

Contextual Factors Associated with Health-Related Quality of Life in Older Adult Cancer Survivors

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1. Abstract

1.1. Aims: The purpose of this study was to examine contextual factors associated with physical and mental health-related quality of life (HRQOL) in older adult cancer survivors.

1.2. Methods: This study is a secondary data analysis of the 2014 Behavioral Risk Factor Surveillance System. Only adults age 65 and older who had a cancer history in the Cancer Survivorship module were included (n=3,846).

1.3. Results: Racial/ethnic minorities were 52% less likely to report good mental HRQOL compared to non-Hispanic whites. Having completed treatment also improved odds of having good mental HRQOL. Being employed and having exercised in the past month increased likelihood of having good physical HRQOL. Having physical comorbidities and a history of depression were related to poor mental HRQOL.

1.4. Conclusion: Older adult cancer survivors who are unmarried, experienced cost as a barrier to care, have physical comorbidities, or a history of depression should be included in interventions to improve HRQOL. Special attention should be paid to older adult cancer survivors who have had a stroke, as they could be at greater risk of poor physical and mental HRQOL. To reduce disparities in HRQOL of cancer survivors, greater effort needs to be made to improve the HRQOL of racial/ethnic minorities and those facing difficulties completing treatment. Greater research is needed to understand the effect of race, aging, and cancer on HRQOL.

2. Introduction

Adults diagnosed with cancer are living longer now than ever before. Today, 69% of cancer patients in the United States (U.S.) can expect to survive 5 years or more beyond diagnosis, up 20% from the previous three decades [1]. Of these cancer survivors, 62% are older adults (age 65 years or older); by 2040, this proportion is expected to climb to 73%, resulting in over 19 million older adult cancer survivors [2]. Recognizing these trends, professional organizations and governmental agencies, such as the American Society of Clinical Oncology and the National Institutes of Health have developed best practices for providing clinical care to older adult cancer survivors with the aim of promoting health-related quality of life (HRQOL).

HRQOL is a subjective assessment of the impact of a disease on an individual's quality of life, particularly the extent to which the disease interferes with one's physical and mental functioning [3]. It is also a meaningful metric for assessing a cancer patient's well-being in comparison to the non-cancer population [4, 5]. Furthermore, HRQOL has strong prognostic value, as HRQOL declines are linked to poorer survival following diagnosis. As greater survival is achieved from cancer, HRQOL is increasingly being recognized as an important endpoint in clinical cancer care.

It is widely acknowledged that older adult cancer survivors experience worse HRQOL following a cancer diagnosis. Cancer and its sequelae can cause chronic pain, fatigue, and other decrements in physical functioning [6-9]. For instance, it is not uncommon for pa-

tients diagnosed with reproductive cancers (e.g., prostate, cervical, ovarian) to experience complications with sexual functioning; and for colorectal cancer patients to struggle with bowel and urinary incontinence [6, 8, 9]. Cancer survivors have also developed psychological distress after diagnosis, including anxiety, depression, and intense fears about cancer recurrence [10-12]. On top of these cancer-related difficulties, older adult cancer survivors must also contend with many age-associated declines, such as restrictions in physical mobility and increases in chronic disease development [13-17]. Over 80% of older adults have physical co-morbidities and many report experiencing losses in psychosocial support in late age, particularly when friends and family members pass on [14, 18-20]. Despite these wide reports of physical and psychosocial declines in older adult cancer survivors, little is known about the factors contributing to their HRQOL.

The current study helps close this gap by examining contextual factors associated with physical and mental HRQOL utilizing a population-based sample. The study was guided by the Contextual Model of HRQOL [21, 22], which posits that HRQOL is influenced by macro-systemic and micro-individual domains (Figure 1). Macro-systemic factors include demographics, cultural context, socio-ecological factors, and health care system factors. Micro-individual factors consist of general health, cancer-related factors, psychological well-being, and health efficacy.

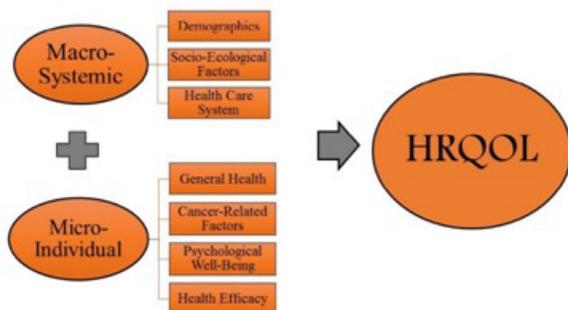


Figure 1. Contextual Model of HRQOL.

3. Materials and Methods

3.1. Sample

Data for this study were drawn from the 2014 wave of the Behavioral Risk Factor Surveillance System (BRFSS). BRFSS is a cross-sectional, random-digit-dialed telephone survey conducted annually in all 50 states, the District of Columbia, and territories of the United States (US). The survey collects data on health behaviors, health conditions, and the use of preventive services that are connected to morbidity and mortality. The data analytic sample for this study included participants age 65 years and older who reported ever having had a cancer diagnosis and who completed the Cancer Survivorship module of BRFSS (n=3,846).

3.2. Measures

Health-Related Quality of Life. The dependent variables in this

study, physical and mental HRQOL were assessed using Healthy Days, a validated measure composed of three items that capture physical and mental HRQOL [23]. For physical HRQOL, participants were asked: “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” For mental HRQOL, participants were asked, “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Responses were captured using a continuous, whole number equal to the number of days (0 to 30). Distributions for the dependent variables were found to be highly skewed towards zero with 52.4% and 67.5% of the cancer survivorship sample reporting zero days of unhealthy physical and mental days, respectively, which is similar to other studies [24-26]. Following the practice of other researchers, the dependent variables were dichotomized as 0 and 1, where “0” represented zero unhealthy days or good HRQOL and “1” represented reporting one or more unhealthy days or poor HRQOL [25]. Healthy Days has been shown to have moderate (.57) to excellent (.75) construct validity and test-retest reliability in non-institutionalized, adult populations [27-29].

Explanatory Variables. Demographic factors included gender, marital status, and race. Gender was reported as either male (0) or female (1). Marital status was reported as not married (0) or married (1). “Not married” included participants who reported being widowed, divorced, or separated, in addition to those who had never been married. “Married” referred to reports of being married or in a domestic partnership. Race was reported as either Non-Hispanic White (NHW) (0) or any Racial/Ethnic Minority (1).

Socio-ecological factors were identified as income level, education level, and employment status. Income level was categorized into three groups according to the sample variance: (0) <\$20,000; (1) \$20,000 to <\$50,000; (2) \$50,000 and more. Education was coded as: (0) High school or less, (1) Some college or a 2-year degree, and (2) 4-year college degree or higher. Employment status was coded as (0) unemployed, (1) employed full-time, and (2) retired.

For general health factors, individuals’ report of having had any of the following nine common co-morbidities (No=0, Yes=1) was measured: heart attack, coronary heart disease, stroke, asthma, chronic obstructive pulmonary disease (COPD), arthritis, kidney disease, or non-gestational diabetes.

Cancer-related factors included participants’ cancer type, treatment status, and time since diagnosis. Cancer type included the following 10 cancer sites (No=0, Yes=1): breast, gynecologic, head/neck, gastrointestinal, leukemia/lymphoma, male reproductive, skin, lung, urinary, and other. For participants who reported having been diagnosed with more than one type of cancer, only the first cancer type was included. Treatment status was coded as treat-

ment completed (1) or treatment not completed (0). Time since diagnosis was calculated using the participant's age at interview subtracted from age at diagnosis, and was coded as a continuous variable.

The psychological well-being factor included respondents' self-report of a history of depressive disorders (No=0, Yes=1). Depressive disorders were defined as ever being told participant had depression, major depression, dysthymia, or minor depression.

The health efficacy factors consisted of three variables: smoking history, exercise, and time since last routine checkup. Smoking history was measured as having smoked at least 100 cigarettes in one's lifetime (No=0, Yes=1). Exercise was operationalized as participating in any physical activity or exercise in the past month (No=0, Yes=1). Time since last routine checkup was coded as: Within the past year (0), 1 year to less than 5 years (1), and 5 or more years (2).

3.3. Data Analysis

Descriptive statistics were first produced for the study sample. Then, bivariate analyses were conducted to assess potential individual associations with HRQOL outcomes. Finally, multiple logistic regressions were conducted to examine associations between independent variables and physical and mental HRQOL. Guiding by the Contextual Model of HRQOL, macro-systemic factors were first entered in blocks (demographics, cultural context, socio-ecological, and then health care access) followed by micro-individual factors (general health, cancer-related factors, psychological well-being, and then health efficacy). The log-likelihood statistic was used to assess each model's goodness-of-fit.

All data were analyzed using SAS Proc Survey commands to account for the complex survey design. Stratification, cluster, and weight functions were conducted using codes provided by BRFSS. Significance testing was assessed at $p < .05$ using Wald ².

4. Results

4.1. Descriptive Statistics

As shown in Table 1, 53% of respondents were female, 53% were married, and 90% were Non-Hispanic White. Almost a quarter of the sample (23%) reported an annual income below \$20,000, while 25% had an annual income of \$50,000 or more. In regard to educational attainment, 56% of the sample had only a high school education or less, while 18% held a 4-year college degree or higher. Seventy-five percent of the sample were retired, and 13% were unemployed. Almost all participants had health insurance (99%), a usual source of care (95%), and did not face financial barriers to receiving care (91%). In regards to comorbidities (Table 2), 15% of respondents had had a heart attack, 15% had coronary heart disease, 11% had experienced a stroke, 12% had asthma, 15% had COPD, 58% had arthritis, 10% had kidney disease, and 25% had diabetes. In relation to cancer type, most respondents had

cancers of the breast (23%), male reproductive system (22%), skin (13%) or gastrointestinal tract (12%). Seventy-six percent of the respondents had completed treatment. The mean years since diagnosis was 12.9 years.

A history of depressive disorders was reported by 17% of the study sample. More than half of the sample reported being a current or former smoker (56%). Sixty-two percent of older adults reported having exercised within the past month. A majority of older adults had completed an annual check-up within the past year (91%).

Table 1. Macro-systemic characteristics of the study population.

	Unweighted Frequency (n=3,846)	(Weighted %)
Demographics		
Gender		
Male	1382	(47)
Female	2206	(53)
Marital Status		
Unmarried	1886	(47)
Married	1681	(53)
Race		
Non-Hispanic White	3334	(90)
Racial/Ethnic Minority	226	(10)
Socio-ecological Factors		
Income Level		
<\$20,000	672	(23)
\$20,000 to \$50,000	1503	(52)
\$50,000 or more	776	(25)
Education		
High school or less	1775	(56)
Some college/ 2-year degree	892	(26)
4-year college degree or higher	893	(18)
Employment Status		
Unemployed	439	(13)
Employed	464	(12)
Retired	2648	(75)
Health Care System		
Health Insurance		
No	31	(1)
Yes	3549	(99)
Usual Source of Care		
No	139	(5)
Yes	3437	(95)
Cost Posed Barrier to Care		
No	3444	(95)
Yes	141	(5)

Table 2. Micro-individual level characteristics of the study sample.

	Unweighted Frequency (n=3,846)	(Weighted %)
General Health		
<i>Co-morbidities</i>		
Heart Attack		
No	3080	(85)
Yes	483	(15)
Coronary Heart Disease		
No	3033	(85)
Yes	488	(15)
Stroke		
No	3259	(89)
Yes	319	(11)
Asthma		
No	3137	(88)
Yes	437	(12)
COPD		
No	3049	(85)
Yes	512	(15)
Arthritis		
No	1454	(42)
Yes	2113	(58)
Kidney		
No	3266	(90)
Yes	295	(10)
Diabetes		
No	2778	(75)
Yes	806	(25)
Cancer-Related Factors		
Cancer Type		
Breast	894	(23)
Gynecological	294	(7)
Head and Neck	114	(3)
Gastrointestinal	352	(12)
Blood	150	(4)
Male Reproductive	548	(22)
Skin	403	(13)
Lung	112	(3)
Urinary	183	(6)
Other	185	(7)
Treatment Status		
Treatment not completed	708	(24)
Treatment completed	2564	(76)

Time Since Diagnosis		
Mean Years (S.E.)	12.9	(.37)
Psychological Well-Being		
History of Depressive Disorders		
No	2957	(83)
Yes	619	(17)
Health Efficacy		
Smoking History		
Never smoked	1725	(44)
Smokes currently or before	1772	(56)
Exercise		
No	1268	(38)
Yes	2311	(62)
Annual Checkups		
More than a year ago	391	(9)
Within the past year	3127	(91)

4.2. Hierarchical Multiple Logistic Regressions

4.2.1. Physical HRQOL

Hierarchical multiple logistic regression analysis (Table 3) indicated that respondents’ physical HRQOL was not significantly associated with gender, marital status, or being a racial/ethnic minority. Respondents who were employed were 2.4 times more likely to report good physical HRQOL compared to respondents who were unemployed (p<.05). Individuals with coronary heart disease,

COPD, arthritis, and kidney disease were 40%, 42%, 36%, and 51% less likely, respectively, to report good HRQOL compared to respondents without such diseases (p<.05). Respondents with a history of depression were 38% less likely to report good HRQOL compared to those without a history of depression (p<.05). Individuals who reported a history of smoking were 1.4 times more likely to report good HRQOL (p<.05) and those who had exercised in the past month were 1.6 times more likely to have good HROL (p<.01).

Table 3. Results of Hierarchical Logistic Regression of Physical HRQOL.

	O.R.	C.I.	
Variables			
<i>Demographics</i>			
Female	1.353	0.796	2.299
Married	1.033	0.719	1.483
Racial/ Ethnic Minority	0.765	0.362	1.616
<i>Socio-Ecological</i>			
Income: \$20,000 to \$50,000	1.368	0.854	2.19
\$50,000 or more	1.67	0.919	3.033
Education: Some college/ 2-year degree	0.785	0.538	1.146
4-year college degree or higher	0.972	0.627	1.507
Employment: Employed	2.432	1.139	5.191 *
Retired	1.136	0.65	1.983
<i>Health Care System</i>			
Has Health Insurance	1.33	0.311	5.685
Has One or More Usual Source of Care	1.571	0.635	3.887
Experienced Cost as a Barrier to Care	0.404	0.151	1.083
<i>General Health</i>			
Heart Attack	0.624	0.356	1.091
Coronary Heart Disease	0.591	0.358	0.975 *

Stroke	0.606	0.342	1.073	
Asthma	0.889	0.527	1.5	
COPD	0.573	0.336	0.979	*
Arthritis	0.644	0.46	0.901	*
Kidney	0.491	0.268	0.899	*
Diabetes	0.874	0.58	1.316	
<i>Cancer Related Factors</i>				
Breast Cancer	1.929	0.695	5.352	
Gynecological Cancer	1.747	0.585	5.217	
Head and Neck Cancer	0.707	0.214	2.344	
Gastrointestinal Cancer	1.902	0.639	5.663	
Blood Cancer	1.431	0.44	4.653	
Male Reproductive Cancer	1.969	0.713	5.44	
Skin Cancer	2.752	0.957	7.911	
Lung Cancer	0.973	0.211	4.479	
Urinary Cancer	2.397	0.796	7.225	
Other Cancer	1.959	0.652	5.883	
Treatment completed	1.376	0.934	2.028	
Years since diagnosis	0.988	0.975	1.001	
<i>Psychological Well-Being</i>				
History of Depression	0.622	0.414	0.934	*
<i>Health Efficacy</i>				
Smokes currently or before	1.443	1.041	2	*
Exercise	1.61	1.139	2.276	**
Had an annual checkup within the past year	0.982	0.59	1.635	
Model Fit				
LRT= 95067.9252				
p<.0001				
*p<.05, **p<.01				

Table 4. Results of Hierarchical Logistic Regression of Mental HRQOL.

	O.R.	C.I.		
Variables				
<i>Demographics</i>				
Female	0.617	0.344	1.107	
Married	1.755	1.154	2.671	**
Racial/ Ethnic Minority	0.481	0.235	0.984	*
<i>Socio-Ecological</i>				
Income: \$20,000 to \$50,000	0.724	0.41	1.279	
\$50,000 or more	1.173	0.598	2.304	
Education: Some college/ 2-year degree	1.047	0.651	1.685	
4-year college degree or higher	0.681	0.42	1.105	
Employment: Employed	3.053	1.294	7.199	*
Retired	2.261	1.234	4.142	**
<i>Health Care System</i>				
Has Health Insurance	0.815	0.098	6.762	
Has One or More Usual Source of Care	1.436	0.502	4.107	
Experienced Cost as a Barrier to Care	0.383	0.164	0.894	*
<i>General Health</i>				
Heart Attack	1.207	0.577	2.527	
Coronary Heart Disease	0.66	0.351	1.244	
Stroke	0.509	0.279	0.927	*
Asthma	0.679	0.348	1.324	
COPD	0.606	0.342	1.075	

Arthritis	0.977	0.633	1.508	
Kidney	0.835	0.423	1.649	
Diabetes	1.385	0.856	2.24	
<i>Cancer Related Factors</i>				
Breast Cancer	0.71	0.249	2.022	
Gynecological Cancer	0.695	0.213	2.27	
Head and Neck Cancer	0.499	0.126	1.975	
Gastrointestinal Cancer	0.78	0.245	2.482	
Blood Cancer	0.398	0.09	1.762	
Male Reproductive Cancer	0.377	0.122	1.166	
Skin Cancer	0.468	0.155	1.41	
Lung Cancer	0.77	0.176	3.363	
Urinary Cancer	0.787	0.249	2.486	
Other Cancer	0.553	0.156	1.963	
Treatment completed	1.955	1.23	3.108	**
Years since diagnosis	0.987	0.972	1.002	
<i>Psychological Well-Being</i>				
History of Depression	0.217	0.14	0.337	****
<i>Health Efficacy</i>				
Smokes currently or before	1.299	0.858	1.967	
Exercise	1.286	0.84	1.969	
Had an annual checkup within the past year	1.487	0.824	2.685	
Model Fit				
LRT= 104701.528				
$p < .0001$				
* $p < .05$, ** $p < .01$, **** $p < .0001$				

4.2.2. Mental HRQOL

Hierarchical multiple logistic regression analysis indicated being married improved survivors' odds of good HRQOL by 1.8 times ($p < .01$) compared to being nonmarried. Respondents who were racial/ethnic minorities were 52% less likely to have good mental HRQOL ($p < .05$). Respondents who were employed were over 3 times more likely to have good mental HRQOL ($p < .05$) and those who were retired were 2.3 times more likely to have good mental HRQOL ($p < .01$) than individuals who were unemployed. Experiencing financial cost as a barrier to receiving care decreased odds of good mental HRQOL by 62% ($p < .05$). Respondents who had had a stroke were 50% less likely to report good mental HRQOL ($p < .05$). Cancer type was not significantly associated with mental HRQOL for this sample. Having completed cancer treatment significantly almost doubled one's odds of having better mental HRQOL ($p < .01$). Having a history of depression lowered odds of good mental HRQOL by 79% ($p < .0001$).

5. Discussion

The purpose of the current study was to examine contextual factors associated with physical and mental HRQOL in a population-based sample of older adult cancer survivors living in the US. A majority of older adult cancer survivors in the sample reported good physical (52%) and mental (68%) HRQOL. Findings from this study revealed that multiple contextual factors contribute to older adult cancer survivors' physical and mental HRQOL.

For sociodemographic factors, being married significantly improved older adult cancer survivors' mental HRQOL. This finding is in line with the extant literature, which has extensively documented the benefits of being married in cancer survivor populations [30-33]. For instance, a study of breast cancer patients found that married participants were more likely to have elevated HRQOL and better social support [32]. Another study found that cancer patients who were married were 20% less likely to die from cancer than those who were not married [30]. One explanation for this connection is possible increased social support and caregiving benefits received from spouses during and after cancer treatment. These findings highlight the need to target unmarried older adult cancer survivors in HRQOL interventions and to promote social support in efforts to improve mental HRQOL in older cancer survivors.

Additionally, being from a racial/ethnic minority group was found to significantly decrease one's odds of having good mental HRQOL. This finding was not surprising as racial/ethnic minorities have long reported worse health outcomes in old age [34-36]. A possible explanation for this is the gerontological phenomenon of "double jeopardy". "Double jeopardy" posits that older racial/ethnic minorities accumulate both age and race-related stressors over their lifetime, resulting in heightened disadvantages in late life [37]. Future research should be devoted to improving the HRQOL of minority cancer survivors and understanding the inter-

section between race, age, and HRQOL.

Employment status was found to be significantly related to good physical and mental HRQOL. It is possible that being employed reflects better physical functioning such that those who are disabled or in declining health are not working anymore. It is also possible that being employed provides older adult cancer survivors with greater socialization opportunities or increased sense of purpose that might contribute to improved HRQOL. Future research should be conducted to understand the relationship between employment status and HRQOL.

The present study also found that experiencing financial cost as a barrier to receiving care was a significant predictor of poor mental HRQOL. However, this variable was not significantly associated with physical HRQOL, indicating that concerns over ability to afford health care might take a greater toll on older adult cancer survivors' mental HRQOL. It is possible that financial costs do not hinder health care receipt, but could still be a burden for survivors who must accumulate immense debt to undergo treatment. My findings echo that of the extant literature, which widely documents the poorer HRQOL of cancer survivors who have faced health-related financial hardships [38-40].

The present study also found that physical HRQOL was poorer in older adult cancer survivors who also had coronary heart disease, COPD, arthritis, or kidney disease. In regards to mental HRQOL, only having had a stroke predicted having poor mental HRQOL. This finding is not surprising, given that stroke has been shown to have debilitating effects on quality of life [41, 42]. In a longitudinal study of stroke survivors, Crichton et al. [41] found that 15 years post stroke, 39.1% of respondents were depressed and 63.2% had some form of physical disability. Interventions aiming to improve HRQOL in cancer survivors should consider special needs of cancer survivors who also have comorbid conditions. Clinicians should pay special attention to individuals who have had a stroke.

Having completed treatment was found to be a significant predictor of better mental HRQOL. This finding was expected, as research consistently has documented the positive relationship between treatment completion, improved mental health, and survival [43, 44]. Strategies should be developed to ensure older adult cancer survivors are completing treatment as recommended.

This study echoed others and found that a history of depression significantly lowered older adult cancer survivors' physical and mental HRQOL [8,10-12]. While it is not known if our respondents developed depression prior to or after their cancer diagnosis because of the cross-sectional nature of this study, the negative influence of depression on older adult cancer survivors' mental HRQOL highlights the increased challenges cancer survivors face. One study has reported that older adult cancer survivors with pre-cancer depression were 49% more likely to die from their cancer; and those diagnosed with depression after their cancer were 38% more likely

to die from their cancer compared to patients without depression [45]. These reports warrant greater attention to identifying and addressing depression in older adult cancer survivors.

Lastly, the current study also found that exercising was a significant predictor of good physical HRQOL, similar to other studies [46, 47]. It is possible that this finding reflects the better physical functioning of respondents who exercised recently. It is also possible that exercising provides a protective effect against declines in HRQOL. These findings underscore the importance of promoting exercising in older adult cancer survivors.

Limitations

The present study is subject to a number of limitations. First, the cross-sectional nature of this study prevents drawing any conclusions about causality or understanding how relationships between explanatory variables and HRQOL might vary at different points in time. Secondly, BRFSS data were collected by telephone survey of the noninstitutionalized population; thus may not be representative of people who do not own or use a telephone, or those who reside in nursing homes, inpatient hospice care, or other residential institution. Third, the data included in this study rely on self-report and might not be accurate.

6. Conclusion

Despite these limitations, this study has several important implications. Older adult cancer survivors who are unmarried, experienced cost as a barrier to care, have physical comorbidities, or a history of depression should be included in interventions to improve HRQOL. Special attention should be paid to older adult cancer survivors who have had a stroke, as they could be at greater risk of poor physical and mental HRQOL. To reduce disparities in HRQOL of cancer survivors, greater effort needs to be made to improve the HRQOL of racial/ethnic minorities and those facing difficulties completing treatment. Overall, this study identifies several contextual factors that are associated with older adult cancer survivors' HRQOL.

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