

2013년 8월

박사학위논문

한국인 암 생존자에서 삶의 질에  
영향을 미치는 요인

조선대학교 대학원

의학과

오 명 근

한국인 암 생존자에서 삶의 질에  
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Factors associated with quality of life among cancer  
survivors in Korea: The Korea National Health and  
Nutrition Examination Survey

2013년 8월 23일

조선대학교 대학원

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이 논문을 의학 박사학위신청 논문으로 제출함

2013년 4월

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# 오명근의 박사학위논문을 인준함

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2013년 6월

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## 초 록

### 한국인 암 생존자에서 삶의 질에 영향을 미치는 요인

오 명 근

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**목적:** 조기검진, 치료기술 향상 등으로 암 생존율이 증가함에 따라 암 생존자의 삶의 질에 대한 관심이 증가하고 있다. 이에 본 연구에서는 국민건강영양조사를 이용해 한국인 암 생존자를 대상으로 삶의 질에 미치는 요인을 평가하고자 하였다.

**연구방법:** 제3기(2005), 제4기(2007-2009), 제5기(2010-2011) 국민건강영양조사에 참여한 대상자 중 의사로부터 암을 진단받은 적이 있다고 응답한 783명을 대상으로 설문조사를 통해 대상자의 인구학적 특성, 건강행태, 임상적 특성 및 삶의 질을 조사하였다. 삶의 질은 EuroQol-5Dimension(EQ-5D)를 이용하여 EQ-5D index와 5가지 영역의 문제 수준을 파악하였으며, 대상자의 일반적 특성 및 삶의 질 현황은 빈도분석과 기술통계로 제시하였다. 또한 다중로지스틱회귀분석을 이용하여 EQ-5D 5가지 영역의 문제수준과 관련요인을 파악하였고, 다중회귀분석을 이용하여 EQ-5D index 관련요인을 파악하였다.

**결과:** 총 대상자 중 여자가 67.3%(524명)였고, 19-44세가 13.3%(81명), 45-64세 49.7%(362명), 65세 이상이 37.0%(340명)으로 평균 연령은 59세였다. 대상자의 약 52%가 45-64세에 암을 진단 받았으며, 암 진단 시 평균 연령은 52.1세였다. 생존 기간의 경우 5년 이하가 54.8%였고, 11년 이상은 25.0%였다. EQ-5D 5가지 영역



중 문제가 있다고 응답한 경우는 통증/불편이 43.7%로 가장 높았고, 다음으로 운동능력 32.9% 순이었다. EQ-5D index는 평균 0.867이었고, 교육수준이 낮은 경우( $\beta=-0.069$ ,  $p=0.001$ ), 가정소득이 낮은 경우( $\beta=-0.071$ ,  $p<0.001$ ), 진단 시 연령이 높거나( $\beta=-0.058$ ,  $p=0.044$ ), 생존기간이 늘어날수록( $\beta=-0.049$ ,  $p=0.011$ ) EQ-5D index가 유의하게 감소하였다.

**결론:** 본 연구를 통해 한국인 암 생존자의 삶의 질 수준 및 관련요인을 파악할 수 있었다. 사회경제적 수준이 낮거나, 진단 시 연령이 높은 경우 및 생존기간이 긴 경우 삶의 질이 유의하게 낮았다. 암환자의 삶의 질 향상을 위해 이들 요인을 고려한 관리가 필요할 것으로 판단된다.

**핵심어:** 국민건강영양조사, 관련요인, 삶의 질, 생존기간, 암 생존자, 진단 시 연령

# **I. Introduction**

Cancer is a major public health problem in Korea and many other parts of the world, with more than 190,000 new cancer cases diagnosed annually. One in three people develops the disease before the age of 81 years, and one in four deaths results from cancer in Korea (Jung et al., 2013).

Cancer survival rates have been increasing steadily due to earlier detection, increased awareness, and advances in treatment. When all sites in Korea were combined, cancer patients diagnosed between the years 2005-2009 had a 5-year relative survival rate of 62.0% (53.2% in males and 71.4% in females), a notable improvement over previous time periods (Jung et al., 2013). This improvement in the 5-year relative survival rate has increased interest in patients' quality of life (Casso et al., 2004; Matalqah et al., 2011; Vrettos et al., 2012). Along with survival duration, health-related quality of life (HRQoL) is an important outcome measure for cancer patients (Arndt et al., 2004). HRQoL represents elements that directly affect an individual's health, including general well-being and physical, psychological, social, spiritual, and role functioning, (Burström et al., 2001). HRQoL is commonly used as an outcome measure for analyzing the health impact of chronic diseases because patient cooperation forms the core of health plans for such diseases (Lee et al., 2012b).

Previous studies investigated the related factors on HRQoL among cancer survivors. Socio-demographic (e.g., age, income), general health (e.g., medical conditions) and treatment (e.g., adjuvant therapy) characteristics have all been associated with quality of life (QoL) (Arndt et al., 2004; DiSipio et al., 2010). With the recent improvements in relative survival rate, the association between life stage perspectives, such as patient age and the number of years following cancer diagnosis, and QoL was investigated in cancer survivors. The age at diagnosis and the number of years they survived were significant

predictors of QoL outcomes in breast cancer survivors (Cimprich et al., 2002).

Though much research has focused on understanding cancer patients' QoL, most of it investigates the early years of treatment (less than five years post-diagnosis) and older survivors (Casso et al., 2004). Furthermore, many of these studies were based on selective samples of patients from one or a few hospitals, limiting the potential interpretation of these studies (Arndt et al., 2004).

Little is known about QoL of cancer survivors in Korea despite its importance in long-term care. The purpose of our study was to investigate the impact of various factors, such as age at diagnosis and the survival duration, on the HRQoL in a large population-based sample.

## **II. Methods**

### **A. Data source**

The Korea National Health and Nutrition Examination Survey (KNHANES), a cross-sectional, nationally representative survey that has been conducted by the Division of Chronic Disease Surveillance and the Korean Centers for Disease Control and Prevention since 1998, assesses the health and nutritional status of the civilian, non-institutionalized population of Korea. In this study, KNHANES III (2005), IV (2007-2009) and V (2010-2011) were analyzed. The KNHANES III was conducted as short-term surveys over a 2-3 month span every 3 years, while the KNHANES IV and V were each conducted over the span of 1 year. Stratification was conducted based on the 13 areas of Korea (seven metropolitan cities and six provinces), the administrative unit (dong or eup-myeon; Korean units), and the dwelling type (apartment house or others) (Cho et al., 2010).

The KNHANES was completed by 34,145 individuals in 2005, 4,594 in 2007, 9,744 in 2008, 10,533 in 2009, 8,958 in 2010, and 8,518 in 2011. Adults were classified as cancer survivors (N=783) in our study if they had ever been diagnosed with cancer by a physician. KNHANES was approved by the Korea Centers for Disease Control and Prevention Institutional Review Board, and all participants signed a written informed consent.

## **B. Personal characteristics and clinical data**

### **1. Demographic characteristics**

Demographic characteristics included sex, age, marital status (with or without a spouse), education ( $\leq$  elementary school, middle school, high school,  $\geq$  college), household income (classified into quartiles of low, middle-low, middle-high, high) and health insurance (National Health Insurance, Medical Aid Program).

### **2. Health behaviors**

The following health behaviors were assessed: smoking (never, former, current), alcohol drinking (none,  $\leq 1$ /month, 2-4/month,  $\geq 5$ /month), and physical activity (no, yes). Physical activity was measured by frequency (sessions per week) and duration (in minutes) of each session. Subjects were considered physically active if they participated in at least 30 minutes of moderate activity 5 days a week or at least 20 minutes of vigorous physical activity 3 days a week. Subjects who exercised at lower frequencies and/or durations were not considered physically active in our study.

### **3. Cancer-related characteristics**

Participants were classified as cancer survivors if they had been diagnosed with cancer by a physician. Participants were also asked about the cancer site and their age at diagnosis. Time since diagnosis was calculated by subtracting their age at the survey interview from their reported age at the initial cancer diagnosis. If multiple cancer diagnoses were reported, age at first diagnosis was used. No data were collected on existing cancer symptoms or treatments,

so the current status of their cancer was not assessed.

## **C. Quality of life assessment**

HRQoL was assessed using the EuroQoL EQ-5D instrument, a short, generic HRQoL instrument that consists of the EQ-5D descriptive system and the EQ-5D index. The descriptive system assessed five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension had three possible responses: “no problems”, “moderate problems”, and “severe problems”. The EQ-5D health states were defined as a combination of the responses for each item and the survey could yield  $3^5$  (i.e., 243) possible combinations (Kim et al., 2012; Lee et al., 2012a; Vrettos et al., 2012).

The EQ-5D index score was a value attached to an EQ-5D state according to a particular set of weights. Weights for Korean populations were derived by the time trade-off method and have been validated. EQ-5D index scores ranged from -0.171 (i.e., severe problems in all 5 dimensions) to 1.0 (i.e., no problem in all 5 dimensions) on a scale where 0 indicates death and 1.0 indicates perfect health (negative values indicate health status worse than death). The EQ-5D instrument has been translated into Korean, and its validity and test-retest reliability have been demonstrated previously (Nam et al, 2007).

## **D. Statistical analysis**

All values presented were weighted to provide national estimates based on the sampling method. All data analyses were performed using SAS software (version 9.2).

Data obtained from the EQ-5D descriptive system were reported as frequencies and percentages. The three possible responses were dichotomized as “no problem” or “any problem”, and multiple logistic regression analyses were performed with the presence of “any problem” as the dependent variable.

EQ-5D index scores were reported as mean and standard deviation. Multiple regression analysis was used to determine the factors associated with the EQ-5D index.



### **III. Results**

#### **A. General characteristics of cancer survivors**

The descriptive characteristics of our cancer survivors are presented in Table 1. Our sample consisted of 67.3% women. The mean age was 59.0±0.62 years, with 37.0% over 65 years. More than 74% of survivors had a spouse. Less than elementary school education was reported by 40.4% of the survivors and 14.4% had more than a college education. Low and high household incomes were reported by 32.1% and 22.6% of subjects, respectively. Most (94.1%) of the subjects had National Health Insurance.

The majority (65.8%) of subjects never smoked, while 10.5% were current smokers. More than half (54.3%) of the participants did not drink alcohol within the past 30 days and about 12.5% reported drinking  $\geq 5$  times per month. About 19.0% engaged in regular exercise (Table 1).

## **B. Clinical characteristics of cancer survivors**

About 52% survivors were diagnosed with cancer between 45-64 years, with the mean age at diagnosis being  $52.1 \pm 0.69$  years. More than half of cancer survivors were diagnosed 5 years or less before the interview, with the most common cancer type being stomach cancer (Table 2).

### **C. EQ-5D dimensions in cancer survivors**

Of the 243 possible health states on the EQ-5D descriptive system, 76 were selected by the respondents. A health profile of 11111 was rated by 42.2% of the respondents. The health profile 33333 was rated by two respondents.

The pain/discomfort dimension showed the highest proportion of problems, with 43.6% of respondents reporting any problem, followed by the mobility dimension, which showed 32.9% of the participants reporting a problem. The lowest percentage of problems was reported in the self-care dimension (9.4%, Table 3).

In the binary multiple logistic regression on EQ-5D responses, age at diagnosis in the 45-64 and  $\geq 65$ -year age groups was significantly associated with problems in mobility [odds ratios (ORs), 1.83 and 4.38, respectively; 95% confidence intervals (CIs), 1.10-3.06 and 2.13-8.99, respectively], usual activities (ORs, 1.97 and 3.53, respectively; 95% CIs, 1.12-3.46 and 1.68-7.45, respectively) and pain/discomfort dimensions (ORs, 1.65 and 2.34, respectively; 95% CIs: 1.03-2.64 and 1.19-4.61, respectively). Individuals who had been diagnosed more than 11 years prior to the survey had significantly greater odds of reporting problems in the mobility (OR, 2.76; 95% CI, 1.55-4.93), self-care (OR, 2.16; 95% CI, 1.02-4.56), and pain/discomfort (OR, 1.86; 95% CI, 1.11-3.11) dimensions. In general, more problems were reported in lower socio-economic groups than in higher socio-economic groups (Table 4-8).

## **D. EQ-5D index in cancer survivors**

The overall mean EQ-5D index for the total sample was  $0.867 \pm 0.007$ , with index ranging from -0.170 to 1.000. Multiple regression analysis on EQ-5D index values showed that, consistent with multiple logistic regression for reported problems in EQ-5D dimensions, low socio-economic status was significantly associated with low EQ-5D index. A diagnosis age  $\geq 65$  and a time since diagnosis of  $\geq 11$  years were significantly associated with worse EQ-5D index ( $\beta$  -0.058 and -0.049, respectively; SE 0.029 and 0.019, respectively; p-value 0.044 and 0.011, respectively) (Table 9).

## IV. Discussion

We have described the HRQoL of cancer survivors in Korea in terms of the EQ-5D dimensions and EQ-5D index. The EQ-5D is a standardized instrument for determining the quality of health states (Lidgren et al., 2007) and can be applied to a wide range of diseases and treatments (Matalqah et al., 2011). Recently, the EQ-5D has been used to study a variety of cancer patient groups, including groups in which the primary tumor site is the same and groups in which the primary tumor site is different (Vrettos et al., 2012), and a growing body of literature supports its validity and reliability.

The accuracy of our estimated EQ-5D index values in depicting individual health states depends on the accuracy of converting these EQ-5D measures into mean EQ-5D index values. Several previous studies have demonstrated that the differences in health preferences among countries have led to recommendations for nation-specific QoL evaluations (Tsuchiya et al., 2002; Yusof et al., 2012). In this study, we used the assessment reported by Nam et al. (2007) since this study evaluated the general Korean population.

Consistent with other studies, EQ-5D dimensions and index varied significantly with socio-economic group. The EQ-5D index scores were lower in the low-educated group ( $\leq$  elementary school) than in the high-educated group ( $\geq$  college). Individuals with a low household income also had a significantly lower EQ-5D index than those with high household incomes, according to a previous study (Burström et al., 2001).

In this study, pain/discomfort was the most frequently reported EQ-5D dimensions in cancer survivors, with more than 43.7% of the survivors reporting moderate or severe pain/discomfort. This dimension was associated with household income, age at diagnosis and time since diagnosis after adjusting for covariates. According to statistics published by the American Cancer Society in 2002, 50% - 70% of people with cancer experience some

degree of pain, which usually only intensifies as the disease progresses. Less than half get adequate pain relief, which negatively impacts their quality of life. According to previous research, more than half of cancer patients have insufficient pain control, and about a quarter of them actually die in pain (Nersesyan and Slavin, 2007). Regular screening for pain and developing safe and effective treatments for chronic pain will help improve HRQoL in cancer survivors.

The mobility dimension was the second most reported problem in cancer survivors. Data from the English National Health Service showed that moderate or severe mobility difficulties were the most commonly reported dimensions of EQ-5D (Glaser et al., 2013). In a previous prospective cohort study, functional limitations were associated with a significant reduction in all-cause and competing-cause survival, irrespective of clinical, lifestyle, and sociodemographic factors. Failure to address physical functioning may have extensive consequences for the quality of life and longevity among cancer survivors (Braithwaite et al., 2010). Thus, managing mobility will improve both QoL and longevity.

Survivors who were diagnosed with cancer at an older age showed significantly worse HRQoL than their younger counterparts. The association between age at diagnosis and QoL is not completely clear. In a study of 185 women who were under 50 years at diagnosis, 92% rated their health as good or excellent five years after their diagnosis and only 10% said their health had been getting worse. Young women who survived breast cancer without recurrence or the development of other forms of cancer improved their physical and mental well-being compared to their well-being at diagnosis (Bloom et al., 2004). Conversely, Cimprich et al. (2002) reported nonlinear association between age at diagnosis and QoL in breast cancer survivors. Middle-aged women reported better physical well-being than did either younger or older women at the time of diagnosis, and this same trend was

evident in the overall QoL scores. The poorer HRQoL in older patients may be related to poorer overall physical health, including greater fatigue and pain, and psychological factors such as feeling less useful in life, more uncertain about the future, and making fewer positive life changes following their diagnosis and treatment. The younger women reported greater psychological distress related to their diagnosis and treatment, such as appearance and self-identity changes, family distress, and its impact on sexuality. However, the younger patients also reported making more positive life changes as a result of the diagnosis and treatment of cancer than middle-aged or older patients (Cimprich et al., 2002).

This study also found that the amount of time between diagnosis and completion of the survey significantly predicted overall HRQoL. Individuals who had survived at least 11 years past their diagnosis reported worse HRQoL compared to survivors who had been diagnosed less than 5 years ago. This disagrees with a previous study of breast cancer survivors, which showed women who had survived longer after their diagnosis had a better overall quality of life and better psychological and social well-being than those who were diagnosed more recently (Cimprich et al., 2002). Furthermore, a study using data from the 2010 National Health Interview Survey showed that although the duration between the diagnosis and the survey was significantly associated with physical and general health, as well as fatigue and pain HRQoL, it was not a significant predictor of poor physical HRQoL (Weaver et al., 2012).

The inconsistent relationships between age and time since initial diagnosis and HRQoL, respectively, may be due to cancer type and treatment-related variables. Some studies investigated HRQoL within limited types of cancer (Bloom et al., 2004; Cimprich et al., 2002), various types of cancer (Weaver et al., 2012), and treatment-associated variables such as the type of therapy (Cimprich et al., 2002; Weaver et al., 2012). Because of the variability in

cancer types and treatments, we were unable to examine the influence of treatment on HRQoL. Site-specific studies are more appropriate to answer how life stage variables influence long-term HRQoL, particularly if they include cancer-specific HRQoL measures. The EQ-5D is suitable for generically comparing HRQoL of survivors with other adults, but may not fully capture all domains of HRQoL relevant to cancer, such as sexual function.

There are several limitations to using KNHANES data to examine the HRQoL of cancer survivors. First, individuals who had been diagnosed with cancer and subsequently died before the KNHANES took place would not have had the opportunity to participate, possibly creating a selection bias. Second, since the KNHANES did not include information about cancer care status, we were unable to determine the proportion of cancer survivors who were actively dealing with treatment or recurrent/advanced disease versus those living with the disease and/or symptom-free. Finally, since cancer survivors living in nursing homes, long-term care facilities, or hospitals were not included in the KNHANES, our results might not reflect the behaviors of all cancer patients in Korea.

We present unique data on the HRQoL of long-term cancer survivors in Korea and the proportion and number with self-reported levels of HRQoL that may be of clinical concern. Cancer survivors with lower socio-economic status and who were diagnosed with cancer at an older age and with a longer survival period had significantly lower quality of life.

Supportive care services should address HRQoL and the concerns of cancer survivors, as they can persist years after the completion of treatment. Discerning how the life stage at diagnosis might affect HRQoL is important for developing tailored care to improve QoL for cancer survivors. The findings of this study suggest that the diagnosis age and the amount of time elapsed since diagnosis may predict certain patterns of HRQoL.

Cancer survival begins at diagnosis and is an ongoing process throughout



acute and transitional treatment, as well as throughout long-term survival. Thus, assessing age-related issues that affect recovery, adjustment, and HRQoL is essential as soon as the individual is diagnosed. Supportive-care services can be tailored to address and anticipate the specific needs of cancer survivors based on age and survival time. Cancer-care providers can improve long-term HRQoL in cancer patients by paying attention to life-stage issues early in patient treatment, educating themselves on the characteristics of each life stage, and testing theory-based interventions in the clinic. These data represent other clinic- and small region-based samples and identify potentially vulnerable populations of survivors for clinic and public health interventions, guide the implementation of plans that would improve HRQoL in cancer patients, and determine progress toward enhancing life after cancer for the growing population of cancer survivors.

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Table 1. Characteristics of cancer survivors

Characteristics	n (weighted %)
Sex	
Male	259(32.7)
Female	524(67.3)
Age (years)	
19-44	81(13.3)
45-64	362(49.7)
≥ 65	340(37.0)
Mean±SE	59.0±0.62
Marital status	
Without spouse	192(25.7)
With spouse	590(74.3)
Education	
≤Elementary school	360(40.4)
Middle school	122(17.0)
High school	199(28.1)
≥College	101(14.4)
Household income	
Low	263(32.1)
Middle-low	194(25.8)
Middle-high	147(19.6)
High	160(22.6)
Health insurance	
National Health Insurance	726(94.1)
Medical Aid Program	50( 5.9)
Smoking status	
Never	507(65.8)
Former	199(23.7)
Current	75(10.5)
Drinking frequency	
None	435(54.3)
≤1/month	181(23.7)
2-4/month	71( 9.4)
≥5/month	92(12.5)
Physical activity	
No	633(81.0)
Yes	150(19.0)

SE, standard error.

Table 2. Clinical characteristics of cancer survivors

Characteristics	n (weighted %)
Age at diagnosis (years)	
19-44	207(31.1)
45-64	427(51.7)
≥ 65	148(17.2)
Mean±SE	52.1±0.69
Time since diagnosis (years)	
≤5	410(54.8)
6-10	168(20.2)
≥11	204(25.0)
Mean±SE	7.3±0.33
Cancer site <sup>a</sup>	
Stomach	218(24.6)
Liver	39( 5.1)
Colorectum	102(12.7)
Breast <sup>b</sup>	146(28.5)
Cervix <sup>b</sup>	156(28.1)
Lung	37( 3.3)
Other	110(18.8)

<sup>a</sup> Allows for patient to have more than one type of cancer.

<sup>b</sup> Percentages are restricted to women.

SE, standard error.

Table 3. Percentage of reported problems by EQ-5D

Dimension		Total (n=783)
Mobility	No problem	522(67.1)
	Moderate	247(31.0)
	Severe	14( 1.9)
Self-care	No problem	695(90.6)
	Moderate	79( 8.3)
	Severe	9( 1.1)
Usual activities	No problem	587(76.8)
	Moderate	169(20.6)
	Severe	27( 2.5)
Pain/discomfort	No problem	457(56.4)
	Moderate	267(36.5)
	Severe	59( 7.2)
Anxiety/depression	No problem	588(72.3)
	Moderate	171(24.4)
	Severe	24( 3.3)

Values are expressed as frequency (weighted %).

EQ-5D, EuroQol-5Dimension.

Table 4. Prevalence of any problems and associated factors in the mobility dimension of EQ-5D

	Characteristics	% <sup>a</sup>	aOR (95% CI)
Sex	Male	35.5	1.19(0.53-2.68)
	Female	31.6	1.00
Marital status	Without spouse	41.3	1.08(0.65-1.79)
	With spouse	29.7	1.00
Education	≤Elementary school	53.1	6.62(3.04-14.43)
	Middle school	31.4	4.8(2.13-10.83)
	High school	17.4	2.35(1.05-5.28)
	≥College	8.3	1.00
Household income	Low	53.3	3.75(1.75-8.04)
	Middle-low	35.2	2.83(1.39-5.76)
	Middle-high	20.7	1.49(0.58-3.80)
	High	9.6	1.00
Health insurance	National Health Insurance	31.2	1.00
	Medical Aid Program	58.5	1.66(0.73-3.80)
Smoking status	Never	29.6	1.00
	Former	39.3	1.05(0.49-2.26)
	Current	37.0	1.12(0.49-2.57)
Drinking frequency	None	40.8	1.00
	≤1/month	21.7	0.69(0.36-1.29)
	2-4/month	27.4	1.11(0.55-2.22)
	≥5/month	22.8	0.50(0.22-1.11)
Physical activity	No	34.6	1.13(0.61-2.09)
	Yes	25.5	1.00
Age at diagnosis (years)	19-44	17.7	1.00
	45-64	33.3	1.83(1.10-3.06)
	≥65	59.0	4.38(2.13-8.99)
Time since diagnosis (years)	≤5	28.0	1.00
	6-10	32.6	1.41(0.76-2.62)
	≥11	43.8	2.76(1.55-4.93)

<sup>a</sup>Weighted %.

EQ-5D, EuroQol-5Dimension; aOR, adjusted odds ratio; CI, confidence interval.



Table 5. Prevalence of any problems and associated factors in the self-care dimension of EQ-5D

	Characteristics	% <sup>a</sup>	aOR (95% CI)
Sex	Male	13.5	2.47(0.67-9.11)
	Female	7.3	1.00
Marital status	Without spouse	13.7	1.50(0.75-3.00)
	With spouse	7.9	1.00
Education	≤Elementary school	13.7	1.37(0.43-4.39)
	Middle school	7.4	1.64(0.47-5.70)
	High school	6.2	1.11(0.32-3.88)
	≥College	5.9	1.00
Household income	Low	18.2	3.19(0.87-11.69)
	Middle-low	6.3	1.51(0.40-5.73)
	Middle-high	2.0	0.57(0.10-3.37)
	High	2.8	1.00
Health insurance	National Health Insurance	7.7	1.00
	Medical Aid Program	32.7	2.87(1.18-6.94)
Smoking status	Never	7.1	1.00
	Former	13.1	0.72(0.19-2.77)
	Current	15.4	0.93(0.26-3.32)
Drinking frequency	None	12.7	1.00
	≤1/month	2.7	0.22(0.07-0.74)
	2-4/month	5.3	0.80(0.19-3.38)
	≥5/month	11.2	0.80(0.30-2.17)
Physical activity	No	10.8	2.86(0.87-9.38)
	Yes	3.3	1.00
Age at diagnosis (years)	19-44	4.4	1.00
	45-64	9.1	1.58(0.66-3.78)
	≥65	19.0	2.58(0.99-6.76)
Time since diagnosis (years)	≤5	8.8	1.00
	6-10	8.8	1.11(0.50-2.46)
	≥11	11.1	2.16(1.02-4.56)

<sup>a</sup>Weighted %.

EQ-5D, EuroQol-5Dimension; aOR, adjusted odds ratio; CI, confidence interval.

Table 6. Prevalence of any problems and associated factors in the usual activities dimension of EQ-5D

	Characteristics	% <sup>a</sup>	aOR (95% CI)
Sex	Male	24.6	0.97(0.41-2.28)
	Female	22.4	1.00
Marital status	Without spouse	33.9	1.56(0.88-2.78)
	With spouse	19.2	1.00
Education	≤Elementary school	34.8	3.23(1.25-8.38)
	Middle school	19.7	3.01(1.12-8.10)
	High school	16.3	2.28(0.84-6.18)
	≥College	8.2	1.00
Household income	Low	36.5	2.27(0.95-5.46)
	Middle-low	23.6	1.81(0.84-3.88)
	Middle-high	13.5	0.98(0.36-2.64)
	High	9.6	1.00
Health insurance	National Health Insurance	21.5	1.00
	Medical Aid Program	45.3	1.42(0.66-3.05)
Smoking status	Never	20.8	1.00
	Former	28.9	1.23(0.51-2.97)
	Current	25.8	1.07(0.45-2.52)
Drinking frequency	None	29.6	1.00
	≤1/month	14.0	0.59(0.29-1.21)
	2-4/month	16.8	0.96(0.38-2.41)
	≥5/month	18.4	0.66(0.28-1.54)
Physical activity	No	25.3	1.66(0.79-3.50)
	Yes	13.9	1.00
Age at diagnosis (years)	19-44	11.9	1.00
	45-64	23.3	1.97(1.12-3.46)
	≥65	43.1	3.53(1.68-7.45)
Time since diagnosis (years)	≤5	22.6	1.00
	6-10	19.9	0.92(0.48-1.77)
	≥11	27.0	1.63(0.79-3.36)

<sup>a</sup>Weighted %.

EQ-5D, EuroQol-5Dimension; aOR, adjusted odds ratio; CI, confidence interval.

Table 7. Prevalence of any problems and associated factors in the pain/discomfort dimension of EQ-5D

	Characteristics	% <sup>a</sup>	aOR (95% CI)
Sex	Male	39.3	0.55(0.26-1.13)
	Female	45.7	1.00
Marital status	Without spouse	50.4	1.01(0.60-1.70)
	With spouse	41.1	1.00
Education	≤Elementary school	56.8	1.68(0.84-3.38)
	Middle school	42.3	1.75(0.84-3.65)
	High school	34.6	1.30(0.68-2.51)
	≥College	26.2	1.00
Household income	Low	58.3	2.45(1.40-4.28)
	Middle-low	47.7	2.09(1.15-3.79)
	Middle-high	32.5	1.15(0.62-2.17)
	High	25.2	1.00
Health insurance	National Health Insurance	42.0	1.00
	Medical Aid Program	68.2	1.64(0.69-3.94)
Smoking status	Never	43.3	1.00
	Former	46.7	1.46(0.71-2.99)
	Current	39.4	1.12(0.47-2.64)
Drinking frequency	None	50.6	1.00
	≤1/month	37.3	0.80(0.48-1.33)
	2-4/month	36.3	0.84(0.41-1.72)
	≥5/month	32.5	0.65(0.34-1.25)
Physical activity	No	45.8	1.30(0.75-2.26)
	Yes	34.3	1.00
Age at diagnosis (years)	19-44	32.7	1.00
	45-64	45.6	1.65(1.03-2.64)
	≥65	57.6	2.34(1.19-4.61)
Time since diagnosis (years)	≤5	39.7	1.00
	6-10	43.9	1.21(0.71-2.07)
	≥11	52.0	1.86(1.11-3.11)

<sup>a</sup>Weighted %.

EQ-5D, EuroQol-5Dimension; aOR, adjusted odds ratio; CI, confidence interval.

Table 8. Prevalence of any problems and associated factors in the anxiety/depression dimension of EQ-5D

	Characteristics	% <sup>a</sup>	aOR (95% CI)
Sex	Male	21.6	0.63(0.29-1.35)
	Female	30.6	1.00
Marital status	Without spouse	39.7	1.66(0.97-2.84)
	With spouse	23.3	1.00
Education	≤Elementary school	32.7	0.81(0.40-1.63)
	Middle school	17.8	0.47(0.21-1.03)
	High school	27.2	0.81(0.39-1.68)
	≥College	26.3	1.00
Household income	Low	37.1	3.25(1.57-6.72)
	Middle-low	29.3	2.46(1.25-4.85)
	Middle-high	23.3	1.72(0.82-3.59)
	High	15.9	1.00
Health insurance	National Health Insurance	26.2	1.00
	Medical Aid Program	50.1	1.67(0.72-3.85)
Smoking status	Never	29.1	1.00
	Former	26.1	1.24(0.57-2.70)
	Current	23.3	0.77(0.29-2.07)
Drinking frequency	None	29.9	1.00
	≤1/month	24.9	0.86(0.49-1.49)
	2-4/month	30.2	1.19(0.53-2.70)
	≥5/month	22.7	0.89(0.40-1.99)
Physical activity	No	28.7	1.10(0.62-1.94)
	Yes	23.6	1.00
Age at diagnosis (years)	19-44	28.6	1.00
	45-64	28.2	1.02(0.61-1.73)
	≥65	24.5	0.54(0.26-1.14)
Time since diagnosis (years)	≤5	27.4	1.00
	6-10	27.9	0.95(0.53-1.69)
	≥11	28.1	0.80(0.48-1.36)

<sup>a</sup>Weighted %.

EQ-5D, EuroQol-5Dimension; aOR, adjusted odds ratio; CI, confidence interval.

Table 9. EQ-5D index and associated factors by multiple linear regression

	Characteristics	EQ-5D index <sup>a</sup>	$\beta$ (SE)	p-value
Sex	Male	0.857(0.016)	-0.009(0.021)	0.668
	Female	0.871(0.007)	Reference	
Marital status	Without spouse	0.831(0.013)	-0.007(0.017)	0.696
	With spouse	0.880(0.008)	Reference	
Education	≤ Elementary school	0.803(0.012)	-0.069(0.020)	0.001
	Middle school	0.897(0.012)	-0.026(0.018)	0.156
	High school	0.907(0.011)	-0.018(0.017)	0.285
	≥ College	0.929(0.013)	Reference	
Household income	Low	0.799(0.012)	-0.071(0.018)	<0.001
	Middle-low	0.861(0.016)	-0.045(0.017)	0.010
	Middle-high	0.918(0.012)	-0.001(0.017)	0.955
	High	0.939(0.010)	Reference	
Health insurance	NHI	0.876(0.007)	Reference	0.202
	MAP	0.740(0.030)	-0.070(0.054)	
Smoking status	Never	0.879(0.006)	Reference	0.755
	Former	0.838(0.019)	-0.007(0.022)	
	Current	0.859(0.028)	0.008(0.029)	
Drinking frequency	None	0.838(0.010)	Reference	0.326
	≤ 1/month	0.910(0.011)	0.030(0.016)	
	2-4/month	0.899(0.019)	0.012(0.023)	
	≥ 5/month	0.883(0.023)	0.026(0.027)	
Physical activity	No	0.857(0.008)	-0.024(0.014)	0.094
	Yes	0.909(0.012)	Reference	
Age at diagnosis (years)	19-44	0.906(0.009)	Reference	0.532
	45-64	0.870(0.009)	-0.012(0.019)	
	≥ 65	0.786(0.019)	-0.058(0.029)	
Time since diagnosis (years)	≤ 5	0.879(0.008)	Reference	0.661
	6-10	0.875(0.012)	-0.008(0.017)	
	≥ 11	0.832(0.016)	-0.049(0.019)	

<sup>a</sup>Values are expressed as mean(standard deviation).

EQ-5D, EuroQol-5Dimension; SE, standard error; NHI, National Health Insurance; MAP, Medical Aid Program.