



Contents lists available at ScienceDirect

## Archives of Gerontology and Geriatrics

journal homepage: [www.elsevier.com/locate/archger](http://www.elsevier.com/locate/archger)

## Gender differences in health status, quality of life, and community service needs of older adults living alone

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## ARTICLE INFO

## Keywords:

Aged  
Health status  
Community services  
Living alone  
Quality of life

## ABSTRACT

**Objectives:** The aim of this study was to identify gender differences in the health status, community service needs, and quality of life of older adults living alone in an urban city in South Korea.**Methods:** A cross-sectional descriptive correlational design was used. The study sampled 1023 older adults (≥ 65 years) living alone in S\* City, during the period from August to October in 2018. Trained interviewers conducted face-to-face interviews with the participants, using the UCLA Loneliness Scale, Short Form Geriatric Depression Scale – Korean version, ENRICH Social Support Instrument (ESSI), the Mini-Mental State Examination Standard Version (MMSE-2SV), and Health-Related Quality of Life (EQ-5D).**Results:** 77.8% were women and the mean age was 77.38 years (men = 74.65, women = 78.16). Women had lower socioeconomic and health status than men. Men felt more lonely, depressed, and had suicidal thoughts more frequently than women. Women had more needs regarding care, residential environment, movement, connection, and emergency services than men. In men, depressive symptoms, suicidal thoughts, loneliness, and right-hand grip strength were identified using the EQ-5D. The EQ-5D was also used to explain depressive symptoms, suicidal thoughts, cognitive function, and physical activity in women.**Conclusion:** Health status and community service needs were dependent on gender; therefore interventions should be tailored according to gender. Our research found that to decrease depression and suicidal thoughts, improve physical health, and enhance quality of life for older adults living alone, interventions need to be designed to decrease male loneliness and to enhance female cognitive function.

## 1. Introduction

The World Health Organization (WHO) has estimated that the proportion of the world's population aged over 60 years will double from 12% to 22% between 2015 and 2050 (World Health Organization, 2018). In 2017, the proportion of adults over 65 years was 13.8% in South Korea (Ministry of Health & Welfare, 2018). The poverty and suicide rates, and the medical expenses of South Korea's older people are the highest among OECD countries, while the aging response index (which evaluates the level of preparedness for aging) is the lowest (OECD, 2017). The rapid increase in the older population greatly

influences South Korean society, and it requires that continuous social attention be paid to the older population. With people's longer life expectancy, living arrangements may change; the percentage older adults living alone is growing every year. In 2010, 28.3 percent of older people in the United States lived alone in the community; 71.2% of these were women (West, Cole, Goodkind, & He, 2014). In South Korea, the percentage of older adults living alone was 23.6% in 2017 (19.5% were men, 80.6% were women). (Ministry of Health & Welfare, 2018).

Gender and health are both factors that shape aging decisively, thereby impacting quality of life (QoL) in old age, and that are relevant in recognizing societal developments as well as in formulating adequate

**Abbreviations:** EQ-5D, EuroQoL – 5 Dimensions scale; ENRICH, Enhancing Recovery in Coronary Heart Disease; ESSI, ENRICH Social Support Instrument; GDS-15, Short Form Geriatric Depression Scale – Korean version; ICT, Information and Communications Technologies; IPAQ, International Physical Activity Questionnaire – short form; MET, Metabolic Equivalent Task; MMSE-2SV, Mini-Mental State Examination Standard Version; OECD, Organisation for Economic Co-operation and Development; QoL, Quality of Life; VAS, Visual Analogue Scale; WHO, World Health Organization

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Received 12 March 2019; Received in revised form 23 April 2019; Accepted 9 May 2019

Available online 11 May 2019

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strategies for facing the challenges of aging (Backes, Lasch, & Reimann, 2006). Previous studies have been conducted on the impact of gender and age on cardiovascular health in Germany (Kendel & Sieverding, 2006), gender differences in the physical activity and quality of life of older adults with osteoarthritis (Seung-Youn, 2017), gender differences in the relationships between types of living arrangements and psychological distress and quality of life (Henning-Smith, 2016), and the association of living alone with hospitalization (Ennis et al., 2014). However, few studies have investigated whether and how health status is associated with the quality of life of older adults living alone and that those relationships differ by gender. Gender-related inequalities in lifetime work experience, social networks, and health status develop over the course of one's life, cumulating in old age and determining differences of socioeconomic status, health status, health behavior, and well-being (Backes et al., 2006). Therefore, identifying health status, quality of life, and community service needs according to the gender of older adults living alone will help to strengthen the policy base for this population and to develop targeted community services.

Living arrangements may reflect both cultural norms regarding filial responsibility and differences in the community services across the selected countries, reflecting variations in the availability, cost, and quality of institutional care (Tomassini, Glaser, Wolf, van Groenou, & Grundy, 2004). In Italy, Germany, and Austria, the trend of older people living alone has declined (Tomassini, Glaser, Wolf, van Groenou, & Grundy, 2004). The reasons involve improvements in mortality, a decrease in the proportion of widowed adults, an increase in the age at which children leave home, and a trend towards using nursing homes and ageing care facilities (Gierveld, Dykstra, & Schenk, 2012; Tomassini et al., 2004). The socioeconomic crisis resulted in co-residence of older adult and their adult children. Older adults provide family and child care to adult children with limited economic and financial resources to live separately (Gierveld et al., 2012; Lee, 2016). South Korea was the lowest in terms of traditional family values and filial piety compared to Asian countries like China, Japan, and Taiwan, and support for co-residence between parents and adult children has dramatically weakened over recent decades (Gierveld et al., 2012; Lee, 2016; Yasuda, Iwai, Yi, & Xie, 2011). Those living alone are in need of more social support and these households must turn to social assistance to fulfill their social and emotional needs (Gierveld et al., 2012). In other words, it is necessary to establish community based services for older adults living alone, who receive insufficient help from their children, which can help the local community and, through linking with local welfare agencies, which can develop realistic and concrete services for older adults in the blind spots (Gierveld et al., 2012; Sun, 2016). Moreover, most older adults want to age at home, wishing to continue living in a place with independence and autonomy (Wiles, Leibing, Guberman, Reeve, & Allen, 2012; World Health Organization, 2007). Therefore, the need for community service providing both health care and daily life support may be increasing in South Korea and worldwide (Henning-Smith, 2016; Kim & Ross, 2008).

Other goals of community services for older people may include increasing independence and healthy living, which are closely related to quality of life (Friedmann, Elasy, & Jensen, 2001; Kabayama, Mikami, & Kamide, 2016; Lee, 2016; Sun, 2016). Although the number of community services provided for older adults has increased, there is still a lack of services that consider the living arrangement and gender differences of older people. In addition, duplicated or provider-oriented community service issues were raised (Kim & Ross, 2008; Sun, 2016). Thus, it is necessary to identify what kind of community services older adults living alone want, as the actual consumers of these services.

The aim of this study was 1) to understand the gender differences in the health status, community service needs, and quality of life of community-dwelling older adults living alone in South Korea and 2) to compare the factors related to their gender and QoL.

## 2. Methods

### 2.1. Study design

A cross-sectional design was used to collect the primary data between August and October 2018 from older adults living alone in S\* City, South Korea.

### 2.2. Participants and settings

Participants were community dwelling older adults aged over 65 living alone in S\* city, South Korea. We recruited the participants as follows. First, the lists of older adults (n = 3753) living alone in 16 regions of S\* City were obtained from the S\* Public Health Center. A total of 1041 subjects were sampled by convenient sampling for each of the 16 regions in S\* City. Trained research assistants called participants and scheduled to meet them in locations including health centers and senior centers if they were willing to participate in the study. Research assistants then assessed the following inclusion criteria of possible participants: (a) aged  $\geq 65$  years, (b) living alone in S\* City, and (c) able to communicate orally and provide written informed consent.

Finally, 1023 questionnaires were analyzed; 14 participants were excluded due to not living alone and four questionnaires had incomplete answers. The final sample included 27% of the total population of 3753 older adults living alone in S\* City.

There were 50 trained research assistants: 34 life managers (older adult helpers) surveyed and constructed the measurements and 16 nursing college students measured handgrip strength. All assistants had received preliminary training on the purpose and outline of the study, the survey method, and the body measurement method and conducted face-to-face surveys. Participants took about 40 min to complete the questionnaires and measurements. After they completed the questionnaires, a small thank you gift of daily necessities was given to the participants.

### 2.3. Measures

#### 2.3.1. General characteristics

The socioeconomic characteristics of the participants were assessed, including age, gender, marital status, surviving child, education level, religion, economic status, and social activity. Age and economic status were measured using continuous scales. The other characteristics were measured using nominal scales. Religion was measured by asking, "Do you have religion, which is the belief in and worship or a god or gods, or any such system of belief and worship" with a "Yes/No" response. Social activity represented the quality of social relationships and was measured by assessing whether or not the participant attended some type of community center. Economic status was measured by asking, "What is your average income per month" and "What is the actual cost of living per month?"

#### 2.3.2. Health status

The participant's health status was assessed by physical health, mental health, cognitive function, and social health.

**2.3.2.1. Physical health.** The physical health of participants was measured by hand grip strength and the International Physical Activity Questionnaire – short form (IPAQ). Hand grip strength was measured twice for each hand, with the participant in a standing position with the forearm held parallel to the body, monitored by nursing college student researchers. The IPAQ consists of three specific types of activity: walking, moderate-intensity activities, and vigorous-intensity activities. The IPAQ computation is a summation of the duration (minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activities. The total MET is the sum of 3.3 x walking, 4.0 x moderate, and 8.0 x vigorous scores ([www.ipaq.ki.se](http://www.ipaq.ki.se)).

**Table 1**  
Gender differences in general characteristics of older adults living alone (N = 1023).

| Variable                 | Total (n = 1023)<br>n(%) or M±SD | Gender                        |                                 | X <sup>2</sup> or t (p) |
|--------------------------|----------------------------------|-------------------------------|---------------------------------|-------------------------|
|                          |                                  | Men (n = 227)<br>n(%) or M±SD | Women (n = 796)<br>n(%) or M±SD |                         |
| Age (years)              | 77.38±5.87                       | 74.65±5.50                    | 78.16±5.74                      | 8.218(< .001)           |
| <b>Marital status</b>    |                                  |                               |                                 |                         |
| Not married              | 28(2.7)                          | 11(4.8)                       | 17(2.1)                         | 240.210(< .001)         |
| Married                  | 10(1.0)                          | 4(1.8)                        | 6(0.8)                          |                         |
| Divorced                 | 205(20.0)                        | 125(55.1)                     | 80(10.1)                        |                         |
| Widowed                  | 780(76.2)                        | 87(38.3)                      | 693(87.1)                       |                         |
| <b>Surviving child</b>   |                                  |                               |                                 |                         |
| Yes                      | 939(91.8)                        | 211(93.0)                     | 728(91.5)                       | 0.523(.469)             |
| No                       | 84(8.2)                          | 16(7.0)                       | 68(8.5)                         |                         |
| <b>Educational level</b> |                                  |                               |                                 |                         |
| Illiteracy               | 396(38.7)                        | 15(6.6)                       | 381(47.9)                       | 250.140(< .001)         |
| Elementary school        | 307(30.0)                        | 55(24.2)                      | 252(31.7)                       |                         |
| Junior high school       | 149(14.6)                        | 55(24.2)                      | 94(11.8)                        |                         |
| High school              | 129(12.6)                        | 69(30.4)                      | 60(7.5)                         |                         |
| ≥ College                | 42(4.1)                          | 33(14.5)                      | 9(1.1)                          |                         |
| <b>Religion</b>          |                                  |                               |                                 |                         |
| Yes                      | 664(64.9)                        | 111(48.9)                     | 553(69.5)                       | 32.823(< .001)          |
| No                       | 359(35.1)                        | 116(51.1)                     | 243(30.5)                       |                         |
| <b>Economic status</b>   |                                  |                               |                                 |                         |
| Incomes (\$/mon)         | 492.33±349.70                    | 606.03±481.18                 | 459.96±294.37                   | 4.348(< .001)           |
| Cost of living (\$/mon)  | 462.74±352.80                    | 615.19±594.94                 | 419.26±225.52                   | 4.863(< .001)           |
| <b>Social activity</b>   |                                  |                               |                                 |                         |
| Senior citizens' center  | 316(30.9)                        | 24(10.6)                      | 292(36.7)                       | 118.741(< .001)         |
| Religious center         | 223(21.8)                        | 32(14.1)                      | 191(24.0)                       |                         |
| Senior center            | 104(10.2)                        | 29(12.8)                      | 75(9.4)                         |                         |
| Cultural center          | 31(3.0)                          | 2(0.9)                        | 29(3.6)                         |                         |
| Other                    | 65(6.3)                          | 24(10.6)                      | 41(5.2)                         |                         |
| No                       | 284(28.1)                        | 116(51.1)                     | 168(21.1)                       |                         |

**2.3.2.2. Mental health.** The UCLA Loneliness Scale was used to assess the participant's loneliness (Russell, Peplau, & Cutrona, 1980). This measure consists of 20 items, using 4-point Likert scales. Scores on the scale range from 20 to 80, with higher scores reflecting greater loneliness.

The participants' depressive symptoms were assessed using the Short Form Geriatric Depression Scale – Korean version (GDS-15) (Sheikh & Yesavage, 1986). This measure consists of fifteen short questions about the participant's feelings over the previous week. The total score ranges from 0 to 15, categorized as follows: 0–5 normal, 6–9 mild depression, 10–15 severe depression.

Participants' suicidal ideation was assessed using the suicidal thought VAS and suicide attempts (0–10). Higher suicidal thought VAS scores indicated more thoughts about suicide.

**2.3.2.3. Cognitive function.** The Mini-Mental State Examination Standard Version (MMSE-2SV) scale was used to measure the severity of cognitive dysfunction among participants (Folstein, Folstein, White, & Messer, 2010). The MMSE-2SV is composed of seven domains: attention and calculation, language, drawing, registration, orientation to time, orientation to place, and recall. The total score is 30 points, with higher scores indicating better cognitive function.

**2.3.2.4. Social health.** The social health of participants was assessed with the ENRICH (Enhancing Recovery in Coronary Heart Disease) Social Support Instrument (ESSI) (Investigators, 2001). The ESSI consists of six short yes/no questions about perceived emotional support, instrumental support, appraisal support, and marital status. Higher scores indicate greater social support.

### 2.3.3. Quality of life

The EQ-5D-3 L was used to measure quality of life (QoL). EuroQoL – 5 Dimensions (EQ-5D) is a standardized instrument developed by the EuroQol Group, which can be used for a range of health conditions

(EuroQol, 1990). The EQ-5D consists of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.

### 2.3.4. Community service needs

Community service need was measured by asking, “Do you need help from a daily community care service?” Based on literature reviews, the participants' community service needs were divided into seven domains: housework support, convenience, residential environment, movement support, connection, emotional support, and emergency support. The measurement was composed of 20 items with yes/no response options.

## 2.4. Ethical considerations

The study obtained approval from the Institutional Review Board of X (approval no. H-1807-131-961). Informed consent was obtained from each participant after the purpose and process of the study were explained, and after the privacy of the participant's information was assured. All personal information was coded into numbers to protect the participants' confidentiality; this was kept in a locked cabinet, complicit with regulations. The authors were approved for the use of all measurements before the start of the study.

## 2.5. Data analysis

Data analysis was conducted using SPSS version 22 (IBM Corp., Somers, NY, USA). Participants' characteristics were analyzed with descriptive statistics. The differences of health status and community service needs by gender were analyzed using independent *t*-test (for normally distributed variables), and chi-square test (for categorical variables). To examine the influencing factors in quality of life, a stepwise multiple logistic regression analysis was performed. Before running the regression analyses, the independent variables were tested for multicollinearity using Tolerance Value and Variance Inflation

Factor (VIF). Multicollinearity is a state of very high inter-correlations or inter-associations among the independent variables (Lin, 2008). If the Tolerance Value is less than 0.1 (Belsley, Kuh, & Welsch, 1980) and, simultaneously, the value of VIF is 10 or above, then the multicollinearity is problematic (Marquardt, 1980). The level of significance was set at  $p = 0.05$ .

### 3. Results

#### 3.1. Gender differences in general characteristics

Table 1 shows the comparison of general characteristics between men and women. Among the 1023 participants, 227 were women and 796 were men, with total mean age of 77.38 years. In total, most participants (76.2%) were widowed and 91.8% had a surviving child. 38.7% were illiterate and more than half of the participants (64.9%) were religious. Participants' total monthly incomes (\$492.33) were more than cost of living (\$462.74), but men's incomes (\$606.03) were less than cost of living (\$615.19). Almost one-third (30.9%) of participants were socially active in a senior citizens' center. There were statistically significant gender differences in all of these general characteristics, except for surviving children. Specifically, women had lower educational levels ( $p < .001$ ) and economic status ( $p < .001$ ) but higher social activity ( $p < .001$ ) than men.

#### 3.2. Gender-based differences in health status and QoL

The findings reveal more gender specificity in health status (Table 2); the physical health, mental health, cognitive function, social health, and quality of life of older adults living alone showed statistically significant gender differences. Both hand grip strength ( $p < .001$ ) and IPAQ scores ( $p < .001$ ) were higher for men than for women. In terms of mental health status, men were significantly more likely than women to report feeling lonely ( $p < .001$ ), depressed ( $p = .046$ ), and frequent suicidal thoughts ( $p < .001$ ). However, men's cognitive function ( $p < .001$ ) and social support ( $p < .001$ ) were higher than

those of women. The EQ-5D-3L and EQ VAS of men were higher than those of women.

#### 3.3. Gender-based differences in community service needs

As shown in Table 3, there is a difference between genders in community service needs. Among the seven domains measured, housework support, convenience, residential environment, movement support, connection support, and emergency support significantly differed by gender. Men were more likely than women to report needing assistance with preparing food (33.5% vs. 21.0%,  $p < .001$ ) and education programs connecting (36.6% vs. 26.8%,  $p = .004$ ). Specifically, women were more likely than men to report needing support from visiting care services ( $p = .017$ ), maintenance and repair of residential environment ( $p < .001$  and  $p < .001$ , respectively), movement support, health supplies and health checkup ( $p = .004$  and  $p = .004$ , respectively) connection support( $p = .004$ ), and emergency service ( $p = .002$ ).

#### 3.4. Influencing factors in QoL

The results of the multiple regression analysis showed that the factors affecting the total participant's QoL were gender ( $\beta = -0.047$ ,  $p < .001$ ), age ( $\beta = -0.002$ ,  $p = .023$ ), depression ( $\beta = -0.012$ ,  $p < .001$ ), cognitive function ( $\beta = 0.005$ ,  $p < .001$ ), and suicidal thoughts ( $\beta = -0.012$ ,  $p < .001$ ) and there was a significant difference in QoL by gender (Table 4). Men's QoL was significantly related to their depressive symptoms ( $\beta = -0.262$ ,  $p = .001$ ), suicidal thoughts ( $\beta = -0.201$ ,  $p = .003$ ), loneliness ( $\beta = -0.147$ ,  $p = .038$ ), and right-hand grip strength ( $\beta = 0.209$ ,  $p < .001$ ); the combination of these factors explained the 55.7% variability in the men's QoL. Conversely, women's QoL was significantly related to their depressive symptoms ( $\beta = -0.253$ ,  $p < .001$ ), suicidal thoughts ( $\beta = -0.169$ ,  $p < .001$ ), cognitive function ( $\beta = 0.164$ ,  $p < .001$ ), and IPAQ ( $\beta = 0.097$ ,  $p = .003$ ); the combination of these variables explained the 43.0% variability in the women's QoL (Table 4). Tolerance Value, which is a

**Table 2**  
Health status and QoL of older adults living alone (N = 1023).

| Variable                    | Total (n = 1023)<br>n(%) or M±SD | Gender                        |                                 | X2 or t (p)    |
|-----------------------------|----------------------------------|-------------------------------|---------------------------------|----------------|
|                             |                                  | Men (n = 227)<br>n(%) or M±SD | Women (n = 796)<br>n(%) or M±SD |                |
| <b>Physical health</b>      |                                  |                               |                                 |                |
| Hand grip strength          |                                  |                               |                                 |                |
| Left hand                   | 24.95±9.76                       | 37.11±10.08                   | 21.51±6.31                      | 22.014(< .001) |
| Right hand                  | 26.57±9.75                       | 38.17±10.17                   | 23.25±6.62                      | 21.057(< .001) |
| IPAQ                        | 1725.61±3994.12                  | 3314.40±7168.85               | 1272.53±2229.84                 | 4.233(< .001)  |
| <b>Mental health</b>        |                                  |                               |                                 |                |
| Loneliness                  | 41.54±13.12                      | 44.49±14.31                   | 40.70±12.64                     | 3.606(< .001)  |
| Depressive symptoms         | 6.34±4.28                        | 6.84±4.45                     | 6.20±4.22                       | 1.993(.046)    |
| Total                       | 485(47.4)                        | 95(41.9)                      | 390(49.0)                       | 3.943(.139)    |
| Normal                      | 270(26.4)                        | 69(30.4)                      | 201(25.3)                       |                |
| Moderate depression         | 268(26.2)                        | 63(27.8)                      | 205(25.8)                       |                |
| Severe depression           |                                  |                               |                                 | 3.806(< .001)  |
| Suicide                     | 1.43±2.80                        | 2.11±3.14                     | 1.24±2.66                       | 1.794(.180)    |
| Suicidal thoughts           | 94(9.2)                          | 26(11.5)                      | 68(8.5)                         |                |
| Suicide attempt             |                                  |                               |                                 |                |
| <b>Cognitive function</b>   |                                  |                               |                                 |                |
| No cognitive impairment     | 438(42.8)                        | 141(62.1)                     | 297(37.3)                       | 55.697(< .001) |
| Mild cognitive impairment   | 273(26.7)                        | 57(25.1)                      | 216(26.7)                       |                |
| Severe cognitive impairment | 312(30.5)                        | 29(12.8)                      | 297(37.3)                       |                |
| <b>Social health</b>        |                                  |                               |                                 |                |
| Social support              | 8.34±1.99                        | 9.04±2.08                     | 8.14±1.93                       | 5.850(< .001)  |
| <b>QoL</b>                  |                                  |                               |                                 |                |
| EQ-5D-3L                    | 0.81±0.18                        | 0.85±0.18                     | 0.79±0.18                       | 4.456(< .001)  |
| EQ VAS                      | 63.47±21.9                       | 66.26±20.48                   | 62.68±21.34                     | 2.249(.025)    |

**Table 3**  
Gender differences in community service needs of older adults (N = 1023).

| Variable                       | Total<br>(n = 1023)<br><br>n(%) | Gender                    |                                | X <sup>2</sup> or t (p) |
|--------------------------------|---------------------------------|---------------------------|--------------------------------|-------------------------|
|                                |                                 | Men (n = 227)<br><br>n(%) | Women<br>(n = 796)<br><br>n(%) |                         |
| <b>Housework support</b>       |                                 |                           |                                |                         |
| Preparing food                 | 243(23.8)                       | 76(33.5)                  | 17(21.0)                       | 15.239(< .001)          |
| Grooming                       | 206(20.1)                       | 52(22.9)                  | 154(19.3)                      | 1.393(.238)             |
| Shopping for food              | 123(12.0)                       | 24(10.6)                  | 99(12.4)                       | 0.580(.446)             |
| <b>Convenience</b>             |                                 |                           |                                |                         |
| Meal delivery                  | 303(29.6)                       | 65(28.6)                  | 238(29.9)                      | 0.136(.713)             |
| Visiting care services         | 160(15.6)                       | 24(10.6)                  | 136(17.1)                      | 5.678(.017)             |
| <b>Residential environment</b> |                                 |                           |                                |                         |
| Maintenance                    | 611(59.7)                       | 109(48.0)                 | 501(63.1)                      | 16.627(< .001)          |
| Repair                         | 581(56.8)                       | 97(42.7)                  | 484(60.8)                      | 23.511(< .001)          |
| <b>Movement support</b>        |                                 |                           |                                |                         |
| Hospitals, financial affairs   | 169(16.5)                       | 23(10.1)                  | 146(18.3)                      | 8.632(.003)             |
| Shopping or outing             | 146(14.3)                       | 20(8.8)                   | 126(15.8)                      | 7.111(.008)             |
| <b>Connection support</b>      |                                 |                           |                                |                         |
| Health supplies                | 603(58.9)                       | 115(50.7)                 | 488(61.3)                      | 8.272(.004)             |
| Health checkup                 | 580(56.7)                       | 122(53.7)                 | 458(57.5)                      | 1.035(.309)             |
| Medical institutions           | 575(56.2)                       | 123(54.2)                 | 452(56.8)                      | 0.485(.486)             |
| Education programs             | 296(28.9)                       | 83(36.6)                  | 213(26.8)                      | 8.258(.004)             |
| <b>Emotional support</b>       |                                 |                           |                                |                         |
| Phone call                     | 617(60.3)                       | 125(55.1)                 | 492(61.8)                      | 3.355(.067)             |
| Keep company                   | 407(39.8)                       | 87(38.3)                  | 320(40.2)                      | 0.259(.611)             |
| Counseling                     | 221(21.6)                       | 50(22.0)                  | 171(21.5)                      | 0.031(.861)             |
| <b>Emergency</b>               |                                 |                           |                                |                         |
| Injury and accident            | 760(4.3)                        | 151(66.5)                 | 609(76.5)                      | 9.225(.002)             |
| Safety                         | 723(70.7)                       | 142(62.6)                 | 581(73.0)                      | 9.280(.002)             |
| Dying                          | 438(42.8)                       | 95(41.9)                  | 343(43.1)                      | 0.111(.739)             |
| Medication                     | 312(30.5)                       | 60(26.4)                  | 252(31.7)                      | 2.276(.131)             |

collinear statistic, was: 0.825–0.935 for the total model, 0.602–0.978 for the men’s model, and 0.810–0.986 for the women’s model. All of them were 0.1 or greater. The variance inflation factor (VIF) was 1.069–1.280 in the total model, 1.022–1.892 in the men’s model, and 1.015–1.234 in the women’s model. All of them were below 10, thus, multicollinearity was excluded.

**4. Discussion**

Due to the global trend of rapidly aging populations and the increasing percentage of individuals living alone, the need for effective interventions to improve the health care and daily life support of older adults living alone continues to increase. This study examined gender differences in the health status, need for community services, and QoL of older adults living alone to improve their independent living and health, and to establish community-centered social service models.

In this study, the demographic and sociological characteristics of older adults living alone differed significantly according to gender; for example, women living alone were older than men and most of them were widowed. This result is due to the fact that women have a longer life expectancy than men (Backes et al., 2006; Ministry of Health & Welfare, 2018; Seung-Youn, 2017). In agreement with prior research, women were more often in difficult socioeconomic situations; they had lower education levels and economic status than men (Gaymu &

**Table 4**  
Factors related to QoL of older adults.

| Variables   | Total (n = 1023) |      |       |        |        | Men (n = 227) |      |       |        |        | Women (n = 796) |      |       |        |        |
|---|------------------|------|-------|--------|--------|---------------|------|-------|--------|--------|-----------------|------|-------|--------|--------|
|   | B                | SE   | β     | t      | p      | B             | SE   | β     | t      | p      | B               | SE   | β     | t      | p      |
| (Constant)  | .980             | .085 |       | 11.523 | < .001 | .893          | .051 |       | 17.659 | < .001 | .746            | .027 |       | 27.371 | < .001 |
| Gender  | -.047            | .013 | -.107 | -3.597 | < .001 | -.010         | .003 | -.262 | -3.468 | .001   | -.011           | .002 | -.253 | -7.094 | < .001 |
| Age   | -.002            | .001 | -.069 | -2.271 | .023   | -.011         | .004 | -.201 | -3.024 | .003   | -.012           | .002 | -.169 | -4.793 | < .001 |
| Depression  | -.012            | .001 | -.270 | -8.659 | < .001 | -.002         | .001 | -.147 | -2.084 | .038   | .006            | .001 | .164  | 5.052  | < .001 |
| Cognitive function  | .005             | .001 | .150  | 4.956  | < .001 | .005          | .001 | .209  | 3.772  | < .001 | 8.021E-006      | .000 | .097  | 3.008  | .003   |
| Suicidal thoughts   | -.012            | .002 | -.188 | -6.037 | < .001 |               |      |       |        |        |                 |      |       |        |        |
| R <sup>2</sup> = .227, Adjusted R <sup>2</sup> = .223, F = 49.751, P < .001 |                  |      |       |        |        |               |      |       |        |        |                 |      |       |        |        |
| R <sup>2</sup> = .557, Adjusted R <sup>2</sup> = .533, F = 27.647, P < .001 |                  |      |       |        |        |               |      |       |        |        |                 |      |       |        |        |
| R <sup>2</sup> = .430, Adjusted R <sup>2</sup> = .185, F = 44.920, P < .001 |                  |      |       |        |        |               |      |       |        |        |                 |      |       |        |        |

Springer, 2010; OECD, 2017; Seung-Youn, 2017). Economic status was significantly associated with the first transition to living alone in older South Koreans; in other words, older adults in South Korea who were economically disadvantaged were also more likely to live alone (Lee, 2016). In addition, it is thought that many older women living alone in South Korea, a patriarchal society, had low economic status because they were less likely to have education and economic activities than men.

At the same time, under the twin influences of weakening traditional family values and rapid aging in South Korea, older adults are more likely to transition to living alone (Lee, 2016). In this study, 91.8% of older adults were living alone, even though they had surviving children. Older men with chronic diseases may be more likely to need support from children (Backes et al., 2006). Socioeconomic status was highly related to the independence in daily life and autonomy of older adults living alone. Therefore, it is necessary to create tailored jobs for older adults living alone, taking gender into consideration.

Interestingly, we found gender differences in both health status and community service needs of older adults. In the present study, women were more likely to report lower physical health status, mental health status, cognitive function, social health status, and QoL than men. This result is similar to that of a previous study in older people with osteoarthritis, which shows that men spent more time performing moderate and vigorous activity than women (Seung-Youn, 2017); also, in the *Report on the South Korean National Older Adults Life Survey* (2017), the exercise rate was higher for men (71.2%) than women (55.3%), while the depression prevalence for women (24.0%) was higher than men (17.2%). Regarding suicide rates, our results support previous findings that suicide rates have decreased significantly among older women (Backes et al., 2006). In contrast, a previous study on the transition to living alone in South Korea showed that physical health conditions did not have a significant effect on the transition to living alone, but only depressive symptoms had a positive association with the transition to living alone (Lee, 2016). However, many factors, such as isolation and reduced mobility, contribute to poor mental health and cognitive function among older adults. Barriers in the physical environment to outdoor mobility not only had a direct effect on loneliness but also an indirect effect through restricted autonomy in outdoor participation (Rantakokko et al., 2014). In the *World Health Organization* (2001) report, older women, who usually have lower socioeconomic status, are at greater risk for mental health problems. Recently, the South Korean government has prioritized providing community services to improve mental health and cognitive function in older adults. The development of gender-based programs for the mental health and cognitive function of older adults living alone should also be considered.

The findings of a previous study on QoL of older Chinese living alone showed significant relationships between self-rated health, functional ability, depression, economic level, social support, loneliness, previous occupation, and satisfaction with health services (Chen, Hicks, & While, 2014). As to the influencing factors in QoL by gender in this study, depressive symptoms, suicidal thoughts, and physical health were significantly associated in both genders, but loneliness was associated more in men and cognitive function was associated more in women. This result differs from previous studies: gender difference did not predict quality of life in Taiwan (Lin, Yen, & Fetzer, 2008) and the degree of QoL for European men and women did not differ (Gaymu & Springer, 2010). However, health has been found to be the strongest determinant of life satisfaction (Gaymu & Springer, 2010; Seung-Youn, 2017); in our study, the outcome variables QoL and influencing factors of QoL were different by gender. Moreover, the separate application of the QoL model to men and women allowed us to show that having no depression or suicidal thoughts and a high level of physical activity were variables that increased the QoL for both genders. These results confirm that mental health issues such as depression were a high risk factor for low quality of life in older adults living alone. Thus, it is

necessary to develop effective depression interventions for older adults living alone and to develop gender-specific programs: a loneliness-reduction program for men that changes social behavior improves social connections and a cognitive enhancement program for women. For example, an ICT (Information and Communications Technologies) based intervention may improve social networks by maintaining visibility, re-awakening previous social networks, or developing new networks that decrease loneliness and improve cognitive function (Chipps, Jarvis, & Ramlall, 2017; Pinto-Bruno, García-Casal, Cspike, Jenaro-Río, & Franco-Martín, 2017).

In South Korea, social insurance expenditures are continuously increasing, and there is no form of public insurance that is especially targeted for older adults living alone (Sun, 2016). Therefore, the subject of community service is limited, nor does its content meet the needs of older adults living alone. In the present study, the difference in demand for gender-based community services was apparent. Men wanted more support in preparing food and connecting education program, and women were in more need of residential environment maintenance and repair, movement support, connection support, and emergency support services. Women in South Korea were primarily responsible for preparing food, while men were mainly engaged in social activities. Particularly men, either non-married or living alone, fared worse in associations between dual economic-social disadvantages and healthy eating (Conklin, Forouhi, Surtees, Wareham, & Monsivais, 2015). In addition, home help hours significantly correlated with frailty and functional dependency (Kelly, O'Brien, Smuts, O'Sullivan, & Warters, 2017). To continue living in a community where older adults have lived for a long time, it is necessary to provide flexible support services that cover the prevention and management of diseases, various issues in daily life and health, and medical care and welfare suitable for individual needs. Thus, public health efforts that provide community services for older adults living alone should include individually tailored home help services, such as healthy eating programs, daily living support, and emergency support.

This study is the first attempt at a large-scale study examining the gender-based health and needs of older adults living alone in an urban area of South Korea. A limitation of this research is that the cross-sectional design allowed results to be interpreted as associations, but it did not allow causality to be determined. To improve validity of the results, it will be necessary for future research to conduct more longitudinal studies to produce wide-ranging results.

## 5. Conclusions

We found gender differences in health status, community service needs, and QoL of older adults living alone. There were gender differences in physical health, mental health, and cognitive function. Further, there were gender differences in the needs for community services: men wanted support in education and preparing food, while women wanted residential maintenance and repair, movement support, connection support, and emergency support. Moreover, we found some evidence of gender differences in older adults living alone regarding quality of life—this was associated with mental health and physical health. We suggest that further research should evaluate an effective depression intervention regarding the quality of life of older adults living alone. Future research could also develop a gender-based tailored service model and evaluate that model—developing a loneliness program for men and a cognitive enhancement program for women. Furthermore, public health efforts to provide gender-based community services for older adults living alone could include individually tailored home help services.

## Declarations of interest

The authors declare that they have no conflict of interest.

## Funding source

This research was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHDI), funded by the Ministry of Health & Welfare, Republic of Korea grant number: HI18C1284

## Acknowledgements

We would like to thank the older adults who participated in this study. We also gratefully acknowledge the help of the S\* Public health Center: Director Park Munghee and Mrs. Park Kyungwon, for their help in collecting the study data.

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