7)	320 (90)	455 (89)
Yes	89 (10.3)	35 (10)	54 (11)
With non-communicable disease			
No	443 (50.7)	176 (49)	267 (52)
Yes	430 (49.3)	181 (51)	249 (48)
Smoker			
No	675 (77.6)	214 (60)	461 (90)
Yes	195 (22.4)	141 (40)	54 (10)

Table 1 (Continued)

Characteristic	Total Number (%) (n = 873)	Male Number (%) (n = 357)	Female Number (%) (n = 516)
Alcohol drinker			
No	659 (75.9)	190 (54)	469 (91)
Yes	209 (24.1)	164 (46)	45 (9)
Region of residence			
Northern midlands and mountains	301 (34.5)	125 (35)	176 (34)
Central coast	246 (28.2)	101 (28)	145 (28)
Central highlands	154 (17.6)	66 (19)	88 (17)
Mekong River Delta	172 (19.7)	65 (18)	107 (21)
Living in disadvantaged area			
No	761 (87.5)	311 (88)	450 (87)
Yes	109 (12.5)	44 (12)	65 (13)
Household economic classification			
Poor[a]	140 (16.0)	63 (18)	77 (15)
Near-poor[b]	100 (11.5)	35 (10)	65 (13)
Non-poor[c]	633 (72.5)	259 (72)	374 (72)

SD: Standard deviation; kg/m^2: kilogram per square meter.
[a]<VND700 (USD32)/month; [b]VND700-1,000 (USD32-46)/month; [c]>VND1,000 (USD46)/month.

without problems in mobility, pain/discomfort and anxiety/depression, although overall EQ-5D-5L score is not significantly different (Table 2); while comparison according to age groups, as expected the younger age group (60-69 years of age) reported no problems in all five categories compared to the older age group (>70 years of age) (Table 3). Of the 3,125 possible health state designations, health states of participants ranged from 11111 (30.0%, most healthy, mean utility score of 1.000) to 21222 (2.0%, least healthy, mean utility score of 0.737) (note that these findings were from 61.7% of participants) (Table 4).

Multivariate tobit analysis of factors related to QoL revealed age lower than mean, absence of non-communicable disease and absence of communicable disease are significant independent factors of better QoL, as indicated by higher mean health utility score (Table 5).

DISCUSSION

The study used data from a self-reporting EQ-5D-5L questionnaire to quantify QoL of minority ethnic elderly in Vietnam showing overall QoL was good [mean (± SD) utility score of 0.8 (± 0.2)]. The overall mean utility score was higher than that reported earlier in Vietnam, 0.7 for elderly in rural community-dwellings and 0.65 in older adults in rural areas in Soc Son (Hoi le *et al*, 2011; Nguyen *et al*, 2019; Nguyen *et al*, 2018). These differences could be attributed to study populations and value sets employed, the current study being the first to adopt the Vietnamese value set validated in year 2020 (Mai *et al*, 2020). The relatively higher QoL indices among ethnic minority

Table 2
Frequency of responses to items in EQ-5D-5L questionnaire categories according to gender of ethnic minority elderly participants in Vietnam.

Characteristic	Total Number (%) (n = 873)	Male Number (%) (n = 357)	Female Number (%) (n = 516)	p-value*
Mobility				<0.001
No problem in walking	468 (53.6)	223 (63)	245 (47)	
Slight problem in walking	275 (31.5)	83 (23)	192 (37)	
Moderate problem in walking	78 (8.9)	29 (8)	49 (10)	
Severe problem in walking	37 (4.3)	14 (4)	23 (5)	
Unable to walk	15 (1.7)	8 (2)	7 (1)	
Self-care				0.130
No problem washing or dressing	647 (74.1)	274 (77)	373 (72)	
Slight problem washing or dressing	160 (18.4)	58 (16)	102 (20)	
Moderate problem washing or dressing	30 (3.4)	7 (2)	23 (5)	
Severe problem washing or dressing	21 (2.4)	10 (3)	11 (2)	
Unable to wash or dress	15 (1.7)	8 (2)	7 (1)	
Normal activities				0.520
No problem doing normal activities	550 (63.0)	234 (66)	316 (61)	
Slight problem doing normal activities	230 (26.4)	90 (25)	140 (27)	
Moderate problem doing normal activities	57 (6.5)	18 (5)	39 (8)	
Severe problem doing normal activities	21 (2.4)	8 (2)	13 (2)	
Unable to do normal activities	15 (1.7)	7 (2)	8 (2)	
Pain/discomfort				0.043
No pain/discomfort	366 (41.9)	169 (47)	197 (38)	
Slight pain/discomfort	349 (40.0)	131 (37)	218 (42)	
Moderate pain/discomfort	108 (12.4)	35 (10)	73 (14)	
Severe pain/discomfort	41 (4.7)	17 (5)	24 (5)	
Extreme pain/discomfort	9 (1.0)	5 (1)	4 (1)	
Anxiety/depression				0.029
Not anxious/depressed	507 (58.1)	227 (63)	280 (54)	
Slightly anxious/depressed	256 (29.3)	87 (24)	169 (33)	
Moderately anxious/depressed	69 (7.9)	24 (7)	45 (9)	
Severely anxious/depressed	31 (3.6)	13 (4)	18 (3)	
Extremely anxious/depressed	10 (1.1)	6 (2)	4 (1)	
EQ-5D-5L score, mean ±SD	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.140

*Significant at p <0.050; SD: standard deviation.

Table 3
Frequency of responses to items in EQ-5D-5L questionnaire categories according to age group of ethnic minority elderly participants in Vietnam.

Category	Age in years					*p*-value*
	60-64 Number (%) (*n* = 250)	65-69 Number (%) (*n* = 206)	70-74 Number (%) (*n* = 192)	75-79 Number (%) (*n* = 99)	80-84 Number (%) (*n* = 126)	
Mobility						
No problem in walking	171 (68)	128 (62)	88 (46)	44 (44)	37 (29)	<0.001
Slight problem in walking	63 (25)	61 (30)	70 (36)	35 (35)	46 (37)	
Moderate problem in walking	9 (4)	8 (4)	22 (11)	15 (15)	24 (19)	
Severe problem in walking	6 (2)	7 (3)	7 (4)	4 (5)	13 (10)	
Unable to walk	1 (1)	2 (1)	5 (3)	1 (1)	6 (5)	
Self-care						
No problem washing or dressing	211 (84)	167 (81)	137 (71)	64 (65)	68 (54)	<0.001
Slight problem washing or dressing	32 (13)	31 (15)	36 (19)	25 (25)	36 (29)	
Moderate problem washing or dressing	4 (1)	2 (1)	9 (5)	7 (7)	8 (6)	
Severe problem washing or dressing	2 (1)	4 (2)	4 (2)	2 (2)	9 (7)	
Unable to wash or dress	1 (1)	2 (1)	6 (3)	1 (1)	5 (4)	
Normal activities						
No problem doing normal activities	193 (77)	145 (70)	113 (59)	52 (52)	47 (37)	<0.001
Slight problem doing normal activities	50 (20)	44 (21)	54 (28)	30 (30)	52 (41)	
Moderate problem doing normal activities	5 (1)	10 (5)	18 (9)	12 (13)	12 (10)	
Severe problem doing normal activities	1 (1)	4 (2)	3 (2)	4 (4)	9 (7)	
Unable to do normal activities	1 (1)	3 (2)	4 (2)	1 (1)	6 (5)	
Pain/discomfort						
No pain/discomfort	138 (55)	96 (47)	67 (35)	29 (29)	36 (29)	<0.001
Slight pain/discomfort	90 (36)	79 (38)	87 (45)	47 (47)	46 (36)	
Moderate pain/discomfort	17 (7)	22 (11)	26 (13)	18 (19)	25 (20)	
Severe pain/discomfort	4 (1)	6 (3)	10 (6)	5 (5)	16 (13)	
Extreme pain/discomfort	1 (1)	3 (1)	2 (1)	0 (0)	3 (2)	

Table 3 (Continued)

Category	Age in years					*p*-value*
	60-64 Number (%) (n = 250)	65-69 Number (%) (n = 206)	70-74 Number (%) (n = 192)	75-79 Number (%) (n = 99)	80-84 Number (%) (n = 126)	
Anxiety/depression						
Not anxious/depressed	162 (65)	128 (62)	114 (59)	47 (47)	56 (44)	0.007
Slightly anxious/depressed	69 (28)	55 (27)	50 (26)	36 (36)	46 (37)	
Moderately anxious/depressed	13 (5)	14 (7)	16 (8)	13 (14)	13 (10)	
Severely anxious/depressed	6 (2)	6 (3)	9 (5)	3 (3)	7 (6)	
Extremely anxious/depressed	0 (0.0)	3 (1)	3 (2)	0 (0)	4 (3)	
EQ-5D-5L score, mean ± SD	0.9 ± (0.2)	0.8 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	0.7 ± 0.3	<0.001

*Significant at p <0.050 using Chi-squared test; SD: standard deviation.

elderly compared to the general elderly population in the country might suggest a healthier aging in the setting of an ethnic rural community.

Percent elderly in the current study having no problems in all five EQ-5D-5L health categories (designated 11111) was similar to that reported in a South Australian community-based population (29.6%) (McCaffrey *et al*, 2016), but was lower compared to that in UK (39.0% of elderly ≥65 years of age) (Feng *et al*, 2015). Again, these differences among the studies probably reflect variations in study populations (especially for data from different countries) value sets used.

EQ-5D-5L scores in the present study were significantly higher in elderly male than female participants. Other studies on senior populations in different parts of Vietnam also reported elderly males tend to have significantly less problems in the five categories compared to elderly females (Nguyen *et al*, 2018; Pham *et al*, 2018; Van Nguyen *et al*, 2017). Apidechkul (2011) noted in rural and suburban regions of Thailand more elderly women (66.2%) compared to men (50.0%) suffering from at least one of the five EQ-5D-5L categories; similar results were observed among the elderly in Myanmar, where 21.8 and 13.5% of elderly females and males respectively have health problems identified by an EQ-5D-5L survey (Naing *et al*, 2010). Similarly, in developed countries elderly males have a better QoL than females (Bang *et al*, 2017; Nguyen *et al*, 2018; Pham *et al*, 2018; Van Nguyen *et al*, 2017). Factors responsible for the difference are not well understood, but might be related to the effects of menopause in females.

Consistent with findings from other countries (Baernholdt *et al*, 2012; Hoi le *et al*, 2011; Khaje-Bishak *et al*, 2014),

Table 4
Most frequently reported EQ-5D-5L health state and mean utility score of ethnic minority elderly participants in Vietnam.

Health state*	Number (%) (n = 873)	Mean single index utility score
11111	262 (30.0)	1.000
11121	56 (6.4)	0.916
11122	47 (5.4)	0.852
22222	40 (4.6)	0.694
21121	33 (3.8)	0.847
11112	27 (3.1)	0.936
21122	26 (3.0)	0.783
21111	19 (2.2)	0.931
22221	19 (2.2)	0.758
21222	17 (2.0)	0.737

*The health state was reported using five digits represented in order five categories including mobility (1st digit), self-care (2nd digit), normal activities (3rd digit), pain/discomfort (4th digit), and anxiety/depression (5th digit). Each digit specifies the level of response; "1" = no, "2" = slight, "3" = moderate, "4" = severe, and "5" = extreme problem. The health state was converted into a single index 'utility' score using a scoring algorithm ranging from "0" to "1", where "0" is defined as a state equivalent to "death" and "1" to "full health" using the time trade-off method (Dolan, 1997).

Table 5
Multivariate tobit regression analysis of socio-demographic characteristics and EQ-5D-5L scores group of ethnic minority elderly participants in Vietnam.

Characteristic	EQ-5D-5L score Mean ± SD	β	95% CI	p-value*
All ages (60->80 years old)		Reference		
Mean age (70 years old)	0.8 ± 0.2	-0.011	-0.013 to 0.008	<0.001
Sex				
Male	0.8 ± 0.2	Reference		
Female	0.8 ± 0.2	0.003	-0.046 to 0.052	0.912
BMI				
Underweight	0.7 ±0.3	Reference		
Normal	0.8 ± 0.2	0.047	-0.005 to 0.099	0.077
Overweight	0.8 ± 0.2	0.038	-0.049 to 0.125	0.391
Marital status				
Single	0.7 ± 0.3	Reference		
Married	0.8 ± 0.2	0.103	-0.063 to 0.269	0.224
Separated/divorced/widowed	0.8 ± 0.2	0.109	-0.057 to 0.276	0.199
Education				
None	0.8 ± 0.2	Reference		
Primary school	0.8 ± 0.2	-0.029	-0.078 to 0.020	0.252
Secondary school	0.8 ± 0.2	0.019	-0.047 to 0.086	0.565
High school or above	0.9 ± 0.1	0.094	-0.004 to 0.192	0.061

Table 5 (Continued)

Characteristic	EQ-5D-5L score Mean ± SD	β	95% CI	*p*-value*
With health insurance				
No	0.9 ± 0.1	Reference		
Yes	0.8 ± 0.2	-0.077	-0.200 to 0.047	0.225
Employment status				
Employed	0.8 ± 0.2	Reference		
Unemployed	0.8 ± 0.2	0.002	-0.108 to 0.112	0.970
Retired	0.8 ± 0.2	0.003	-0.053 to 0.059	0.924
Others	0.8 ± 0.3	0.030	-0.033 to 0.092	0.351
Religious				
No	0.8 ± 0.2	Reference		
Yes	0.8 ± 0.2	0.013	-0.033 to 0.058	0.582
With communicable disease				
No	0.8 ± 0.2	Reference		
Yes	0.7 ± 0.2	-0.098	-0.162 to -0.035	0.002
With non-communicable disease				
No	0.8 ± 0.2	Reference		
Yes	0.8 ± 0.2	-0.092	-0.134 to -0.051	<0.001
Smoking				
No	0.8 ± 0.2	Reference		
Yes	0.8 ± 0.2	0.010	-0.043 to 0.064	0.702
Drinking alcohol				
No	0.8 ± 0.2	Reference		
Yes	0.8 ± 0.2	0.055	-0.002 to 0.111	0.058
Living in disadvantaged area				
No	0.8 ± 0.2	Reference		
Yes	0.8 ± 0.3	-0.036	-0.102 to 0.030	0.284
Household economic classification				
Poor	0.8 ± 0.2	Reference		
Near poor	0.8 ± 0.2	-0.001	-0.078 to 0.077	0.990
Non-poor	0.8 ± 0.2	-0.012	-0.070 to 0.047	0.696

Significant at $p < 0.050$ compared to Reference; CI: confidence interval; **β:** Beta coefficient; SD: standard deviation.

multivariate regression analysis identified age lower than mean and absence of non- and communicable diseases were independent factors significantly associated with better QoL indices. Aging is often accompanied by impaired health, decreased social engagement and increased propensity to ailments. In Vietnam, Vu *et al* (2019) reported >80% of participants hospitalized from fall have at least one problem among EQ-5D-5L categories, and Khaje-Bishak *et al* (2014) in Iran observed a significant reduction in total QoL score in patients with cardiovascular, respiratory and gastrointestinal diseases, and with hearing and visual impairments. Impaired QoL in all categories is frequently found

associated with acquiring diseases (Megari, 2013).

The weakness in the study was that its cross-sectional design, precluding causal ordering to a certain extent, and thus, the relationship between predictors and QoL need to be interpreted carefully.

In conclusion, the notably high quality of life index found among minority ethnic elderly living in remote regions of Vietnam should be of interest to public health policy, necessitating future studies in identifying the underlying factors so that lessons could be learnt regarding differences in quality of life in the elderly populations between remote, rural and urban regions of the country so that the best public health intervention measures can be implemented to ensure a good quality of life for all the elderly in Vietnam.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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