Original Contribution

Impact of Financial Burden of Cancer on Survivors' Quality of Life

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Abstract

Purpose: Little is known about the relationship between the financial burden of cancer and the physical and emotional health of cancer survivors. We examined the association between financial problems caused by cancer and reported quality of life in a population-based sample of patients with cancer.

Methods: Data from the 2010 National Health Interview Survey (NHIS) were analyzed. A multivariable regression model was used to examine the relationship between the degree to which cancer caused financial problems and the patients' reported quality of life.

Results: Of 2,108 patients who answered the survey question, "To what degree has cancer caused financial problems for you and your family?," 8.6% reported "a lot," whereas 69.6% reported "not at all." Patients who reported "a lot" of financial problems as a result of cancer care costs were more likely to rate their physical health (18.6% *v* 4.3%, $P < .001$), mental health (8.3% *v* 1.8%, $P < .001$), and satisfaction with social activities and relationships (11.8% *v* 3.6%, $P < .001$) as poor compared to those with no financial hardship. On multivariable analysis controlling for all of the significant covariates on bivariate analysis, the degree to which cancer caused financial problems was the strongest independent predictor of quality of life. Patients who reported that cancer caused "a lot" of financial problems were four times less likely to rate their quality of life as "excellent," "very good," or "good" (odds ratio = 0.24; 95% CI, 0.14 to 0.40; $P < .001$).

Conclusion: Increased financial burden asa result of cancer care costs is the strongest independent predictor of poor quality of life among cancer survivors.

Introduction

For a patient who receives a diagnosis of cancer, the financial impact of this diagnosis can be significant. The magnitude of the resulting financial burden is determined by a multitude of factors, including household income, socioeconomic status, insurance status, and extent of disease. Causes of cancer-related financial stress are multifactorial. Treatment-related costs can be substantial, including costs of chemotherapy, radiation, and surgery, as well as home health care and travel to treatment centers.[1] Patients who are employed may experience loss of productivity at work or total loss of employment and work-related benefits.[2,3] Household finances may suffer if the patient's family members take time away from work to help with their care.[4] Other less apparent causes of financial burden include child care, domestic help, medical equipment, special foods, and nutritional supplements.[1]

A high proportion of patients are affected economically by a cancer diagnosis. The SUPPORT (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment) study found that approximately one third of families of seriously ill patients reported losing most or all of their family's savings.[5] There is evidence to suggest that patients who are economically affected by cancer are more likely to delay further medical treatment and avoid filling prescriptions, thus putting their physical health in jeopardy.[6,7]

Among American patients with cancer, the degree of financial burden resulting from cancer care costs can be variable. Low-income patients have been shown to have disproportionately high expenses as a result cancer.[8] Insurance coverage and cancer type can also affect an individual's cancer-related economic burden.[9] Depending on an individual's particular financial and personal circumstances, the economic toll of cancer can be profound.

The psychosocial effects of cancer-related financial strain are understudied, and the degree to which cancer-related monetary costs affect an individual's overall quality of life has not been fully elucidated. Several studies have recently emerged reporting an association between increased economic burden resulting from cancer and decreased quality of life.[10,11] We sought to characterize the relationship between cancer-related financial problems and self-reported quality of life through analysis of data from a nationwide, population-based study.

Methods

Data from the 2010 National Health Interview Survey (NHIS) were analyzed. The NHIS is the largest source of health information of US households, designed to reflect the nation's civilian noninstitutionalized population. It is a cross-sectional interview study administered annually by the National Center for Health Statistics, Centers for Disease Control and Preven-

Table 1. Degree to Which Cancer Caused Financial Problems, by Demographic Characteristics

Characteristic	Degree of Cancer-Related Financial Problems				P
	A Lot (%)	Some (%)	A Little (%)	Not at All (%)	
% total sample	8.6	11.7	10.3	69.6	
Sex					.016
Male	7.2	10.8	12.5	69.6	
Female	9.8	12.3	8.5	69.5	
Race/ethnicity					< .001
White, non-Hispanic	7.2	10.5	10.4	71.9	
Hispanic	16.9	19.0	5.4	58.8	
Black	17.6	17.5	12.9	52.0	
Asian	14.3	22.3	10.0	53.4	
All other races	26.7	16.4	0.0	57.0	
Age, years					< .001
18-20	0.0	0.0	34.0	66.0	
21-30	14.6	10.5	8.4	66.5	
31-40	12.1	14.3	10.9	62.8	
41-50	14.6	16.3	9.0	60.1	
51-60	16.9	14.1	11.6	57.4	
61-70	6.5	14.7	11.0	67.8	
71-80	3.6	6.0	9.3	81.1	
≥ 81	1.8	6.6	9.3	82.3	
Education					.002
Less than grade 12	11.3	23.6	15.8	60.3	
High school graduate	11.8	11.3	9.0	68.0	
Some college/associate's	8.1	12.7	10.3	69.0	
Bachelors	6.2	12.1	8.5	73.2	
Masters	5.6	8.2	9.6	76.6	
Professional/doctorate	1.7	8.9	7.2	82.3	
Insurance status					< .001
Medicare	5.6	10.0	10.2	74.3	
Medicaid	19.8	8.1	12.2	59.9	
Military	16.8	4.5	10.8	67.9	
Private	8.9	13.5	10.5	67.0	
Not covered	22.8	15.5	9.0	52.8	
Total combined family income, $					< .001
0-34,999	13.2	12.4	10.9	63.5	
35,000-74,999	8.1	12.1	10.7	69.2	
75,000-99,999	8.2	14.6	9.6	67.6	
≥ 100,000	3.6	8.8	8.1	79.6	
Region					.390
Northeast	7.8	9.4	9.5	73.3	
Midwest	6.7	13.4	11.3	68.6	
South	10.7	11.8	10.5	67.1	
West	8.0	10.9	9.1	72.0	
Cancer type					< .001
Breast	12.0	16.6	10.0	61.4	
Cervical	5.5	13.5	10.3	70.6	
Colorectal	11.5	14.3	11.6	62.6	
Lung	23.7	8.8	19.6	48.0	

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Table 1. (Continued)

Characteristic	Degree of Cancer-Related Financial Problems				P
	A Lot (%)	Some (%)	A Little (%)	Not at All (%)	
Lymphoma/leukemia	11.9	27.6	10.8	49.7	
Melanoma	3.0	6.0	9.6	81.5	
Ovarian	25.3	16.8	6.5	51.4	
Prostate	4.0	8.0	14.8	73.2	
Thyroid	30.6	10.8	5.5	53.1	
Uterine	6.5	11.9	9.4	72.3	
Other	6.8	9.0	8.8	75.4	

tion. The NHIS uses a multistage sample design involving stratification and clustering techniques, and is designed to oversample Black, Hispanic, and Asian persons. The survey is administered face-to face by one of approximately 400 trained surveyors using computer-assisted personal interviewing, in which survey administrators enter data directly into a laptop computer at the time of interview.

The core of the survey contains four different segments: Household, Family, Sample Adult, and Sample Child. The Household segment collects demographic information on all members of the household from a single representative. The Family segment verifies and collects additional demographic information about individual members of the household. A sample adult and sample child (if applicable) are randomly chosen from each household, and questionnaires are administered to collect additional information on health status, health service use, and health behaviors. Supplements to the survey are administered to address specific public health questions. The Cancer Control Supplement (CCS) collects information on cancer-related health behaviors and cancer screening. In years when the CCS is administered, it is given to the sample adult in each selected household. The CCS was last administered in 2010. Further data on the NHIS are available elsewhere.[12]

Respondents were asked if they had ever been told that they had cancer. For those who were 18 years of age or older, and who responded affirmatively, they were subsequently asked, "To what degree has cancer caused financial problems for you and your family?". This question measured each individual's perceived financial burden caused by cancer using a 4-point scale. Possible responses were "a lot," "some," "a little," "not at all," "don't know," and "refused."

We analyzed the resulting data. Bivariate analyses were performed to examine whether the respondents who refused to answer or answered "don't know" to this question had statistically significant differences in their responses to other survey items examined in this study. Those who answered the question informatively then formed the cohort of interest for our analyses.

The degree to which cancer caused financial problems was then evaluated in terms of its correlation with sociodemographic covariates, including sex, age, race/ethnicity, highest level of education completed, insurance status, family income, region of residence, and cancer type, along with respondents' rating of their perceived quality of life. In particular, respondents were asked to rate their quality of life in general, their physical health, their mental health, and their satisfaction with social activities and relationships. Possible responses included "excellent, "very good," "good," "fair," and "poor." Furthermore, we evaluated respondents' perceived risk of recurrence ("What do you think the chances that your cancer will come back or get worse within the next 10 years?"), and their worry regarding the same ("How often do you worry that your cancer may come back or get worse?").

A binary logistic regression model was created to determine the independent effect of cancer-related financial problems on quality of life, controlling for all of the sociodemographic factors found to be significant at $P < .1$ on bivariate analysis. All statistical analyses were performed with SUDAAN software (Release 9.0.1, Research Triangle Park, NC).

Results

For the 2010 administration of the NHIS, the final response rate for the Sample Adult was 60.8%.[12] Among the 2,151 adult cancer survivors surveyed (representing 17,873,413 people in the population), 98.0% answered the question regarding the degree to which cancer caused them and their family financial problems. Among all people who were asked the question, 1.5% reported that they "didn't know" how cancer had financially affected them or declined to answer. When informative responders were compared with those who responded "don't know" or declined to answer, no statistically significant differences were seen in terms of sociodemographic factors, suggesting that there was unlikely to be a systematic reporting bias in those who responded to the question of how cancer affected their financial life (Appendix Table A1, online only). Those who refused to answer or did not know how cancer affected their financial status did, however, had a significantly lower rate of worrying about their cancer coming back than those who provided informative answers (0% *v* 9.6%; $P = .005$).

Of those who provided informative responses, 8.6% reported "a lot" of cancer-related financial problems, 11.7% reported "some," 10.3% "a little," and 69.6% "not at all." Patients wo reported "a lot" of financial problems were more likely to be female ($P = .016$), under the age of 61 ($P < .001$), of non-white race ($P < .001$), with less than a 4-year college

education ($P = .002$), and a total combined household income of less than $35,000 ($P < .001$; Table 1). Subjects who reported "a lot" of cancer-related financial problems were also less likely to report Medicare as their primary health insurer ($P < .001$). The three types of cancer with the largest proportion of patients reporting "a lot" of financial problems were thyroid cancer (30.6%), ovarian cancer (25.3%), and lung cancer (23.7%; $P < .001$). Region of residence was not significantly correlated with degree of cancer-related financial problems ($P = .390$).

Bivariate analyses were then performed to examine the association between degree of cancer-related financial problems and subjective evaluation of quality of life (Table 2). Compared with patients who answered "not at all," patients who reported "a lot" of cancer-related financial problems were more likely to report "poor" quality of life ($P < .001$). This was true for self-assessment of general quality of life, as well as respondents' rating of their physical health, mental health, and social life. In addition, patients who reported "a lot" of cancer-related financial problems were more likely to believe the chances of their cancer returning to be high and to report a higher frequency of worry about their cancer returning in the future ($P < .001$).

On multivariable analysis, self-reported quality of life of "good," "very good," or "excellent" was inversely correlated with the degree to which cancer caused financial problems,

Table 2. Bivariate Analysis of Degree to Which Cancer Caused Financial Problems, by Quality-of-Life Ratings

	Degree of Cancer-Related Financial Problems				
Variable	**A Lot (%)**	**Some (%)**	**A Little (%)**	**Not at All (%)**	***P***
Rating of general quality of life					< .001
Excellent	3.7	9.7	8.9	77.8	
Very good	9.7	10.6	9.7	74.9	
Good	11.6	13.9	11.8	62.8	
Fair	21.6	16.2	12.7	49.4	
Poor	37.2	8.4	9.4	45.0	
Rating of physical health					< .001
Excellent	3.7	9.7	7.7	78.9	
Very good	3.2	10.0	9.1	77.7	
Good	8.0	13.0	10.6	68.3	
Fair	18.3	11.9	11.4	58.5	
Poor	24.1	14.6	16.2	45.1	
Rating of mental health, including mood and ability to think					< .001
Excellent	3.6	8.3	7.7	80.4	
Very good	5.5	12.2	11.0	71.4	
Good	11.6	13.1	13.4	61.9	
Fair	22.2	15.8	5.2	56.8	
Poor	28.0	9.4	12.8	49.7	
Rating of satisfaction with social activities and relationships					< .001
Excellent	5.4	8.2	7.7	78.7	
Very good	4.9	11.7	10.0	73.5	
Good	10.5	13.4	11.5	64.6	
Fair	18.6	16.4	12.5	52.5	
Poor	22.3	9.1	13.5	55.0	
Belief the chances of cancer returning/becoming worse in 10 yr					< .001
Very low	5.3	9.8	8.1	76.8	
Fairly low	5.3	15.9	12.2	66.6	
Moderate	10.6	12.7	9.6	67.1	
Fairly high	16.5	10.4	12.0	61.1	
Very high	21.9	10.7	17.0	50.4	
Frequency of worry that cancer may come back/get worse "all the time"					< .001
Never	4.6	8.5	7.1	79.8	
Rarely	5.7	11.1	12.6	70.6	
Sometimes	12.2	18.3	10.9	58.6	
Often	20.1	15.2	23.1	41.7	
All the time	43.0	17.1	11.8	28.1	

Table 3. Multivariable Analysis: Quality of Life of at Least "Good," by Degree to Which Cancer Caused Financial Problems and Demographic Characteristics

Variable	Adjusted OR	95% CI	*P*
Degree to which cancer caused financial problems			
A lot	0.24	0.14 to 0.40	< .001
Some	0.57	0.33 to 0.99	.044
A little	0.67	0.41 to 1.08	.101
Not at all		Referent	
Sex			
Male		Referent	
Female	1.54	0.97 to 2.47	.070
Race/ethnicity			
White, non-Hispanic		Referent	
Hispanic	1.04	0.63 to 1.73	.879
Black	0.94	0.58 to 1.54	.818
Asian	0.41	0.16 to 1.04	.060
All other races	0.53	0.12 to 2.43	.415
Age, years			
18-20		Referent	
21-30	0.61	0.19 to 1.98	.408
31-40	0.82	0.25 to 2.70	.744
41-50	0.47	0.21 to 1.05	.067
51-60	0.36	0.18 to 0.74	.005
61-70	0.56	0.32 to 0.98	.042
71-80	1.00	1.00 to 1.00	1.00
≥ 81	0.64	0.37 to 1.10	.108
Education			
Less than grade 12		Referent	
High school graduate	1.10	0.70 to 1.74	.667
Some college/Associate's degree	2.09	1.26 to 3.44	.004
Bachelor's degree	3.16	1.53 to 6.51	.002
Master's degree	2.40	1.08 to 5.30	.031
Professional degree/Doctorate	4.50	0.88 to 22.87	.070
Insurance status			
Medicare	0.48	0.23 to 1.02	.058
Medicaid	0.63	0.30 to 1.32	.221
Military	0.53	0.19 to 1.48	.225
Private	1.65	0.81 to 3.36	.170
Not covered		Referent	
Total combined family income, $			
0-34,999		Referent	
35,000-74,999	2.24	1.48 to 3.41	< .001
75,000-99,999	1.84	0.93 to 3.63	.080
≥ 100,000	2.24	1.01 to 4.98	.047
Cancer type			
Breast		Referent	
Cervical	0.97	0.47 to 1.99	.933
Colorectal	0.90	0.41 to 2.02	.805
Lung	0.38	0.15 to 0.96	.040
Lymphoma/leukemia	0.91	0.42 to 1.95	.799
Melanoma	1.45	0.53 to 3.97	0.463
Ovarian	1.24	0.25 to 6.12	0.789
Prostate	1.53	0.64 to 3.62	0.335
Thyroid	0.67	0.17 to 2.57	0.554
Uterine	0.97	0.47 to 2.01	0.928
Other	1.18	0.70 to 1.99	0.544

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Table 3. (Continued)

Abbreviation: OR, odds ratio.

independent of all sociodemographic variables found to be significant on bivariate analyses (Table 3). Patients with "a lot" of cancer-related financial problems carried a four-fold decrease in likelihood of reporting a quality of life of "good" or better (odds ratio = 0.24; 95% CI, 0.14 to 0.40; $P < .001$). Age, education, insurance status, and total combined family income were also significant independent predictors of quality of life.

Discussion

We analyzed results of a nationwide health interview study and found that the degree of cancer-related financial problems was the strongest independent predictor of quality of life among a population of cancer survivors over the age of 18. Patients who reported "a lot" of financial problems were approximately four times less likely to report a quality of life that was "good" or better (odds ratio = 0.24; 95% CI, 0.14 to 0.40) compared with patients who reported no financial problems. The magnitude of cancer-related financial difficulty was a more significant predictor of quality of life than age, education, race/ethnicity, and family income. These findings highlight the potentially powerful impact of financial strain on a patient's perception of their overall well-being after a cancer diagnosis.

Like others, we found that increased cancer-related financial hardship is associated with lower household income,[13,14] female sex,[15] and younger age.[7,13,14] Several factors can be identified to help explain the sex disparity. In comparison with men, terminally ill women have been found to be less likely to receive caregiving assistance from family and friends and thus more likely to have to pay for nursing care.[15] In addition, women may be disproportionately affected by childcare expenses, potentially contributing to increased financial burden after cancer diagnosis. Age was another significant predictor of financial burden. Both Medicare coverage and age over 65 years were associated with fewer cancer-related financial problems. Americans over 65 benefit from Medicare coverage, and are thus less likely than younger patients to be uninsured or underinsured, leading to increased financial protection from medical diagnoses that require expensive treatment. Furthermore, older patients are more likely to have accrued financial resources and are less likely to have younger dependents.

Several studies have reported that financial difficulties and low income are associated with anxiety and depression in cancer survivors.[16-19] However, few have examined the relationship

between cancer-specific financial problems and quality of life. Using survey data from patients on a cancer registry in Ireland, Sharp et al[11] found that cancer-related financial strain was associated with a roughly three-fold risk for depression. Similarly, among a group of breast cancer survivors from the southeastern United States, Meneses et al[10] reported an association between cancer-related financial events, such as decrease in work productivity and additional incurred out of pocket expenses, with decreased quality of life. A major strength of our study is the use of data designed to be representative of the entire US population, thus limiting population biases that may be present in institution-based or regional studies.

Compared with some prior studies, we noted a relatively low proportion of patients who reported financial problems as a result of cancer. The majority of patients in our study (69.6%) claimed no financial problems at all, whereas much smaller proportions reported "a lot" (8.6%), or "some" (11.7%). Reported levels of cancer-related financial strain vary. For example, Sharp et al[11] found that 32% of patients more than 6 months post cancer diagnosis reported increased financial strain as a result of cancer. Similarly, we found that 30% of patients surveyed in our study reported some degree of cancer-related financial problems. However, Zafar et al[7] found that, even among a group of insured patients who did not request copayment assistance, 85% reported at least some degree of financial burden from cancer-related expenses; for 27%, this burden was significant or catastrophic. Aspects of our study population may explain the lower reported rates of financial strain. The survey captured responses from patients who reported a diagnosis of cancer ever in their lifetime. Recall bias is likely to be present: patients for whom much time has elapsed since cancer diagnosis and treatment may be less likely to recall financial hardship, especially if they have reaccumulated resources lost during that time. It is also possible that the survey population included some patients who were diagnosed with childhood cancer and were thus, to a degree, protected from the financial toll of their disease.

Our study has several limitations. The survey item on cancer-related financial problems assessed a subjective rating of financial burden. There may have been significant variation in patients' interpretation of the potential responses (eg, "a lot" *v* "some"). Similarly, quality of life was also measured by self-assessment, potentially leading to greater variation in response in comparison to results obtained from validated quality-of-life instruments. Because the NHIS is a cross-sectional study, no conclusions about causation can be drawn. In addition, the survey does not provide any data on cancer stage and prognosis. Patients with more advanced disease may be more likely to have increased worry, lower quality of life, and increased financial difficulties; we are unable to examine this relationship with the available survey data. Furthermore, the survey included any patients who had ever been told they had cancer, and no temporal relationship between cancer diagnosis and emergence of financial difficulty can thus be elucidated from the data. This temporal relationship is also likely to confound data on quality of life and degree of worry that cancer may return; for example, patients for whom more time has elapsed since a cancer diagnosis may be less likely to worry about recurrence. Finally, our data do not report on the sources of financial difficulties for patients with cancer, which could inform the types of interventions necessary to address this problem.

However, this study is, to our knowledge, the largest, most contemporary population-based analysis of the financial impact of cancer on the self-reported quality of life of Americans. Our data highlight the need to draw increased attention to the economic burden caused by a cancer diagnosis and the impact this burden may have on a patient's overall well-being. Lack of insurance coverage is strongly associated with the degree of cancer-related financial problems. Additional interventions to decrease personal costs of cancer are worthy of further study. Cost-effectiveness research to meticulously appraise the cost versus benefit of cancer therapies is needed, along with an increasing awareness on the part of clinicians of the impact cancer-related costs can have on the quality of life of their patients.

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Authors' Disclosures of Potential Conflicts of Interest

The authors indicated no potential conflicts of interest.

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Appendix

Table A1. Demographic Characteristics of Informative Responders Versus Those Who Refused to Answer or Responded "Don't Know"

Characteristic	Informative Responders (%)	"Don't Know" or Refused to Respond (%)	*P*
% total sample	98.5	1.5	
Sex			.219
Male	44.0	39.3	
Female	56.0	60.6	
Race/ethnicity			.450
White	90.6	90.4	
Black	6.7	7.5	
Asian	1.5	1.2	
All other races	1.2	0.4	
Age, years			.696
18-64	53.2	54.8	
≥ 65	46.8	45.2	
Education			.300
Less than grade 12	12.5	17.6	
High school graduate	27.5	25.4	
Some college/associate's	29.8	31.0	
Bachelor's	16.8	16.3	
Master's	9.1	7.0	
Professional/doctorate	4.4	2.8	
Insurance status			.851
Medicare	51.0	51.1	
Medicaid	3.7	5.6	
Military	2.7	3.0	
Private	36.6	34.4	
Not covered	6.0	5.9	
Total combined family income, $			.055
0-34,999	35.2	45.5	
35,000-74,999	33.0	30.5	
75,000-99,999	12.5	8.7	
≥ 100,000	19.3	15.3	
Region			.450
Northeast	17.1	22.9	
Midwest	25.0	23.7	
South	37.4	35.3	
West	20.5	18.1	
Cancer type			.280
Breast	88.1	11.9	
Cervical	93.1	6.9	
Colorectal	89.3	10.7	
Lung	90.1	9.9	
Lymphoma/leukemia	86.6	13.4	
Melanoma	91.0	9.0	
Ovarian	84.2	15.8	
Prostate	87.0	13.0	
Thyroid	94.7	5.3	
Uterine	94.5	5.5	
Other	92.0	8.0	