Influence of Offspring on Quality of Life among Cancer Patients and Survivors: Results from the Korean Longitudinal Study of Aging (KLoSA), 2008-2011

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Abstract

Background: To examine whether offspring improve or reduce quality of life (QOL) among cancer patients and survivors. Materials and Methods: We used data from the Korean Longitudinal Study of Aging (KLoSA) from 2008 to 2011. There were 490 research subjects in our study: 245 cancer patients and survivors and 245 controls matched using propensity scores. Results: For cancer patients and survivors with no offspring, the QOL estimate was -2.831 lower (SE: 5.508, p-value: 0.623) than that of those with two offspring, while for those with five or more offspring, the QOL estimate was 7.336 higher (SE: 2.840, p-value: 0.036). For non-cancer patients and survivors with one child, the QOL estimate was -11.258 lower (SE: 2.430, p-value: 0.002) than that of those with two offspring, while for those with five or more offspring, the QOL estimate was -4.881 lower (SE: 2.484, p-value: 0.090). Conclusions: This article provides evidence for a beneficial effect of offspring upon QOL in cancer patients and survivors, indicating that offspring are important for them.

Keywords: Offspring - loneliness - depressive disorder - Korean cancer patients

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Introduction

In South Korea, cancer has been the leading cause of death since 1983, and the overall incidence rate increased 3.3% per year (1.5% in males and 5.3% in females) from 1999 to 2010 (Jung et al., 2010). Many epidemiological studies have suggested that cancer risk is associated with a western lifestyle (Zhang et al., 2012). A previous study indicates that cancer influences quality of life (QOL) in patients and their families (Montazeri et al., 1996). Studying QOL, especially in patients with a life-threatening disease such as cancer, is becoming increasingly important. This is due to several factors, including understanding patients’ experiences of the impact of the disease and its treatments. It has been argued that such understanding may help to deliver effective and efficient healthcare. Many previous QOL studies have been conducted in patients with cancer. These studies have found that the QOL of patients with cancer is affected by many factors, such as treatment with palliative intent, socioeconomic status, psychosocial and demographic factors, social and family support, and the presence of a spouse caregiver (Dorval et al., 1998; Parker et al., 2003; Ashing-Giwa and Lim, 2009; Ezat WPS, 2014). In addition, there are arguments for and against positive effects of social networks and competence on subjective well-being (Pinquart and Sorensen, 2000).

Sociologists stress the importance of offspring within the social network of aging parents (Bures et al., 2009). Offspring can provide social support and care. A greater number of offspring might therefore prevent loneliness in old age. Offspring also express gratitude and provide parents with feelings of meaning in life, which might positively affect mental health (Evenson and Simon, 2005). QOL is subjective, and a patient’s own judgment in this respect is a major determinant; it has been described as a “quality of being” (Benner, 1985).

Cancer and its treatment have a substantial impact on mental and social health and, consequently, on the QOL of patients (Alptekin et al., 2010). In this new era of cancer management, more emphasis is placed on QOL vs quantity of life (Marra et al., 1996). Therefore, the purpose of our study was to investigate whether offspring improve or reduce QOL among cancer patients and survivors.

Materials and Methods

Study sample and design
Data were drawn from the Korean Longitudinal Study of Aging (KLoSA), a nationwide survey of community-dwelling South Koreans aged 45 years and older conducted using multistage stratified cluster sampling. Our study used a sample drawn from the first to fourth waves of KLoSA; the survey is repeated every even-numbered year by the Korea Labor Institute to collect the basic data needed to devise and implement effective

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Table 1. General Characteristics of Study Subjects at Baseline (2008) after Propensity Score Matching

|                                      | Total | Cancer | P-value |
|--------------------------------------|-------|--------|---------|
|                                      | N %   | Yes %  | No %    |
| Number of offspring                  |       |        |         |
| 0                                    | 15    | 3.1    | 7       |
| 1                                    | 40    | 8.2    | 19      |
| 2                                    | 125   | 25.5   | 64      |
| 3                                    | 143   | 29.2   | 77      |
| 4                                    | 81    | 16.5   | 40      |
| ≥5                                   | 86    | 17.6   | 38      |
| Proportion of cohabitating offspring |       |        |         |
| 0                                    | 268   | 54.7   | 136     |
| ≥0 and ≤0.499                        | 100   | 20.4   | 53      |
| ≥0.500                               | 122   | 24.9   | 56      |
| Average age of offspring (years)     |       |        |         |
| Q1 (≤31.3)                           | 140   | 28.6   | 65      |
| Q2 (31.4–44.9)                       | 202   | 41.2   | 109     |
| Q3 (≥45.0)                           | 148   | 30.2   | 71      |
| Number of male offspring             |       |        |         |
| 0                                    | 71    | 14.49  | 40      |
| 1                                    | 185   | 37.76  | 90      |
| 2                                    | 150   | 30.61  | 77      |
| ≥3                                   | 84    | 17.14  | 38      |
| Number of female offspring           |       |        |         |
| 0                                    | 113   | 23.06  | 54      |
| 1                                    | 140   | 28.57  | 71      |
| 2                                    | 142   | 28.98  | 74      |
| ≥3                                   | 95    | 19.39  | 46      |
| Age (years)                          |       |        |         |
| ≤59                                  | 153   | 31.2   | 72      |
| 60–69                                | 172   | 35.1   | 93      |
| ≥70                                  | 165   | 33.7   | 80      |
| Sex                                  |       |        |         |
| Male                                 | 214   | 43.7   | 102     |
| Female                               | 276   | 56.3   | 143     |
| Residential region                   |       |        |         |
| Urban                                | 318   | 64.9   | 168     |
| Rural                                | 172   | 35.1   | 77      |
| Education                            |       |        |         |
| ≤Elementary school                  | 274   | 55.9   | 133     |
| Middle school                        | 69    | 14.1   | 30      |
| High school                          | 101   | 20.6   | 57      |
| ≥College                             | 46    | 9.4    | 25      |
| Marital status                       |       |        |         |
| Single                               | 396   | 80.8   | 198     |
| Married                              | 94    | 19.2   | 47      |
| Employed                             |       |        |         |
| Yes                                  | 126   | 25.7   | 54      |
| No                                   | 364   | 74.3   | 191     |
| Number of interactions with friends  |       |        |         |
| Everyday                             | 82    | 16.7   | 41      |
| 1–6 times per week                   | 238   | 48.6   | 119     |
| None                                 | 170   | 34.7   | 85      |
| Income                               |       |        |         |
| Yes                                  | 77    | 15.7   | 31      |
| No                                   | 413   | 84.3   | 214     |
| Smoking status                       |       |        |         |
| Smoker                               | 348   | 71.0   | 174     |
| Former smoker                        | 104   | 21.2   | 52      |
| Never smoker                         | 38    | 7.8    | 19      |
| Alcohol use                          |       |        |         |
| Drinker                              | 152   | 31.0   | 57      |
| Former drinker                       | 64    | 13.1   | 40      |
| Never drinker                        | 274   | 55.9   | 148     |
| Depressive symptoms                  |       |        |         |
| Yes                                  | 90    | 18.4   | 52      |
| No                                   | 400   | 81.6   | 193     |
| Chronic disease                      |       |        |         |
| Yes                                  | 266   | 54.3   | 133     |
| No                                   | 224   | 45.7   | 112     |
| Total                                | 490   | 100.0  | 245     |

social and economic policies that address emerging trends related to population aging. The original KLoSA study population comprised South Koreans living in 15 large administrative areas.

In the first baseline survey in 2006, 10,254 individuals in 6,171 households (1.7 per household) were interviewed using the Computer-Assisted Personal Interviewing method. There were 292 individuals with cancer. The second survey, in 2008, followed up with 8,688 subjects, who represented 86.6% of the original panel. The third survey, in 2010, followed up with 7,920 subjects, who represented 80.3% of the original panel, and the fourth survey, in 2012, followed up with 7,486 subjects, who represented 76.2% of the original panel.

Respondent samples comprise a total of 16,613 individuals (see Table 1) from 6,314 households, 16,255 individuals from 6,207 households, 15,625 individuals from 6,207 households, 14,696 individuals from 6,034 households, and 14,604 individuals from 5,735 households from wave 3 (2008) to wave 7 (2012), respectively.
Table 2. Quality of Life in Relation to General Study Subject Characteristics at Baseline (2008)

| Quality of life | Cancer | Yes | SD | P-value | No | SD | P-value |
|----------------|--------|-----|----|---------|----|----|---------|
| Number of offspring | 0 | 43.3 | 23.5 | <0.0001 | 45.7 | 27.6 | <0.0001 | 41.3 | 21.0 | <0.0001 |
| 1 | 46.8 | 29.2 | | | 45.3 | 35.3 | | 48.1 | 23.2 | |
| 2 | 57.0 | 26.8 | | | 53.4 | 28.8 | | 60.8 | 24.2 | |
| 3 | 57.8 | 23.2 | | | 56.5 | 24.3 | | 59.2 | 22.0 | |
| 4 | 52.3 | 21.3 | | | 50.0 | 23.6 | | 54.6 | 18.9 | |
| ≥5 | 55.6 | 21.9 | | | 57.6 | 20.5 | | 54.0 | 23.0 | |
| Proportion of cohabitating offspring | 0 | 52.1 | 25.2 | <0.0001 | 51.4 | 27.1 | <0.0001 | 52.7 | 23.2 | <0.0001 |
| >0 and ≤0.499 | | | | | 55.1 | 23.0 | | 57.7 | 21.4 | |
| ≥50.0 | | | | | 57.7 | 25.7 | | 62.4 | 21.3 | |
| Average age of offspring (years) | Q1 (≤31.3) | 58.2 | 24.5 | <0.0001 | 55.1 | 26.9 | <0.0001 | 60.9 | 22.0 | <0.0001 |
| Q2 (31.4–44.9) | 56.9 | 22.7 | | | 57.9 | 23.2 | | 55.8 | 22.1 | |
| Q3 (≥45.0) | 49.2 | 25.7 | | | 45.8 | 27.8 | | 52.3 | 23.3 | |
| Number of male offspring | 0 | 47.7 | 30.9 | <0.0001 | 49.0 | 33.4 | <0.0001 | 46.1 | 27.6 | <0.0001 |
| 1 | 58.4 | 21.7 | | | 56.2 | 24.8 | | 60.5 | 18.0 | |
| 2 | 52.3 | 24.3 | | | 51.2 | 23.9 | | 53.4 | 24.8 | |
| ≥3 | 58.2 | 22.5 | | | 57.4 | 23.6 | | 58.9 | 21.8 | |
| Number of female offspring | 0 | 55.5 | 25.5 | <0.0001 | 54.3 | 28.4 | <0.0001 | 56.6 | 22.6 | <0.0001 |
| 1 | 53.1 | 25.9 | | | 52.1 | 27.3 | | 54.1 | 24.5 | |
| 2 | 55.6 | 23.2 | | | 51.6 | 23.6 | | 60.0 | 22.1 | |
| ≥3 | 56.1 | 22.7 | | | 58.5 | 24.8 | | 53.9 | 20.5 | |
| Age (years) | ≤59 | 50.5 | 25.1 | <0.0001 | 50.0 | 27.3 | <0.0001 | 50.9 | 23.2 | <0.0001 |
| 60–69 | 55.8 | 23.9 | | | 54.9 | 25.9 | | 56.8 | 21.4 | |
| ≥70 | 58.2 | 23.7 | | | 55.4 | 24.9 | | 60.9 | 22.4 | |
| Sex | Male | 57.7 | 24.0 | <0.0001 | 57.7 | 25.1 | <0.0001 | 57.6 | 23.0 | <0.0001 |
| Female | 52.9 | 24.6 | | | 50.7 | 26.3 | | 55.2 | 22.4 | |
| Residential region | Urban | 54.7 | 25.6 | <0.0001 | 54.0 | 27.0 | <0.0001 | 55.5 | 24.2 | <0.0001 |
| Rural | 55.5 | 21.9 | | | 52.9 | 23.9 | | 57.6 | 20.1 | |
| Education | ≤Elementary school | 52.0 | 24.0 | <0.0001 | 49.4 | 25.4 | <0.0001 | 54.5 | 22.3 | <0.0001 |
| Middle school | 54.3 | 22.0 | | | 51.3 | 22.9 | | 56.7 | 21.3 | |
| High school | 60.1 | 25.5 | | | 61.1 | 27.4 | | 58.9 | 23.0 | |
| ≥College | 62.0 | 25.3 | | | 62.0 | 24.8 | | 61.9 | 26.4 | |
| Marital status | Single | 57.1 | 23.4 | <0.0001 | 55.8 | 25.1 | <0.0001 | 58.4 | 21.5 | <0.0001 |
| Married | 46.0 | 26.5 | | | 44.7 | 28.0 | | 47.2 | 25.1 | |
| Employed | Yes | 61.6 | 21.1 | <0.0001 | 60.0 | 19.1 | <0.0001 | 62.8 | 22.5 | <0.0001 |
| No | 52.7 | 25.1 | | | 51.8 | 27.4 | | 53.6 | 22.2 | |
| Number of interactions with friends | Everyday | 43.2 | 27.8 | <0.0001 | 59.1 | 22.0 | <0.0001 | 58.2 | 20.4 | <0.0001 |
| 1–6 times a week | 56.4 | 24.2 | | | 52.7 | 26.4 | | 60.1 | 21.3 | |
| None | 58.6 | 21.1 | | | 45.1 | 30.2 | | 41.2 | 25.3 | |
| Income | Yes | 58.8 | 22.2 | <0.0001 | 55.8 | 24.1 | <0.0001 | 60.9 | 20.9 | <0.0001 |
| No | 54.2 | 24.7 | | | 53.3 | 26.3 | | 55.2 | 23.0 | |
| Smoking status | Smoker | 55.8 | 23.7 | <0.0001 | 54.0 | 25.4 | <0.0001 | 57.7 | 21.7 | <0.0001 |
| Former smoker | 52.7 | 26.0 | | | 52.9 | 27.6 | | 52.5 | 24.5 | |
| Never smoker | 53.2 | 26.6 | | | 52.6 | 28.1 | | 53.7 | 25.9 | |
| Alcohol use | Drinker | 60.7 | 21.8 | <0.0001 | 62.1 | 20.7 | <0.0001 | 59.8 | 22.5 | <0.0001 |
| Former drinker | 45.9 | 25.1 | | | 45.5 | 26.8 | | 46.7 | 22.4 | |
| Never drinker | 53.9 | 24.9 | | | 52.6 | 26.9 | | 55.5 | 22.4 | |
| Depressive symptoms | Yes | 42.7 | 24.3 | <0.0001 | 42.5 | 26.6 | <0.0001 | 42.9 | 21.0 | <0.0001 |
| No | 57.7 | 23.6 | | | 56.6 | 25.1 | | 58.7 | 22.1 | |
| Chronic disease | Yes | 56.9 | 24.1 | <0.0001 | 54.1 | 26.1 | <0.0001 | 59.7 | 21.7 | <0.0001 |
| No | 52.6 | 24.6 | | | 53.0 | 26.0 | | 52.2 | 23.2 | |

Total 55.0 24.4 53.6 26.0 56.3 22.6
To investigate the association between offspring and QOL among cancer patients and survivors, we extracted a study sample using 1:1 propensity score matching (PSM), adjusting for proportion of cohabitating offspring, average number of offspring, number of male and female offspring, age, sex, residential region, education, marital status, employment status, number of interactions with friends, income, smoking status, alcohol use, self-rated health, Table 3.

### Table 3. Adjusted Association between Number of Offspring and Quality of Life among Cancer Patients and Survivors

|                          | Cancer patients | Non-cancer patients |
|--------------------------|-----------------|---------------------|
|                          | Estimate   | SE       | P-value | Estimate   | SE       | P-value |
| **Number of offspring**  |            |          |         |            |          |         |
| 0                        | -2.831     | 5.508    | 0.623   | -9.038     | 4.130    | 0.065   |
| 1                        | 3.590      | 2.978    | 0.267   | -11.258    | 2.430    | 0.002   |
| 2 (ref)                  |            |          |         |            |          |         |
| 3                        | 2.531      | 2.059    | 0.259   | 0.088      | 1.795    | 0.962   |
| 4                        | 2.739      | 2.660    | 0.337   | -0.366     | 2.284    | 0.877   |
| ≥5                       | 7.336      | 2.840    | 0.036   | -4.881     | 2.484    | 0.090   |
| **Proportion of cohabitating offspring** |            |          |         |            |          |         |
| 0                        | -2.497     | 2.330    | 0.289   | 1.258      | 1.683    | 0.458   |
| ≥0 and ≤0.499 (ref)      | -1.131     | 2.850    | 0.693   | 2.556      | 2.285    | 0.267   |
| ≥0.500                   |            |          |         |            |          |         |
| **Average age of offspring (years)** |            |          |         |            |          |         |
| Q1 (≤31.3)               | -1.861     | 3.612    | 0.608   | -0.308     | 2.157    | 0.887   |
| Q2 (31.4–44.9)           | 4.345      | 2.261    | 0.058   | 3.680      | 3.029    | 0.228   |
| Q3 (≥45.0) (ref)         |            |          |         |            |          |         |
| **Age (years)**          |            |          |         |            |          |         |
| ≤59                      |            |          |         |            |          |         |
| 60–69                    | -6.068     | 2.455    | 0.065   | 2.267      | 1.921    | 0.241   |
| ≥70                      | -6.479     | 3.362    | 0.058   | -0.430     | 2.748    | 0.876   |
| **Sex**                  |            |          |         |            |          |         |
| Male                     | 5.966      | 2.449    | 0.016   | -1.352     | 1.846    | 0.465   |
| Female (ref)             |            |          |         |            |          |         |
| **Residential region**   |            |          |         |            |          |         |
| Urban (ref)              | -1.403     | 1.715    | 0.499   | -2.348     | 1.419    | 0.282   |
| Rural                    |            |          |         |            |          |         |
| **Education**            |            |          |         |            |          |         |
| ≤Elementary school       | -11.211    | 2.800    | <0.0001 | -6.608     | 2.293    | 0.004   |
| Middle school            | -10.372    | 3.206    | 0.001   | -3.198     | 2.388    | 0.182   |
| High school              | -3.043     | 2.861    | 0.289   | -4.144     | 2.216    | 0.063   |
| ≥College (ref)           |            |          |         |            |          |         |
| **Marital status**       |            |          |         |            |          |         |
| Single (ref)             |            |          |         |            |          |         |
| Married                  | 3.861      | 2.013    | 0.081   | 2.007      | 1.710    | 0.268   |
| Employed                 | 3.309      | 2.019    | 0.109   | 1.475      | 1.501    | 0.330   |
| No (ref)                 |            |          |         |            |          |         |
| **Number of interactions with friends** |            |          |         |            |          |         |
| Everyday (ref)           |            |          |         |            |          |         |
| 1–6 times a week         | -3.084     | 1.754    | 0.081   | -3.084     | 1.754    | 0.081   |
| None                     | -13.270    | 2.519    | <0.0001 | -13.270    | 2.519    | <0.0001 |
| **Income**               |            |          |         |            |          |         |
| Yes                      | -1.576     | 2.626    | 0.555   | 0.203      | 1.652    | 0.903   |
| No (ref)                 |            |          |         |            |          |         |
| **Smoking status**       |            |          |         |            |          |         |
| Smoker                   | 1.319      | 2.925    | 0.657   | -0.644     | 2.262    | 0.780   |
| Former smoker            | -2.514     | 2.961    | 0.406   | -2.029     | 2.269    | 0.385   |
| Never smoker (ref)       |            |          |         |            |          |         |
| **Alcohol use**          |            |          |         |            |          |         |
| Drinker                  | 2.087      | 2.176    | 0.344   | 1.315      | 1.621    | 0.422   |
| Former drinker           | -4.141     | 2.129    | 0.060   | -4.134     | 2.065    | 0.052   |
| Never drinker (ref)      |            |          |         |            |          |         |
| **Depressive symptoms**  |            |          |         |            |          |         |
| Yes                      | -9.967     | 2.137    | <0.0001 | -12.271    | 1.933    | <0.0001 |
| No (ref)                 |            |          |         |            |          |         |
| **Chronic disease**      |            |          |         |            |          |         |
| Yes                      | 1.274      | 1.842    | 0.491   | 1.493      | 1.505    | 0.323   |
| No (ref)                 |            |          |         |            |          |         |
| **Year**                 |            |          |         |            |          |         |
| 2008                     | -0.404     | 2.220    | 0.856   | -2.208     | 1.821    | 0.226   |
| 2009                     | 1.201      | 2.085    | 0.565   | -1.234     | 1.805    | 0.495   |
| 2010                     | 0.637      | 1.981    | 0.748   | -1.880     | 1.735    | 0.279   |
| 2011 (ref)               |            |          |         |            |          |         |
depressive symptoms, and chronic disease. Of the 490 research subjects included 245 were cancer patients and survivors and 245 were non-cancer patients and survivors.

**Independent variables**

Number of offspring, our independent variable, was divided into five categories: 0, 1, 2, 3, 4, and 5 or more.

**Control variables**

The proportion of cohabitating offspring was the number of offspring living with the parent divided by the total number of offspring; it was divided into three categories: 0, >0 and ≤0.499, and ≥0.500. Average age of offspring was divided into three categories: Q1 (≤31.3 years), Q2 (31.4-44.9 years), and Q3 (≥45.0 years). We also included the number of male and female offspring as covariates.

Age groups were divided into three categories: ≤59, 60-69 and ≥70 years. Education status was divided into four categories: elementary school or less, middle school, high school, and college or more. Income status was divided into two categories, yes or no, and the number of interactions with friends was divided into three categories: every day, 1-6 times per week, or never. Employment status was divided into two categories: employed and unemployed. Self-rated health, depressive symptoms, daily life restrictions, and number of chronic disease were also included as covariates in our analyses.

**Dependent variables**

Subjective QOL records the respondent’s current overall state on a vertical, visual analogue scale ranging from 0 (worst overall state) to 100 (best overall state), with endpoints labeled ‘best imaginable overall state’ and ‘worst imaginable overall state’. A measure of general well being that includes physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health.

**Analytical approach and statistics**

Analysis of variance (ANOVA) and mixed models were used to investigate the association between offspring and QOL in cancer patients or survivors. For all analyses, the criterion for statistical significance was p≤0.05, two-tailed. All analyses were conducted using the SAS statistical software package, version 9.2 (SAS Institute Inc., Cary, NC, USA).

**Propensity score matching**

PSM is a statistical matching technique that attempts to estimate the effect of a treatment, policy, or other intervention by accounting for covariates that predict whether or not a treatment is received. Propensity scores are used in observational studies to reduce bias.

A propensity score is the predicted probability of an outcome. It has been shown that a sample matched on propensity score will be similar for all covariates considered when computing the propensity score. Thus, matching on propensity score can reduce selection bias in an observational study. Here, the SAS LOGISTIC procedure was used to create propensity scores; we explain the matching macro used to create propensity score matched-pair samples.

SAS software allowed us to perform multivariate logistic regression with the LOGISTIC procedure. The PROC LOGISTIC options allow users to calculate and save the predicted probability of the dependent variable, or the propensity score, for each observation in the data set. This single score (between 0 and 1) represents the relationship between multiple characteristics and the dependent variable. In the case of an observational study, the dependent variable could be a treatment group. The propensity score would then be the predicted probability of receiving the treatment (Rosenbaum and Rubin, 1983).

**Results**

Table 1 lists the general characteristics of the 245 research samples at baseline, after PSM. Mean QOL was 43.3 (SD: 23.5) for those with zero offspring, 46.8 (SD: 29.2) for those with one child, and 55.6 (SD: 21.9) for those with five or more offspring (Table 2).

Table 3 shows the adjusted effect of number of offspring on QOL. For cancer patients with zero offspring, the QOL estimate was -2.831 lower (SE: 5.508, p-value: 0.623) than for those with two offspring, while for those with five or more offspring the estimate was 7.336 higher (SE: 2.840, p-value: 0.036). Table 4 shows the adjusted
effect of offspring composition on QOL. For cancer patients and survivors with three or more female offspring, the QOL estimate was 6.427 higher (SE: 2.670, p-value: 0.047) than for those with zero female offspring.

**Discussion**

In this study, our primary purpose was to investigate the impact of offspring on QOL among cancer patients and survivors using longitudinal models to analyze a nationally representative sample of South Korean adults 45 years or older.

The associations were independent of other offspring-related variables (proportion of cohabitating offspring, number of male offspring, number of female offspring, and average age of offspring), sociodemographic variables (age, sex, education, marital status, number of interactions with friends, income, and employment status), health risk behavior variables (smoking status and alcohol consumption), health status (depressive symptoms and number of chronic diseases), and year of KLoSA data survey.

QOL is difficult to define and varies among individuals. It has been argued that QOL is a uniquely personal perception. A previous study indicates that patients define QOL in different ways (Montazeri et al., 1996). For example, in that study, a significant proportion of patients defined QOL as health (42%), enjoyment of life (25%), and family life (24%), while the majority of the same individuals stated that a good QOL for themselves consisted of family life (58%), health (51%), and social life and leisure activities (43%). As in this previous study, we found family life has a relatively large effect on the QOL of patients with cancer.

Questions of QOL in cancer patients and survivors become increasingly important as long-term survival increases (Gotay and Muraoka, 1998; Carver et al., 2006). One common definition used in the literature is an ‘individual’s’ perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, and standards (WHO). Although QOL is generally regarded as a multidimensional concept (Cummins, 2005), QOL dimensions that have been identified from a family perspective have focused on emotional health, relationships, and an enjoyable/meaningful life (Pain et al., 1998).

The importance of family well-being has been stressed in the course of studying cancer (Sherwood et al., 2004). A highly malignant cancer will cause a state of crisis within the family (Salander, 1996; Wideheim et al., 2002), and the affliction limits the patient’s capacity to carry out daily life activities, which increases the burden to the family (Wideheim et al., 2002).

Many previous studies (Evenson and Simon, 2005; Buber, 2008) on the association between offspring and health outcomes have identified relatively large, significant, and positive U-shaped effects. However, our results suggest that QOL in patients with cancer significantly increases with number of offspring, in contrast to what was observed in controls (Table 3). We also found that as the number of female offspring increased among cancer patients and survivors, QOL increased.

This study has a number of strengths and limitations. One strength is that the participants in the survey are representative of the overall population. Because the sample size is large, the results can be generalized to South Korean adults aged 45 years or older.

Nevertheless, we do acknowledge possible sample bias. First, respondents’ reports were subjective, so recall bias may exist. Second, personality characteristics are likely to be associated with QOL; failure to include them in our statistical models could lead to an exaggeration of the association of interest. Third, we did not measure the effect of multiple births because of a small sample size. Fourth, although we analyzed longitudinal data, the results could reflect reverse causality between QOL and number of offspring. Fifth, although severity of disease and survival rate at 5 years affect QOL in cancer patients and survivors, we did not adjust for these factors because of insufficient data. Finally, although some recent investigations have focused on QOL in infertile patients (Bolsoy et al., 2010; Aarts et al., 2011), we could not determine fertility status in this study.

In conclusions, this article provides evidence for an association between number of offspring and QOL in cancer patients and survivors. In contrast to a previous study performed in the general population, offspring are important for cancer patients and survivors. Further investigations are required to more precisely measure QOL in cancer patients and survivors; to achieve this, research into the best ways of measuring and assessing QOL in cancer patients and survivors must continue.

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