

# Demographic and Disease Characteristics Associated With Non-Hodgkin Lymphoma Survivors' Quality of Life: Does Age Matter?

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Understanding quality-of-life (QOL) domains among non-Hodgkin lymphoma (NHL) survivors is a growing area of interest. NHL is the sixth most common cancer in the United States (National Cancer Institute [NCI], 2012), and treatments such as chemotherapy, biologic therapy, and stem cell transplantation have improved survival of patients with NHL to a five-year rate of 68% (Horner et al., 2009). However, NHL remains an illness that elicits concerns related to late and long-term effects of QOL.

QOL is an accepted outcome measure in cancer research, but little is known about the moderating effect of age on QOL in NHL survivors. Moderators are independent variables that affect the strength and direction of the association between another independent variable and the outcome variable and help to determine when the relationship occurs (Bennett, 2000). Age may moderate the relationships between other demographic and disease characteristics and QOL. Therefore, interface of age on overall QOL and its determinants must be understood.

Studies have evaluated the impact of sociodemographic and disease characteristics on QOL; however, limited published reports exist in NHL literature to provide insight for clinicians and researchers on the moderated effect of age and its association with QOL. Leak, Mayer, and Smith (2011) reviewed QOL domains of older NHL survivors and the impact cancer had on survivors' health and found that most studies lacked conceptual or theoretical frameworks and representation of sociodemographic diversity, particularly age. NHL research has focused primarily on examining the impact of NHL and its treatment on survivors' QOL. Oerlemans, Mols, Nijziel, Lybeert, and van de Poll-Franse (2011) systematically reviewed lymphoma studies and found that having higher education, being married or living with a partner, and being male were

**Purpose/Objectives:** To examine demographic and disease characteristics by age and the moderating effect of age on quality of life (QOL) among non-Hodgkin lymphoma (NHL) survivors.

**Design:** A cross-sectional, secondary analysis study of NHL survivors.

**Setting:** Two North Carolina cancer registries.

**Sample:** 741 NHL survivors with a mean age of 62 years and a mean time since diagnosis of 10 years.

**Methods:** Mailed surveys were sent to individuals treated for NHL. All analyses were conducted using SPSS®, version 18.0. Multiple regression was used to analyze relationships among demographic and disease characteristics, age, and QOL.

**Main Research Variables:** Demographic, disease, and clinical characteristics on QOL.

**Findings:** In relation to QOL, income and gender were moderated by age; for example, younger survivors who earned less than \$30,000 annually had a poorer QOL. Women reported a higher QOL than men.

**Conclusions:** Age was a moderator for income and an indicator for how income could affect care of younger survivors. Men reported a lower QOL than women and gender-specific resources may be helpful to them.

**Implications for Nursing:** Nursing research should focus on age-sensitive resources targeted for younger NHL survivors.

**Knowledge Translation:** Age is an important characteristic that impacts overall health-related QOL. Oncology nurses are instrumental in identifying patients at all ages who could benefit from age-specific resources.

associated with higher QOL in various cancer populations, including NHL.

Addressing the association between age and personal characteristics could assist clinicians in identifying patients for whom age-appropriate cancer care is recommended. The purpose of the current study

was to explore the relationship of demographic and disease characteristics to QOL and examine the moderating effect of age among NHL survivors.

## Methods

A cancer survivor adaptation (CSA) model of QOL was a guide for the current study and provided a theoretical argument to move NHL research beyond examining associations to explaining the components of the model (Naus, Ishler, Parrott, & Kovacs, 2009). The three-component model (personal characteristics, a moderator, and outcomes) proposed that personal characteristics (demographic or disease factors) have a relationship with QOL, and age may affect that relationship or its strength. The outcome variable for that model was QOL.

Surveys were mailed to individuals treated for NHL from 2005–2006 at one of two comprehensive cancer centers in the southeastern United States: Duke University in Durham, NC, and the University of North Carolina at Chapel Hill (UNC). Eligible individuals were aged 18 years or older, at least two years postdiagnosis, and with or without active disease. The response rate was 74%, and institutional review board approval was received from Duke and UNC. The current study was a secondary analysis of a cross-sectional study of NHL survivors that aimed to estimate the prevalence and risk factors of post-traumatic stress disorder symptoms in survivors of adult NHL who were at least two years postdiagnosis (Smith, Zimmerman, Williams, Preisser, & Clipp, 2008).

## Sample

The study sample included 741 NHL survivors (see Table 1) who were an average age of 62 years (SD = 13.4) at the time of study. The mean age for survivors younger than 65 (n = 419) was 53 years (SD = 9.3); the mean age for those older than 65 (n = 322) was 74 years (SD = 6.4). The mean time since diagnosis for the sample was 10.2 years (SD = 7.1). Disease characteristics for the sample included 204 survivors (28%) in stage I and 178 (24%) in stage IV (see Table 2). Most commonly reported comorbidities were heart disease (19%), high blood pressure (18%), lung disease (17%), and diabetes (14%).

**Table 1. Study Sample Demographic Characteristics (N = 741)**

Characteristic	Younger Than 65 Years (n = 419)		65 Years or Older (n = 322)		All Survivors		p
	n	%	n	%	n	%	
<b>Gender</b>							0.312
Male	220	53	157	49	377	51	
Female	199	47	165	51	364	49	
<b>Race</b>							0.013
Caucasian	347	83	293	91	640	86	
Minority	72	17	29	9	101	14	
<b>Ethnicity</b>							0.059
Hispanic	10	2	2	1	12	2	
Non-Hispanic	409	98	320	99	729	98	
<b>Education</b>							–
College graduate	197	47	112	35	309	42	
Not a college graduate	222	53	210	65	432	58	
<b>Marital status</b>							–
Married or living with partner	328	78	240	75	568	77	
Not married or living with partner	91	22	81	25	172	23	
Not reported	–	–	1	< 1	1	< 1	
<b>Employment status</b>							–
Retired or unemployed	150	36	277	86	427	58	
Employed	269	64	45	14	314	42	
<b>Annual income (\$)</b>							–
Less than 30,000	93	22	109	34	202	27	
30,000–59,999	111	27	117	36	228	31	
60,000–89,999	89	21	42	13	131	18	
90,000 or greater	126	30	54	17	180	24	

Note. Because of rounding, not all percentages total 100.

Survivors younger than age 65 were more likely to be a racial minority, college-educated, married or living with a partner, and employed. Younger survivors also had higher annual incomes than older survivors. No age differences existed for chemotherapy or radiation therapy; however, younger survivors were more likely to have undergone biologic therapy or hematopoietic stem cell transplantation than older survivors. Comorbidities were more common in older survivors, with 28% having three or more, compared to 23% in younger survivors.

## Instruments

**Demographic and disease characteristics:** Sociodemographic and disease-related characteristics were self-reports obtained from Duke and UNC tumor registries. NHL type and stage were provided from the tumor registry and the other demographics were self-reported. Comorbidities were measured with the **self-administered comorbidity questionnaire (SCQ)** (Sangha, Stucki, Liang, Fossel, & Katz, 2003). That questionnaire was used to assess past and current health conditions including heart disease, high blood pressure, lung disease, diabetes, ulcer or stomach

disease, kidney disease, liver disease, anemia or other blood disease, cancer other than lymphoma or non-melanoma skin cancer, depression, osteoarthritis, degenerative arthritis, back pain, and rheumatoid arthritis. A binary answer (yes = 1 or no = 0) was supplied for each question. The total comorbidity score ranged from 0–30, with higher scores indicating a greater comorbidity burden and lower scores indicating a lower burden. The mean total comorbidity score for the sample was 5.6 (SD = 4.8).

**Quality-of-life outcome:** The 27-item **Functional Assessment of Cancer Therapy–General (FACT-G), version 4** (Cella et al., 1993; Cella, Webster, & Cashy, 2005), was used to measure cancer-related QOL. A higher score indicated a higher perception of QOL. The FACT-G scores range from 0–108. Four subscales total the sum for FACT-G: physical well-being (PWB), social/family well-being (SFWB), emotional well-being (EWB), and functional well-being (FWB). Evidence of satisfactory reliability and validity for FACT-G has been reported in psychometric studies (Cella et al., 1993, 2005). In the parent study, the reliability of the FACT-G total score was 0.93 (Smith et al., 2008).

### Data Analyses

All analyses were conducted using SPSS®, version 18.0. Multiple regression was used to analyze relationships among demographic and disease characteristics, age, and QOL. The associations among QOL and demographic or disease characteristics in the unmoderated multiple regression model are provided in Table 3.

The regression model included demographic and disease characteristics that were statistically significant (all at  $p < 0.05$ ) in bivariate analyses with QOL. The significant demographic characteristics in that model were age, gender, annual income, education, and employment status. Significant disease characteristics were total comorbidity scores, some treatment types, and years since diagnosis. Those variables were jointly entered into the model, and the final model only retained those predictors that were significant at  $p < 0.05$  (see Table 3, Model 1). To test

for moderation by age, the interaction between each demographic or disease characteristic and age was added to the model separately, and the significant interactions were jointly added to a single model (see Table 3, Model 2). All variables had less than 5% missing data except for cancer stage (13%), which was excluded from the analyses (see Figure 1).

## Results

The FACT-G total mean score was 85.3 (SD = 16.9), with a range of 10–108 for the sample. The QOL subscales' mean scores were PWB = 22.7, range = 0–28; SFWB = 22.2, range = 4–28; EWB = 19.6, range = 0–24; and FWB = 20.7, range = 0–28. NHL survivors had higher QOL mean scores on all domains (see Table 4). Higher QOL was

**Table 2. Study Sample Disease Characteristics (N = 741)**

Characteristic	Younger Than 65 Years (n = 419)		65 Years or Older (n = 322)		All Survivors		p
	n	%	n	%	n	%	
<b>NHL histology</b>							0.244
Indolent	202	48	163	51	365	49	
Aggressive	200	48	135	42	335	45	
Not reported	17	4	24	8	41	6	
<b>Stage at diagnosis</b>							0.249
I	108	26	96	30	204	28	
II	78	19	59	18	137	18	
III	79	19	46	14	125	17	
IV	108	26	70	22	178	24	
Not reported	46	11	51	16	97	13	
<b>Currently in remission</b>							0.415
Yes	321	77	258	80	579	78	
No	60	14	37	12	97	13	
Do not know	33	8	25	8	63	9	
Not reported	5	1	2	< 1	2	< 1	
<b>Currently receiving treatment</b>							0.041
Yes	69	17	36	11	105	14	
No	350	84	286	89	636	86	
<b>Treatments received<sup>a</sup></b>							
Chemotherapy	340	81	252	78	592	80	0.331
Radiation therapy	214	51	144	45	358	48	0.086
Surgery	133	32	90	28	223	30	0.245
Biologic therapy	150	36	73	23	223	30	–
Bone marrow or stem cell transplantation	95	23	21	7	116	16	–
Other therapy	54	13	33	10	87	12	0.269
Not reported	11	3	7	2	18	2	–
<b>Number of comorbidities</b>							0.001
0	71	17	13	4	84	11	
1	95	23	43	14	138	19	
2	78	19	56	17	134	18	
3 or more	175	41	210	65	385	52	

<sup>a</sup> Participants could undergo more than one treatment.

NHL—non-Hodgkin lymphoma

Note. Because of rounding, not all percentages total 100.

**Table 3. Age as a Moderator of the Relationship of Demographic and Disease Characteristics to Quality of Life (FACT-G Score)**

Characteristic	Model 1: No Moderation		Model 2: Moderation by Age	
	B	p	B	p
<b>Demographics</b>				
Age (years)	0.29	< 0.0001	0.25	0.0004
Female gender	1.88	0.08	10.34	0.04
Income < \$30,000	-6.03	< 0.0001	-24.11	< 0.0001
College graduate	2.48	0.056	2.71	0.04
Employed	2.78	0.04	1.99	0.13
<b>Disease</b>				
Comorbidity score	-1.36	< 0.0001	-1.36	< 0.0001
Currently receiving treatment	-4.84	0.003	-4.92	0.002
<b>Cancer treatment</b>				
Bone marrow transplantation	-4.58	0.003	-4.87	0.002
Biologic	-2.68	0.04	-2.83	0.03
<b>Years since diagnosis</b>				
Female age <sup>a</sup>	-	-	-0.14	0.08
Income age <sup>a</sup>	-	-	0.28	0.001

<sup>a</sup> Interaction term

FACT-G—Functional Assessment of Cancer Therapy—General

Note. Age is a continuous variable.

observed in women (1.87 points), college graduates (2.47 points), and those who were employed (2.78 points); however, earning less than \$30,000 was associated with a lower QOL score (6.03 points). In terms of disease characteristics, the FACT-G score was 1.35 points lower for every point increase in comorbidity score. Lower QOL also was observed for those who currently were receiving treatment (4.84 points) and those who had received a transplantation (4.58 points) or biologic therapy (2.68 points). However, longer time since diagnosis was associated with a higher score (0.16 point increase for every year since diagnosis).

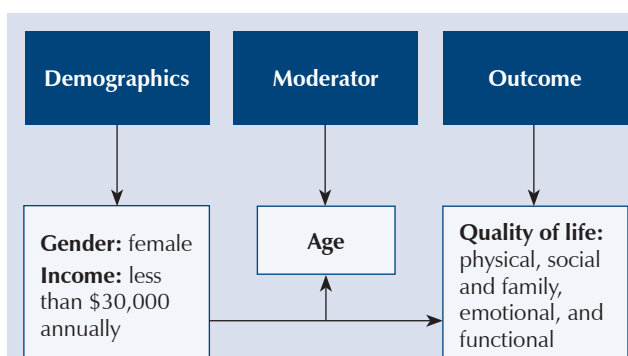
### Moderating Effect of Age on Quality of Life

Age was examined by adding the interaction between each disease or demographic characteristic one at a time to Model 1. Income and gender were two demographic characteristics that were moderated by age and had relationships with QOL. The corresponding interaction terms were included in the final model. Moderation of the relationship between income and QOL remained significant ( $p < 0.01$ ). Although lower income was associated with lower QOL scores, the difference was not as large in older survivors. The relationship between gender and QOL was moderated only marginally by age in the final model ( $p = 0.08$ ). Women had higher QOL scores than men, but the difference was not as large in older survivors.

## Discussion

The goals of the current study were to explore the relationship of demographic and disease characteristics to QOL and determine the moderating effect of age on QOL among NHL survivors. QOL was measured using the FACT-G. The current study's results are not consistent with Jerkeman, Kaasa, Hjermstad, Kvaloy, and Cavallin-Stahl's (2001) prospective study of lymphoma survivors, which found nonsignificant associations. The current study found significant associations between younger age and decreased QOL, as well as lower income and decreased QOL. Although NHL is more common in older adults than younger adults and has an unpredictable illness trajectory (Elphee, 2008), younger survivors had a more difficult time with their diagnoses than older survivors. Breast cancer survivorship literature has explored the impact of cancer in younger survivors more than any other cancer, and age has been shown as a moderator (Ganz, Greendale, Petersen, Kahn, & Bower, 2003; Kornblith et al., 2007); however, to the current researchers' knowledge, the current study is the first NHL study to explore age as a moderator on QOL.

The moderating effect of age was examined and age differences were found in relationships between income and QOL. NHL survivors younger than age 65 years with lower income had poorer QOL compared to older NHL survivors. Women had higher QOL than men. Time since diagnosis and treatment period (e.g., active surveillance) may have contributed to improved or decreased QOL in younger survivors and female survivors. The association or influence of age on QOL was not fully described in some studies, but sociodemographic characteristics correlated (Bellizzi, Miller, Arora, & Rowland, 2007; Jerkeman et al., 2001; Smith et al., 2008). Leak et al. (2011) found that older age was associated with worse physical QOL but better mental



Note. Women earning less than \$30,000 were moderated by age and associated with a poorer quality of life.

**Figure 1. Age Moderation Model**

health compared to younger adults with NHL. In addition, older survivors who received chemotherapy had poorer social and psychological well-being compared to those who did not receive chemotherapy. The overall FACT-G score for that population was 85.3 (range 10–108), which was higher than the normative data of the cancer sample.

Providers often focus on the number of comorbidities, and less attention is focused on type, severity, and duration of the comorbidity (Kerr et al., 2007). Challenges posed by multiple comorbidities and loss of function exist for patients at the time of diagnosis. Future work is needed to explore the impact of comorbidities on QOL, with special attention to type of comorbidity.

Lower socioeconomic status has been associated with lower QOL and poorer survival (Byers et al., 2008; Du, Fang, & Meyer, 2008; Newman et al., 2006). Younger survivors earning less than \$30,000 were associated with a lower QOL. Younger survivors often are diagnosed at a time when they have multiple responsibilities (e.g., primary caregiver for their spouse, parent, child) or reproductive issues, are working in or outside of the home, or are maintaining their career aspirations. In addition, younger survivors usually have fewer coping skills to manage their diagnosis and the thought of an early death may contribute to greater distress and poorer QOL (Stanton, 2006; Thewes, Butow, Girgis, & Pendlebury, 2004). Younger breast cancer survivors felt their diagnoses had limited their family, career, and lifestyle priorities (Stewart et al., 2001; Thewes et al., 2004).

Female survivors had higher QOL than male survivors with a marginal moderation by age. The data are mixed in the literature; however, most cancer studies focused on increased coping skills and support services for women with few studies focused on men (Mattson, Demshar, & Daly, 2012; Thewes et al., 2004). Increasing age- and gender-specific social support systems and coping skills for men may increase QOL to favorably impact overall survival.

### Limitations

The secondary analysis was cross sectional in nature and cannot establish a cause-effect relationship between demographic or disease characteristics and QOL; however, the strength of those associations was assessed. The current population had a relatively high education level with 42% having a college degree, which may have biased the findings. The strength of the study was the use of an existing dataset of NHL survivors to answer questions about an understudied cancer population. Future studies using other moderating effects on QOL, such as type of comorbidity and sociodemographic variables, can provide more

**Table 4. Quality-of-Life Scores**

Subscale	Range	$\bar{X}$ Score	FACT-G Normative Data on Cancer Sample
FACT-G	10–108	85.3	80.9
PWB	0–28	22.7	21.3
SFWB	4–28	22.2	22.1
EWB	0–24	19.6	18.7
FWB	0–28	20.7	18.9

EWB—emotional well-being; FACT-G—Functional Assessment of Cancer Therapy—General; FWB—functional well-being; PWB—physical well-being; SFWB—social/family well-being  
*Note.* Higher scores indicate higher perception of quality of life.  
*Note.* Based on information from Cella, 2004.

information about their associations with QOL. In addition, exploring income variances between younger and older survivors is warranted. A more standardized approach may be needed to collect demographic information. A longitudinal study would provide a more definitive answer as to whether demographic and disease characteristics differentially impact QOL changes with increasing age. Future research is needed to explore male QOL and the impact of socioeconomic factors on survivorship.

### Implications for Nursing Practice

The current study contributed to an important gap in the NHL literature about younger survivors and the association between demographic and disease characteristics and QOL. Despite limitations, the study highlighted the importance of considering age when trying to understand demographic and disease characteristics and QOL. Increasing age does not necessarily mean that QOL will be lessened, and future studies are needed to look at age differences across cancer populations with other sociodemographic and disease variables. Increasing social support systems is one way to increase QOL and favorably impact overall survival in younger survivors (Bloom, Stewart, Chang, & Banks, 2004). Social support systems may not make a difference; however, nurses can effectively assess and refer patients to the most appropriate resources. Understanding the buffering effect of age on QOL expands new avenues for targeting younger survivors. Additional research is needed to optimize resources and services that could improve QOL for those survivors.

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