



Published in final edited form as:

Cancer Epidemiol Biomarkers Prev. 2019 July ; 28(7): 1202–1211. doi:10.1158/1055-9965.EPI-18-1336.

Financial hardship and quality of life among African American and white cancer survivors: The role of limiting care due to cost

Theresa A. Hastert^{1,2}, Jaclyn M. Kyko^{1,2,3}, Amanda R. Reed^{1,2}, Felicity W. K. Harper^{1,2}, Jennifer L. Beebe-Dimmer^{1,2}, Tara E. Baird^{1,2}, and Ann G. Schwartz^{1,2}

¹Department of Oncology, Wayne State University School of Medicine, Detroit, MI

²Population Studies and Disparities Research Program, Karmanos Cancer Institute, Detroit, MI

³Department of Family Medicine & Public Health Sciences, Wayne State University School of Medicine, Detroit, MI

Abstract

BACKGROUND: Financial hardship is common among cancer survivors and is associated with both limiting care due to cost and with poor health-related quality of life (HRQOL). The present study estimates the association between limiting care due to cost and HRQOL in a diverse population of cancer survivors and tests whether limiting care mediates the association between financial hardship and HRQOL.

METHODS: We used data from 988 participants (579 African American, 409 white) in the Detroit Research on Cancer Survivors (ROCS) pilot, a hospital-based cohort of breast, colorectal, lung, and prostate cancer survivors. We assessed associations between financial hardship, limiting care, and HRQOL (measured by the FACT-G) using linear regression and mediation analysis controlling for demographic, socioeconomic, and cancer-related variables.

RESULTS: FACT-G scores were 4.2 (95% CI: 2.0, 6.4) points lower among survivors who reported financial hardship compared to those who did not in adjusted models. Limiting care due to cost was associated with a –7.8 point (95% CI: –5.1, –10.5) point difference in FACT-G scores. Limiting care due to cost explained 40.5% (95% CI: 25.5%, 92.7%) of the association between financial hardship and HRQOL overall, and 50.5% (95% CI: 29.1%, 188.1%) of the association for African American survivors.

CONCLUSIONS: Financial hardship and limiting care due to cost are both associated with lower HRQOL among diverse cancer survivors and this association is partially explained by limiting care due to cost.

IMPACT: Actions to ensure cancer patients can access appropriate care could lessen the impact of financial hardship on HRQOL.

Corresponding Author: Theresa A. Hastert, Ph.D., M.P.P., 4100 John R. St., MM04EP, Detroit, MI 48201, Phone: (313) 478-5261, Fax: (313) 578-4306, hastertt@karmanos.org.

Conflict of Interest: The authors declare no potential conflicts of interest.

Keywords

survivorship research; quality of life; psychosocial; financial hardship; disparities

Introduction

Financial hardship is common among cancer survivors, with close to 50% reporting adverse financial outcomes related to cancer or cancer treatment.¹ Cancer survivors may experience material financial hardship such as reductions in income, utilizing assets, and incurring cancer-related debt, as well as behavioral financial hardship, including measures of limiting care (e.g. forgoing or delaying treatment, limiting medication) due to cost.^{1–4} (From here forward, this paper will refer to material financial hardship as “financial hardship” and behavioral financial hardship as “limiting care due to cost”.)

Cancer-related financial hardship is associated with poor health-related quality of life (HRQOL),^{3,5–15} including lower physical, functional, mental, and emotional wellbeing.^{3,6,8,15,16} Many cancer patients worry about cost when making treatment decisions,¹⁷ and experiencing financial hardship is associated with forgoing or delaying medical care.^{18,19} Limiting medical care because of cost concerns could be a plausible mechanism through which material financial hardship impacts HRQOL, but little is known about the association between limiting care due to cost and HRQOL. Its role as a potential mediator of the association between financial hardship and HRQOL has not been tested.

The objectives of this study are to estimate associations between financial hardship and limiting care due to cost and HRQOL among white and African American cancer survivors, and to test whether and to what extent observed associations between financial hardship and HRQOL are mediated by limiting care due to cost. We hypothesize that financial hardship and limiting care due to cost will each be associated with lower HRQOL and that limiting care due to cost will at least partially mediate the association between financial hardship and HRQOL.

Materials and Methods

Study Population

The Detroit Research On Cancer Survivors (ROCS) pilot is a hospital-based cohort study designed to investigate associations between medical history, health behaviors, financial hardship, and health-related outcomes among cancer survivors in Metropolitan Detroit.²⁰ Participants were eligible to join the cohort if they were: white or African American; diagnosed with a first primary, invasive colorectal, lung, prostate or female breast cancer on or after January 1, 2013; ages 20–79 at diagnosis; and diagnosed and/or treated at the Karmanos Cancer Center in Detroit, MI. Participants were diagnosed a median of 17 (mean: 18.7, range: 1–54) months before completing the baseline survey. On average, lung cancer survivors were diagnosed more recently (14.9 months) than colorectal (18.8 months), prostate (18.9 months), or breast cancer survivors (20.2 months).

A flow diagram of participant recruitment appears in Figure 1. A total of 1,475 potentially-eligible participants were identified through a data query of the Metropolitan Detroit Cancer Surveillance System (MDCSS; the Detroit registry of the Surveillance, Epidemiology and End Results Program). We contacted the physician of record for each potential participant asking if they objected to the patient being invited to participate. Participant invitation letters were sent if no objection was received within three weeks. Nine survivors were excluded due to physician objection, 347 refused, and 119 did not respond to repeated invitations, for a total of 1,000 survivors enrolled into the cohort (response rate=67.8%). Participants completed baseline surveys between March, 2015 and June, 2017. Analyses exclude participants missing information on financial hardship or limiting care due to cost (N=10) or HRQOL (N=2), for an analytic sample of 988 participants.

The Institutional Review Board at Wayne State University approved this research, which was conducted in concordance with the Belmont Report. Participants completing the survey online provided written informed consent. Phone participants received a written study information sheet, which was reviewed by the interviewer, and provided informed consent orally.

Data Collection

Information on individuals' demographic and socioeconomic characteristics, HRQOL, and experiences of financial hardship and limiting care due to cost was self-reported. Participants completed surveys online via Qualtrics® or over the phone with a trained interviewer. We obtained cancer-related information including cancer site, stage, and time since diagnosis via linkage with MDCSS.

Financial Hardship and Limiting Care Due to Cost—Financial hardship information was collected using a previously-developed multidimensional instrument assessing the financial experiences of patients with cancer.⁴ Participants were asked whether in order to pay bills related to cancer treatment they had to do any of the following, and were instructed to select all that apply: refinance or take out a second mortgage on their home, sell their home, sell stocks or other investments, or withdraw money from retirement accounts. They were separately asked whether their income had declined since their cancer diagnosis; whether they or any member of their family had to borrow money from friends or other family members to help pay for their cancer treatment; and whether they were currently in debt due to expenses related to their cancer. We counted participants answering in the affirmative to any of the above items as experiencing financial hardship.

Participants were considered to have limited care due to cost if they answered in the affirmative to any of the following questions: Did you turn down treatments (chemotherapy, radiation, pain medications, anti-nausea medications, anti-diarrhea medications, or other recommended cancer treatments) because you were concerned about the cost? Did you ever skip doses of prescribed medication in order to save money? Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?

In sensitivity analyses we separately excluded assets from the measure of financial hardship, and estimated associations between the number (0, 1, 2+) of financial hardships and care

limitations reported and HRQOL, and estimated a per-hardship and per-care limitation association with HRQOL by modeling each as continuous predictors in linear regression models.

Health-Related Quality of Life (HRQOL)—HRQOL was measured using the Functional Assessment of Cancer Therapy—General (FACT-G),²¹ including four subscales: Physical Well-Being (PWB), Social/Family Well-Being (SWB), Emotional Well-Being (EWB), and Functional Well-Being (FWB). Each subscale includes 6–7 statements (e.g. “I have a lack of energy”) and participants are asked to rate the extent to which each statement applied to them in the past seven days using a five-point scale (0=“not at all” to 4=“very much”). Responses are coded so that higher scores reflect higher quality of life. Cancer site-specific subscales assess concerns specific to survivors of individual cancers. Subscale scores are added to the FACT-G to produce total HRQOL scores for breast (FACT-B), colorectal (FACT-C), lung (FACT-L), and prostate (FACT-P) cancers.

The reliability and validity of the FACT-G and the site-specific measures have been extensively documented, with alpha coefficients for internal consistency measured at 0.60 to 0.90 and with consistent findings of sensitivity to changes in disease progression and performance status.^{22–25} A two-point difference on the subscale scores and a five-point difference on the total FACT-G score are associated with meaningful differences on clinical and subjective indicators.²⁶ Differences of 2–3 points on the site-specific subscale scores, or 5–10 points for the site-specific FACT measures are associated with clinically meaningful differences in HRQOL.^{27–30}

Statistical Analysis

We fit linear regression models with financial hardship or limiting care as the exposure and HRQOL measures as the outcomes of interest and utilizing robust standard errors. Age, sex, and race were determined *a priori* to be included as covariates. Additional covariates were selected using a directed acyclic graph (DAG) including relationships between financial hardship, limiting care, HRQOL, and each of the factors listed in Table 1.³¹ Final models controlled for continuous, mean-centered age, in addition to sex, race, marital status, income, education, employment status, health insurance, number of comorbid conditions, cancer site, stage at diagnosis, and treatments received using categories presented in Table 1. Checks of variance inflation factors did not suggest problems with multicollinearity between covariates (<https://stats.idre.ucla.edu/stata/webbooks/reg/chapter2/stata-webbooksregressionwith-statachapter-2-regression-diagnostics/> accessed December 10, 2018). In post hoc analyses we tested for effect modification by time since diagnosis split approximately at the median (<18 months/18+ months) by including interaction terms between since diagnosis and financial hardship or limiting care.

Mediation Analysis—We used causal mediation analyses to test whether observed associations between financial hardship and HRQOL were mediated by limiting care due to cost. These models use the *medeff* command³² to estimate three parameters: 1) total effect of financial hardship on HRQOL; 2) average causal mediated effect (ACME), or the effect

of financial hardship on HRQOL acting through limiting care due to cost; and 3) direct effect of financial hardship on HRQOL.^{33–35}

Estimates of the proportion mediated can be unstable and can even be greater than one or negative in the presence of inconsistent mediation.³⁶ The mediation models require the strong assumption of sequential ignorability, or that there is no uncontrolled confounding of the association between the exposure and the mediator or outcome, or between the mediator and outcome.³⁷ To address this, we present the results of sensitivity analyses (using the *medsens* command³²) estimating how large a departure from sequential ignorability would be required for the observed mediated effect to be zero.^{32–35}

All analyses were conducted using Stata, version 14.2.

Results

Participant characteristics and mean FACT-G scores by participant characteristics are presented in Table 1. The mean FACT-G score was 76.0 (95% CI: 74.9, 77.2), lower than the mean of 80.1 from normative data for United States adults (not necessarily cancer survivors).³⁸ Higher FACT-G scores were associated with being older, male, white, married or living with a partner, having higher levels of education and income, full- or part-time employment, fewer comorbid conditions, prostate cancer, not receiving chemotherapy or requiring multiple forms of cancer treatment, having private insurance and not reporting Medicaid coverage. Nearly all (99%) participants had some form of health insurance coverage at the time of study participation (data not shown).

Table 2 gives the prevalence of financial hardship and limiting care due to cost by participant characteristics. Financial hardship was more common among younger survivors, women, those with lower income and educational attainment, and unmarried survivors, as well those with breast cancer, those who received chemotherapy, and those with Medicaid coverage. Limiting care was more common among African American survivors, those with lower incomes, those on medical leave or disability, those with Medicaid and those without private insurance.

Table 3 describes the prevalence of overall and specific forms of financial hardship and limiting care due to cost for all survivors and stratified by race. Nearly half (46.1%) of participants reported experiencing some form of financial hardship associated with cancer. Financial hardship was more common in African American (50.0%) than white survivors [40.6%, risk ratio (RR) of financial hardship associated with being African American vs. white: 1.23, 95% CI: 1.06, 1.43]. Experiencing a decrease in income was the most common form of financial hardship (29.4%), followed by still being in cancer-related debt (25.5%), borrowing money from family or friends (9.7%), and utilizing assets to pay for cancer care (6.7%).

Prevalence of some forms of financial hardship differed by race, with more African American than white survivors reporting still being in debt due to cancer (RR: 1.68, 95% CI: 1.32, 2.13), and fewer African American than white survivors reporting utilizing assets to pay for care (RR: 0.68, 95% CI: 0.51, 0.90). Prevalence of borrowing money from family or

friends and experiencing a decrease in income did not differ by race. Limiting care due to cost was more common in African American than white survivors (RR: 1.41, 95% CI: 1.05, 1.89), driven by differences in needing to see a doctor and not going due to cost.

Associations between both financial hardship and limiting care due to cost and HRQOL are presented in Table 4. FACT-G scores were 7.5 (95% CI: 5.2, 9.8) points lower among survivors who experienced financial hardship compared to those who did not in an unadjusted model, and the difference was more than twice as great in African American compared with white survivors ($P_{\text{interaction}}=0.011$). The association attenuated in adjusted models, particularly for white survivors, and results of the adjusted models did not differ by race.

FACT-G scores were 12.3 (95% CI: 9.4, 15.2) points lower among all survivors, 15.3 (95% CI: 9.8, 20.8) points lower among white, and 9.9 (95% CI: 6.4, 13.3) points lower among African American survivors who limited care compared to those who did not in unadjusted models. These associations attenuated dramatically among white survivors but less so among African American survivors in adjusted models.

In sensitivity analyses we observed a dose-response association between both financial hardship and care limitations and HRQOL. FACT-G scores were 4.8 (95% CI: 2.2, 7.5) and 11.2 points (95% CI: 8.0, 14.3) lower for survivors who reported one or two or more forms of financial hardship, respectively, compared with those who reported none. Similarly, FACT-G scores were 10.4 (95% CI: 7.2, 13.6) and 17.1 (95% CI: 11.5, 22.8) points lower, respectively, for those reporting one or two or more care limitations (Supplementary Table S1). FACT-G scores were 2.4 (95% CI: 1.3, 3.6) and 5.1 (95% CI: 3.3, 6.9) points lower, respectively, for each additional financial hardship or care limitation reported (Supplementary Table S2).

Experiencing financial hardship was not associated with clinically meaningful differences in specific forms of wellbeing in adjusted models, but was associated with clinically meaningful differences in site-specific HRQOL for breast, and prostate cancer (Table 4). Limiting care due to cost was associated with clinically significant differences in physical and functional wellbeing and with lower site-specific HRQOL for breast and prostate cancer in adjusted models.

Results of the mediation models (Table 5) suggest that 40.5% (95% CI: 25.5%, 92.7%) of the difference in FACT-G scores associated with financial hardship was due to limiting care due to cost. Limiting care explained half (50.5%, 95% CI: 29.1%, 188.1%) of the association among African American survivors and 18.4% (95% CI: 9.7%, 88.7%) among white survivors.

In *post hoc* sensitivity analyses we tested whether the association between financial hardship and quality of life differed by time since diagnosis (Supplementary Table S3). These analyses revealed that among survivors diagnosed within the previous 18 months, FACT-G scores were 6.8 (95% CI: 3.7, 9.9) points lower for those who reported financial hardship, but that financial hardship was not associated with differences in FACT-G scores for longer-term survivors (-0.6 , 95% CI: -3.6 , 2.5 ; $P_{\text{interaction}}=0.006$).

Discussion

Our results confirm previous findings of an inverse association between financial hardship and HRQOL among cancer survivors, and extend this work by including a large number of African American survivors and estimating race-specific associations. To our knowledge, this is the first work to establish an association between limiting care due to cost and HRQOL, finding clinically meaningful differences in HRQOL for survivors who limited care compared with those who did not. Mediation analyses suggest that 40% of the association between financial hardship and HRQOL is due to limiting care due to cost, and that limiting care explains half of the association between financial hardship and HRQOL for African American survivors. Post hoc analyses suggest effect modification in the association between financial hardship and HRQOL by time since diagnosis.

Previous work has examined the association between material financial hardship or financial distress and HRQOL using both the FACT-G^{3,5-7,14,16} and other measures.^{8-13,15} This work has examined associations between financial reserves,¹⁶ financial strain,^{8,9,13} specific types of financial burdens (e.g. debt, bankruptcy),¹² living expenses,¹⁰ work impacts,^{10,11} and out-of-pocket medical expenses¹¹ and HRQOL among survivors of several types of cancer, including breast,^{8,11} colorectal,^{9,13,16} lung,^{8,13,16} and prostate.⁸ In each case, adverse financial impacts of cancer were associated with worse HRQOL.

To our knowledge, this is the first work to report on associations between financial hardship and HRQOL separately by race. Previous work suggests that financial hardship is more common among African American than white survivors,^{39,40} but only one previous study into the association between financial hardship and HRQOL included a substantial proportion of African American participants,⁵ and none estimated race-specific associations.

Financial hardship was common in this population of cancer survivors even though nearly all had some form of health insurance. Even among those with health insurance, out-of-pocket costs can pose a serious threat to cancer patients' finances. In 2018, 45% of American adults between the ages of 19 and 64 were underinsured, meaning that their out-of-pocket costs and/or deductibles were equivalent to at least 5–10% of their income.⁴¹ In one study of Medicare enrollees, out-of-pocket costs for cancer care ranged from more than \$2000 per year among those with supplemental Medicaid coverage to more than \$8000 per year for Medicare enrollees without supplemental coverage.⁴² For Medicare enrollees without supplemental coverage these out-of-pocket costs equated to 23.7% of their household income.⁴²

These findings highlight the importance of underinsurance in the financial consequences of cancer. As Americans consider policy options to expand health insurance coverage more broadly, investigators in this area should work with policy makers to ensure that proposals to expand coverage also address underinsurance and its potential to impact cancer survivors' finances, their ability to access appropriate care, and subsequent impacts on HRQOL.

Improving patients' knowledge of treatment costs may also represent a promising strategy to improve financial outcomes. Although most cancer patients want to discuss treatment costs with their physicians,^{43,44} research suggests that cost discussions happen infrequently when

patients and oncologists discuss treatment options, and may focus more on indirect costs such as missing work than on direct costs such as out-of-pocket costs and copayments.⁴⁵ Improved cost discussions between cancer patients and their oncologists could help patients make more informed treatment decisions,^{19,46–48} connect patients with financial support,⁴⁹ and potentially reduce financial hardship related to cancer.^{19,46,47,50}

It is important to consider how some features of this study design may impact our results and their interpretations. Although the ROCS pilot includes data on several forms of financial hardship and care limitations used in previous work, this is a cross-sectional study with self-reported, retrospective information about cancer survivors' experiences with financial hardship and care limitations. Given this design, it is possible that survivors who were negatively impacted by financial hardships and care limitations could be more likely to remember and report them than survivors for whom these problems were less severe, which could inflate our observed associations with HRQOL.

For survivors with adequate financial resources, utilizing assets to pay for cancer care may not represent a hardship. In supplemental analyses (Supplementary Table S1) we estimated the association between each individual form of financial hardship and HRQOL, finding that FACT-G scores were 5.2 (95% CI: 0.6, 9.7) points lower survivors who utilized assets to pay for care than those who did not. This is a clinically meaningful difference in HRQOL and is similar to the effect of experiencing a decrease in income, but weaker than the association observed for borrowing from friends and family or being in debt due to cancer (differences in FACT-G of 9.9–10.0). In an adjusted model, experiencing financial hardship other than utilizing assets was associated with –4.0 (95% CI: –6.2, –1.9) point difference in FACT-G scores similar to the estimate including assets (Supplementary Table S4).

A unique contribution of this work is our attempt to estimate the proportion of the association between financial hardship and HRQOL due to a particular mechanism, finding that approximately 40% of the association is explained by limiting care due to cost. Limiting care explains half of the association for African American survivors and approximately 18% among white survivors. This finding has the potential to direct resources to minimize the impact of financial hardship among African American survivors, who experience more negative financial impacts of cancer than white survivors do,^{39,40} and highlights the importance of ensuring cancer patients can access necessary care.

Our finding that that limiting care is strongly associated with worse HRQOL, particularly for African American survivors, suggests that future work addressing the financial consequences of cancer should focus on ensuring all cancer patients can access appropriate treatments without limitations related to cost concerns, both to improve survivors' HRQOL and to potentially reduce disparities in outcomes related to the financial consequences of cancer.

Estimates of the proportion mediated can be unstable and can even be greater than one or negative in the presence of inconsistent mediation.³⁶ To address this instability, we conducted sensitivity analyses^{32–35} and estimate that if 19% of the variation in FACT-G scores was due to unmeasured confounding, the mediation effect would no longer be

observed. The mediation effect observed among African American survivors was more stable (larger absolute ρ value) than that among white survivors (Table 5).

In assessing whether differences in time since diagnosis influenced our findings, we discovered effect modification such that financial hardship was associated with HRQOL among survivors diagnosed within 18 months, but not among longer-term survivors in adjusted models (Supplementary Table S3). Previous work has examined longitudinal changes in HRQOL, finding that HRQOL improved more among patients without financial stress,⁶ but to our knowledge, our finding of effect modification is novel. Because late stage at diagnosis is associated with shorter expected survival, patients diagnosed with late stage disease would be less likely to be included in this cohort than longer-term survivors. However, the stage distribution in this study population does not vary substantially by time since diagnosis (stages I, II, III, and IV disease account for 31.6%, 28.9%, 19.0%, and 20.6% of recently diagnosed and 26.2%, 39.4%, 19.3%, and 15.1% of longer-term survivors, respectively). This finding warrants further examination in future research, but suggests that the impacts of financial hardship on HRQOL may not be enduring, and that survivors who face financial difficulties may regain quality of life during longer-term survival. Interestingly, we observed no effect modification in the association between limiting care and HRQOL by time since diagnosis, suggesting that care limitations may have lasting negative impacts on survivors' HRQOL.

Important strengths of this study include its sample size sufficient to estimate associations between financial hardship and limiting care due to cost, and several measures of HRQOL; the inclusion of a large number of African American survivors, allowing for race-specific estimates; its high response rate, minimizing the potential for selection bias; and use of a detailed participant survey including validated HRQOL measures, and the ability to control for several potential confounders.

Additional limitations of this work should also be noted. Although the Detroit ROCS pilot cohort includes diversity in race, income, and cancer site, it is hospital-based, and therefore not representative of the general population of cancer survivors. The financial hardship measures included here have been used in prior research,⁴ but they are self-reported and have not been validated against survivors' financial records. Additionally, information about survivors' pre-diagnosis household income or assets is not available. Although the FACT-G and its site-specific scales have demonstrated good reliability, validity, and sensitivity to change, the available information on minimally important differences was developed in reference to changes in individuals' scores over time rather than between groups. While the questions about financial hardship and limiting care refer to experiences since diagnosis or in the previous year and the FACT-G asks survivors about their HRQOL in the previous seven days, this study is cross sectional, and information about financial hardship, limiting care, and HRQOL were all collected at the same time, limiting our ability to establish temporal relationships.

Financial hardship is common among cancer survivors and is associated with lower HRQOL. Our results suggest that this association is at least partly explained by limiting care due to cost, making care limitations a potentially important target for interventions aimed at

reducing the adverse financial consequences of cancer, particularly for African American survivors. As investigators call for interventions to minimize the impact of financial hardship on cancer survivors,⁵¹ it is critical to better understand the potential mechanisms through which financial hardship impacts survivors' health outcomes and quality of life, and this is especially true for non-white populations where financial hardship is most common.^{39,40} Measures that improve access to and affordability of care represent a promising strategy as investigators, clinicians, and policymakers aim to reduce the burden of financial hardship and its impacts on health-related outcomes among cancer survivors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Financial Support:

This research was funded by the American Cancer Society (MRS-17-019 to TAH), the Karmanos Cancer Institute, the General Motors Foundation, and NIH grants/contracts U01CA199240 to AGS, P30CA022453 and HHSN2612612013000111.

References

1. Altice CK, Banegas MP, Tucker-Seeley RD, Yabroff KR. Financial Hardships Experienced by Cancer Survivors: A Systematic Review. *J Natl Cancer Inst.* 2017;109(2):djw205. doi:10.1093/jnci/djw205 [PubMed: 27754926]
2. Zafar SY, Peppercorn JM, Schrag D, et al. The Financial Toxicity of Cancer Treatment: A Pilot Study Assessing Out-of-Pocket Expenses and the Insured Cancer Patient's Experience. *The Oncologist.* 2013;18(4):381–390. doi:10.1634/theoncologist.2012-0279 [PubMed: 23442307]
3. Hamilton JG, Wu LM, Austin JE, et al. Economic survivorship stress is associated with poor health-related quality of life among distressed survivors of hematopoietic stem cell transplantation. *Psychooncology.* 2013;22(4):911–921. doi:10.1002/pon.3091 [PubMed: 22605430]
4. Shankaran V, Jolly S, Blough D, Ramsey SD. Risk Factors for Financial Hardship in Patients Receiving Adjuvant Chemotherapy for Colon Cancer: A Population-Based Exploratory Analysis. *J Clin Oncol.* 2012;30(14):1608–1614. doi:10.1200/JCO.2011.37.9511 [PubMed: 22412136]
5. Delgado-Guay M, Ferrer J, Rieber AG, et al. Financial Distress and Its Associations With Physical and Emotional Symptoms and Quality of Life Among Advanced Cancer Patients. *The Oncologist.* 2015;20(9):1092–1098. doi:10.1634/theoncologist.2015-0026 [PubMed: 26205738]
6. Ell K, Xie B, Wells A, Nedjat-Haiem F, Lee P-J, Vourlekis B. Economic stress among low-income women with cancer: effects on quality of life. *Cancer.* 2008;112(3):616–625. doi:10.1002/encr.23203 [PubMed: 18085642]
7. Fenn KM, Evans SB, McCorkle R, et al. Impact of Financial Burden of Cancer on Survivors' Quality of Life? *J Oncol Pract.* 5 2014;JOP.2013.001322. doi:10.1200/JOP.2013.001322
8. Gupta D, Lis CG, Grutsch JF. Perceived cancer-related financial difficulty: implications for patient satisfaction with quality of life in advanced cancer. *Support Care Cancer.* 2007;15(9):1051–1056. doi:10.1007/s00520-007-0214-2 [PubMed: 17242911]
9. Sharp L, O'Leary E, O'Ceilleachair A, Skally M, Hanly P. Financial Impact of Colorectal Cancer and Its Consequences: Associations Between Cancer-Related Financial Stress and Strain and Health-Related Quality of Life. *Dis Colon Rectum.* 2018;61(1):27–35. doi:10.1097/DCR.0000000000000923 [PubMed: 29219919]
10. Rogers SN, Harvey-Woodworth CN, Hare J, Leong P, Lowe D. Patients' perception of the financial impact of head and neck cancer and the relationship to health related quality of life. *Br J Oral Maxillofac Surg.* 2012;50(5):410–416. doi:10.1016/j.bjoms.2011.07.026 [PubMed: 22000023]

11. Meneses K, Azuero A, Hassey L, McNees P, Pisu M. Does economic burden influence quality of life in breast cancer survivors? *Gynecol Oncol.* 2012;124(3):437–443. doi:10.1016/j.ygyno.2011.11.038 [PubMed: 22138013]
12. Peipert BJ, Goswami S, Helenowski I, Yount SE, Sturgeon C. Financial burden is associated with worse health-related quality of life in adults with multiple endocrine neoplasia type 1. *Surgery.* 2017;162(6):1278–1285. doi:10.1016/j.surg.2017.07.010 [PubMed: 28923697]
13. Zafar SY, McNeil RB, Thomas CM, Lathan CS, Ayanian JZ, Provenzale D. Population-Based Assessment of Cancer Survivors' Financial Burden and Quality of Life: A Prospective Cohort Study. *J Oncol Pract.* 2015;11(2):145–150. doi:10.1200/JOP.2014.001542 [PubMed: 25515717]
14. de Souza JA, Yap BJ, Wroblewski K, et al. Measuring financial toxicity as a clinically relevant patient-reported outcome: The validation of the COmprehensive Score for financial Toxicity (COST). *Cancer.* 2017;123(3):476–484. doi:10.1002/cncr.30369 [PubMed: 27716900]
15. Kale HP, Carroll NV. Self-reported financial burden of cancer care and its effect on physical and mental health-related quality of life among US cancer survivors. *Cancer.* 2016;122(8):283–289. doi:10.1002/cncr.29808 [PubMed: 26991528]
16. Lathan CS, Cronin A, Tucker-Seeley R, Zafar SY, Ayanian JZ, Schrag D. Association of Financial Strain With Symptom Burden and Quality of Life for Patients With Lung or Colorectal Cancer. *J Clin Oncol.* 2016;34(22):2232. doi:10.1200/JCO.2015.63.2232
17. Martin MY, Fouad MN, Oster RA, et al. What do cancer patients worry about when making decisions about treatment? Variation across racial/ethnic groups. *Support Care Cancer Off J Multinatl Assoc Support Care Cancer.* 2014;22(1):233–244. doi:10.1007/s00520-013-1958-5
18. Kent EE, Forsythe LP, Yabroff KR, et al. Are survivors who report cancer-related financial problems more likely to forgo or delay medical care? *Cancer.* 2013;119(20):3710–3717. doi:10.1002/cncr.28262 [PubMed: 23907958]
19. Bestvina CM, Zullig LL, Rushing C, et al. Patient-Oncologist Cost Communication, Financial Distress, and Medication Adherence. *J Oncol Pract.* 2014;10(3):162–167. doi:10.1200/JOP.2014.001406 [PubMed: 24839274]
20. Beebe-Dimmer JL, Albrecht TL, Baird TE, et al. The Detroit Research on Cancer Survivors (ROCS) Pilot Study: A focus on outcomes after cancer in a racially-diverse patient population. *Cancer Epidemiol Prev Biomark.* 2018;17(12):2018. doi:10.1158/1055-9965.EPI-18-0123
21. Cella DF, Tulsky DS, Gray G, et al. The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *J Clin Oncol.* 1993;11(3):570–579. [PubMed: 8445433]
22. Brady MJ, Cella DF, Mo F, et al. Reliability and validity of the Functional Assessment of Cancer Therapy-Breast quality-of-life instrument. *J Clin Oncol.* 1997;15(3):974–986. doi:10.1200/JCO.1997.15.3.974 [PubMed: 9060536]
23. Ward WL, Hahn EA, Mo F, Hernandez L, Tulsky DS, Cella D. Reliability and validity of the Functional Assessment of Cancer Therapy-Colorectal (FACT-C) quality of life instrument. *Qual Life Res.* 8(3):181–195. doi:10.1023/A:1008821826499
24. Cella DF, Bonomi AE, Lloyd SR, Tulsky DS, Kaplan E, Bonomi P. Reliability and validity of the functional assessment of cancer therapy—lung (FACT-L) quality of life instrument. *Lung Cancer.* 1995;12(3):199–220. doi:10.1016/0169-5002(95)00450-F [PubMed: 7655830]
25. Esper P, Mo F, Chodak G, Sinner M, Cella D, Pienta KJ. Measuring quality of life in men with prostate cancer using the Functional Assessment of Cancer Therapy-prostate instrument. *Urology.* 1997;50(6):920–928. doi:10.1016/S0090-4295(97)00459-7 [PubMed: 9426724]
26. Brucker PS, Yost K, Cashy J, Webster K, Cella D. General Population and Cancer Patient Norms for the Functional Assessment of Cancer Therapy-General (FACT-G). *Eval Health Prof.* 2005;28(2):192–211. doi:10.1177/0163278705275341 [PubMed: 15851773]
27. Eton DT, Cella D, Yost KJ, et al. A combination of distribution- and anchor-based approaches determined minimally important differences (MIDs) for four endpoints in a breast cancer scale. *J Clin Epidemiol.* 2004;57(9):898–910. doi:10.1016/j.jclinepi.2004.01.012 [PubMed: 15504633]
28. Yost KJ, Cella D, Chawla A, et al. Minimally important differences were estimated for the Functional Assessment of Cancer Therapy–Colorectal (FACT-C) instrument using a combination

- of distribution- and anchor-based approaches. *J Clin Epidemiol.* 2005;58(12):1241–1251. doi: 10.1016/j.jclinepi.2005.07.008 [PubMed: 16291468]
29. Cella D, Eton DT, Fairclough DL, et al. What is a clinically meaningful change on the Functional Assessment of Cancer Therapy–Lung (FACT-L) Questionnaire?: Results from Eastern Cooperative Oncology Group (ECOG) Study 5592. *J Clin Epidemiol.* 2002;55(3):285–295. doi:10.1016/S0895-4356(01)00477-2 [PubMed: 11864800]
 30. Cella D, Nichol MB, Eton D, Nelson JB, Mulani P. Estimating Clinically Meaningful Changes for the Functional Assessment of Cancer Therapy—Prostate: Results from a Clinical Trial of Patients with Metastatic Hormone-Refractory Prostate Cancer. *Value Health.* 2009;12(1):124–129. doi: 10.1111/j.1524-4733.2008.00409.x [PubMed: 18647260]
 31. Textor J, van der Zander B, Gilthorpe MS, Li kiewicz M, Ellison GT. Robust causal inference using directed acyclic graphs: the R package ‘dagitty.’ *Int J Epidemiol.* 2016;45(6):1887–1894. doi:10.1093/ije/dyw341 [PubMed: 28089956]
 32. Hicks R, Tingley D. mediation: Stata package for causal mediation analysis. 2011.
 33. Imai K, Keele L, Tingley D. A general approach to causal mediation analysis. *Psychol Methods.* 2010;15(4):309–334. doi:10.1037/a0020761 [PubMed: 20954780]
 34. Imai K, Keele L, Tingley D, Yamamoto T. Causal Mediation Analysis Using R In: *Advances in Social Science Research Using R. Lecture Notes in Statistics.* Springer, New York, NY; 2010:129–154. doi:10.1007/978-1-4419-1764-5_8
 35. Imai K, Keele L, Yamamoto T. Identification, Inference and Sensitivity Analysis for Causal Mediation Effects. *Stat Sci.* 2010;25(1):51–71.
 36. Mediation (David A. Kenny). <http://davidakenny.net/cm/mediate.htm#CI>. Accessed April 24, 2018.
 37. Imai K, Keele L, Tingley D, Yamamoto T. Unpacking the Black Box of Causality: Learning about Causal Mechanisms from Experimental and Observational Studies. *Am Polit Sci Rev.* 2011;105(4):765–789. doi:10.1017/S0003055411000414
 38. Webster K, Cella D, Yost K. The Functional Assessment of Chronic Illness Therapy (FACIT) Measurement System: properties, applications, and interpretation. *Health Qual Life Outcomes.* 2003;1:79. doi:10.1186/1477-7525-1-79 [PubMed: 14678568]
 39. Jagi R, Pottow JAE, Griffith KA, et al. Long-Term Financial Burden of Breast Cancer: Experiences of a Diverse Cohort of Survivors Identified Through Population-Based Registries. *J Clin Oncol.* 3 2014;JCO.2013.53.0956. doi:10.1200/JCO.2013.53.0956
 40. Pisu M, Kenzik KM, Oster RA, et al. Economic hardship of minority and non-minority cancer survivors 1 year after diagnosis: Another long-term effect of cancer? *Cancer.* 2015;121(8):1257–1264. doi:10.1002/cncr.29206 [PubMed: 25564986]
 41. Health Insurance Coverage Eight Years After the ACA — 2018 Biennial | Commonwealth Fund. doi:10.26099/penv-q932
 42. Narang AK, Nicholas LH. Out-of-Pocket Spending and Financial Burden Among Medicare Beneficiaries With Cancer. *JAMA Oncol.* 2017;3(6):757–765. doi:10.1001/jamaoncol.2016.4865 [PubMed: 27893028]
 43. Bullock AJ, Hofstatter EW, Yushak ML, Buss MK. Understanding Patients’ Attitudes Toward Communication About the Cost of Cancer Care. *J Oncol Pract.* 2012;8(4):e50–e58. doi:10.1200/JOP.2011.000418 [PubMed: 23180999]
 44. Kelly RJ, Forde PM, Elnahal SM, Forastiere AA, Rosner GL, Smith TJ. Patients and Physicians Can Discuss Costs of Cancer Treatment in the Clinic. *J Oncol Pract.* 2015;11(4):308–312. doi: 10.1200/JOP.2015.003780 [PubMed: 26015459]
 45. Hamel LM, Penner LA, Eggly S, et al. Do Patients and Oncologists Discuss the Cost of Cancer Treatment? An Observational Study of Clinical Interactions Between African American Patients and Their Oncologists. *J Oncol Pract.* 12 2016;JOP.2016.015859. doi:10.1200/JOP.2016.015859
 46. Ubel PA, Abernethy AP, Zafar SY. Full Disclosure — Out-of-Pocket Costs as Side Effects. *N Engl J Med.* 2013;369(16):1484–1486. doi:10.1056/NEJMp1306826 [PubMed: 24131175]
 47. Schnipper LE, Davidson NE, Wollins DS, et al. American Society of Clinical Oncology Statement: A Conceptual Framework to Assess the Value of Cancer Treatment Options. *J Clin Oncol.* 6 2015;JCO.2015.61.6706. doi:10.1200/JCO.2015.61.6706

48. Meropol NJ, Schrag D, Smith TJ, et al. American Society of Clinical Oncology Guidance Statement: The Cost of Cancer Care. *J Clin Oncol.* 2009;27(23):3868–3874. doi:10.1200/JCO.2009.23.1183 [PubMed: 19581533]
49. Smith SK, Nicolla J, Zafar SY. Bridging the Gap Between Financial Distress and Available Resources for Patients With Cancer: A Qualitative Study. *J Oncol Pract.* 5 2014;JOP.2013.001342. doi:10.1200/JOP.2013.001342
50. Schnipper LE, Davidson NE, Wollins DS, et al. Updating the American Society of Clinical Oncology Value Framework: Revisions and Reflections in Response to Comments Received. *J Clin Oncol.* 2016;34(24):2925–2934. doi:10.1200/JCO.2016.68.2518 [PubMed: 27247218]
51. Yousuf Zafar S Financial Toxicity of Cancer Care: It's Time to Intervene. *JNCI J Natl Cancer Inst.* 2016;108(5). doi:10.1093/jnci/djv370

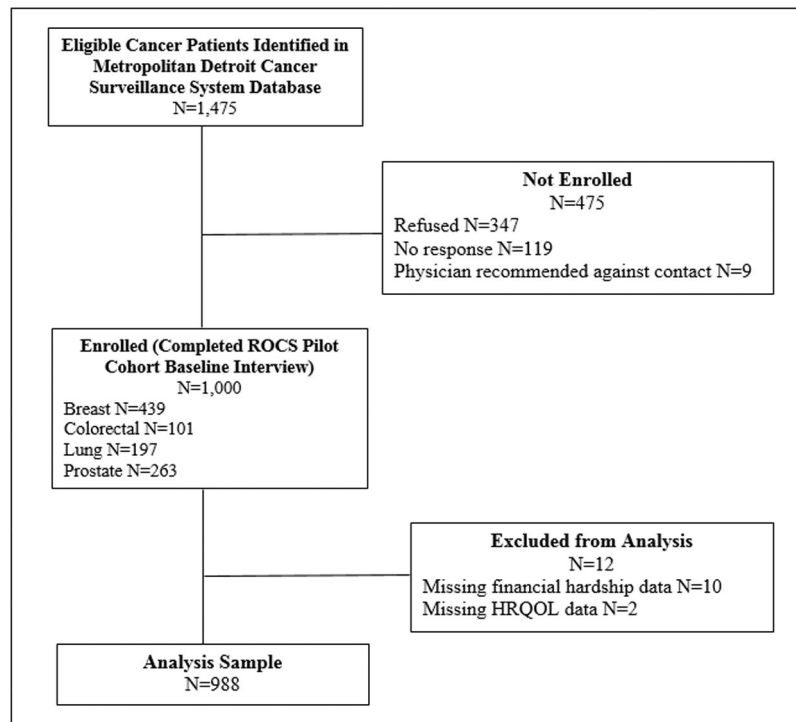


Figure 1:
Flow diagram of study sample - This figure shows the recruitment flow of participants into the Detroit ROCS pilot cohort. **Abbreviations:** HRQOL – health-related quality of life, ROCS – Detroit Research on Cancer Survivors

Table 1.

Participant characteristics and mean FACT-G scores by participant characteristics

	White		African American		Total		FACT-G	
	N	%	N	%	N	%	Mean	95% CI
	409	41.4	579	58.6	988	100	76.0	(74.9, 77.2)
Age (mean, SD)	59.7	9.5	59.5	8.8	59.6	9.1		
Age								
<60	190	46.5	292	50.4	482	48.8	73.3	(71.8, 74.9)
60-69	153	37.4	215	37.1	368	37.3	77.2	(75.4, 79.0)
70+	66	16.1	72	12.4	138	14.0	82.3	(79.3, 85.3)
Sex								
Women	258	63.1	352	60.8	610	61.7	74.7	(73.3, 76.1)
Men	151	36.9	227	39.2	378	38.3	78.2	(76.3, 80.0)
Race								
White	409	100.0	0	0	409	41.4	79.5	(77.8, 81.2)
African American	0	0	579	100.0	579	58.6	73.6	(72.1, 75.0)
Education								
Less than high school	24	5.9	88	15.2	112	11.3	67.2	(64.0, 70.5)
High school/GED	96	23.5	200	34.5	296	30.0	74.1	(72.1, 76.1)
Some college/2-year degree	133	32.5	210	36.3	343	34.7	77.3	(75.5, 79.2)
College graduate/4-year degree	156	38.1	74	12.8	230	23.3	80.8	(78.5, 83.1)
Missing	0	0	7	1.2	7	0.7	80.6	(67.6, 93.6)
Income								
<\$20,000	58	14.2	335	57.9	393	39.8	68.1	(66.5, 69.8)
\$20,000-39,999	68	16.6	100	17.3	168	17.0	77.5	(74.9, 80.0)
\$40,000-59,999	60	14.7	53	9.2	113	11.4	80.6	(77.5, 83.7)
\$60,000-79,999	37	9.1	32	5.5	69	7.0	82.4	(78.5, 86.4)
\$80,000+	155	37.9	30	5.2	185	18.7	86.0	(83.6, 88.4)
Missing	31	7.6	29	5.0	60	6.1	77.1	(72.9, 81.3)
Employment Status								
Employed full time	119	29.1	77	13.3	196	19.8	85.2	(82.9, 87.5)
Employed part time	49	12.0	31	5.4	80	8.1	82.5	(78.9, 86.0)
Homemaker	17	4.2	19	3.3	36	3.6	75.2	(69.9, 80.5)
Unemployed	22	5.4	64	11.1	86	8.7	67.3	(63.8, 70.7)
Retired	151	36.9	206	35.6	357	36.1	79.2	(77.5, 80.9)
On medical leave/disability	48	11.7	172	29.7	220	22.3	64.1	(61.9, 66.2)
Other/missing	3	0.7	10	1.7	13	1.3	73.8	(65.0, 82.6)
Marital Status								
Married or living with partner	297	72.6	159	27.5	456	46.2	80.9	(79.4, 82.5)
Widowed	27	6.6	80	13.8	107	10.8	71.8	(68.5, 75.1)
Divorced or separated	60	14.7	164	28.3	224	22.7	74.2	(71.9, 76.5)
Never married	22	5.4	172	29.7	194	19.6	69.4	(66.9, 71.8)

	White		African American		Total		FACT-G	
	N	%	N	%	N	%	Mean	95% CI
Missing	3	0.7	4	0.7	7	0.7	63.1	(50.3, 76.0)
Comorbid conditions (mean, SD)	2.3	1.8	2.7	1.8	2.6	1.9		
Comorbid conditions								
None	74	18.1	58	10.0	132	13.4	81.9	(78.9, 84.9)
1-2	167	40.8	218	37.7	385	39.0	79.0	(77.2, 80.7)
3+	168	41.1	303	52.3	471	47.7	72.0	(70.4, 73.6)
Cancer site								
Breast	172	42.1	264	45.6	436	44.1	75.3	(73.6, 77.0)
Colorectal	51	12.5	49	8.5	100	10.1	74.9	(71.3, 78.4)
Lung	100	24.5	92	15.9	192	19.4	74.7	(72.2, 77.3)
Prostate	86	21.0	174	30.1	260	26.3	78.7	(76.5, 80.9)
Any chemotherapy								
No	171	42.1	279	48.5	450	45.9	78.8	(77.1, 80.4)
Yes	235	57.9	296	51.5	531	54.1	73.9	(72.4, 75.4)
Any surgery								
No	117	28.6	175	30.4	292	29.7	75.6	(73.5, 77.6)
Yes	292	71.4	400	69.6	692	70.3	76.3	(75.0, 77.6)
Any radiation								
No	169	42.3	209	36.3	378	38.7	77.9	(76.1, 79.7)
Yes	231	57.8	367	63.7	598	61.3	75.0	(73.5, 76.4)
Multiple treatment types								
No	146	36.2	215	37.4	361	36.9	78.3	(76.5, 80.2)
Yes	257	63.8	360	62.6	617	63.1	74.8	(73.4, 76.2)
Time since diagnosis								
<18 months	205	50.1	304	52.6	509	51.6	76.5	(74.9, 78.0)
18+ months	204	49.9	274	47.4	478	48.3	75.5	(73.9, 77.2)
Any private insurance								
No	56	13.8	244	42.7	300	30.7	68.6	(66.7, 70.6)
Yes	349	86.2	328	57.3	677	69.3	79.4	(78.1, 80.7)
Any Medicare								
No	238	58.6	311	54.3	549	56.1	75.7	(74.2, 77.2)
Yes	168	41.4	262	45.7	430	43.9	76.5	(74.8, 78.2)
Any Medicaid								
No	366	90.4	402	70.3	768	78.6	78.5	(77.3, 79.7)
Yes	39	9.6	170	29.7	209	21.4	67.1	(64.8, 69.5)

Abbreviations: GED – General Educational Development, FACT-G – Functional Assessment of Cancer Therapy – General, SD – standard deviation

Column percents may not add up to 100 due to rounding.

Table 2.

Financial hardship and limiting care due to cost by participant characteristics

	No Financial Hardship		Any Financial Hardship		No Limiting Care Due to Cost		Any Limiting Care Due to Cost	
	N	%	N	%	N	%	N	%
	505	53.9	432	46.1	799	82.4	171	17.6
Age (mean, SD)	61.2	8.9	57.3	8.9	59.9	9.2	58.6	8.6
Age								
<60	214	42.4	253	58.6	378	47.3	93	54.4
60-69	197	39.0	151	34.5	299	37.4	63	36.8
70+	94	18.6	30	6.9	122	15.3	15	8.8
Sex								
Women	286	56.6	287	66.4	495	62.0	108	63.2
Men	219	43.4	145	33.6	304	38.1	63	36.8
Race								
White	230	45.5	157	36.3	344	43.1	57	33.3
African American	275	54.5	275	63.7	455	57.0	114	66.7
Education								
Less than high school	66	13.1	39	9.0	87	10.9	23	13.5
High school/GED	147	29.1	137	31.7	231	28.9	57	33.3
Some college/2-year degree	156	30.9	168	38.9	282	35.3	56	32.8
College graduate/4-year degree	133	26.3	85	19.7	195	24.4	32	18.7
Missing	3	0.6	3	0.6	4	0.5	3	1.8
Income								
<\$20,000	174	34.5	200	46.3	283	35.4	103	60.2
\$20,000-39,999	82	16.2	80	18.5	135	16.9	29	17.0
\$40,000-59,999	64	12.7	43	10.0	97	12.1	14	8.2
\$60,000-79,999	34	6.7	33	7.6	59	7.4	9	5.3
\$80,000+	119	23.6	53	12.3	172	21.5	10	5.9
Missing	32	6.3	23	5.3	53	6.6	6	3.5
Employment status								
Employed full time	105	20.8	83	19.2	171	21.4	23	13.5
Employed part time	35	6.9	39	9.0	64	8.0	16	9.4
Homemaker	20	4.0	12	2.8	29	3.6	6	3.5
Unemployed	32	6.3	52	12.0	65	8.1	21	12.3
Retired	208	41.2	127	29.4	295	36.9	52	30.4
On medical leave/disability	99	19.6	113	26.2	164	20.5	51	29.8
Other/missing	6	1.2	6	1.4	11	1.4	2	1.2
Marital status								
Married or living with partner	266	52.7	170	39.4	393	49.2	54	31.6
Widowed	49	9.7	50	11.6	77	9.6	29	17.0

	No Financial Hardship		Any Financial Hardship		No Limiting Care Due to Cost		Any Limiting Care Due to Cost	
	N	%	N	%	N	%	N	%
Divorced or separated	100	19.8	107	24.8	172	21.5	46	26.9
Never married	86	17.0	102	23.6	152	19.0	40	23.4
Missing	4	0.8	3	0.7	5	0.63	2	1.2
Comorbid conditions (mean, SD)	2.6	1.9	2.5	1.8	2.5	1.8	2.8	2.0
Comorbid conditions								
None	69	13.7	57	13.2	114	14.3	16	9.4
1-2	182	36.0	183	42.4	308	38.6	69	40.4
3+	254	50.3	192	44.4	377	47.2	86	50.3
Cancer site								
Breast	202	40.0	208	48.2	352	44.1	81	47.4
Colorectal	52	10.3	45	10.4	82	10.3	13	7.6
Lung	97	19.2	83	19.2	155	19.4	32	18.7
Prostate	154	30.5	96	22.2	210	26.3	45	26.3
Any chemotherapy								
No	269	53.6	151	35.2	375	47.3	69	40.6
Yes	233	46.4	281	64.8	418	52.7	101	59.4
Any surgery								
No	151	30.0	126	29.4	235	29.6	50	29.2
Yes	353	70.0	303	70.6	560	70.4	121	70.8
Any radiation								
No	210	41.9	151	35.5	307	38.8	63	37.7
Yes	291	58.1	274	64.5	485	61.2	104	62.3
Multiple treatment types								
No	207	41.2	133	31.2	300	37.9	57	33.7
Yes	295	58.8	293	68.8	492	62.1	112	66.3
Time since diagnosis								
<18 months	260	51.5	225	52.2	419	52.4	82	48.2
18+ months	245	48.5	206	47.8	380	47.6	88	51.8
Any private insurance								
No	126	25.2	162	37.9	223	28.2	71	42.0
Yes	375	74.9	265	62.1	567	71.8	98	58.0
Any Medicare								
No	257	51.2	269	63.0	440	55.6	96	56.8
Yes	245	48.8	158	37.0	352	44.4	73	43.2
Any Medicaid								
No	413	82.4	314	73.5	635	80.4	118	69.8
Yes	88	17.6	113	26.5	155	19.6	51	30.2

Abbreviations: GED – General Educational Development, FACT-G – Functional Assessment of Cancer Therapy – General, SD – standard deviation

Column percents may not add up to 100 due to rounding.

Prevalence of financial hardship and limiting care due to cost by race and risk ratios of reporting each form of financial hardship and care limitation associated with being African American vs. white

Table 3.

	Total		White		African American		African American vs. white	
	N	%	N	%	N	%	RR	95% CI
Any financial hardship	432	46.1	157	40.6	275	50.0	1.23	(1.06, 1.43)
Borrowed money from family or friends	95	9.7	39	9.7	56	9.8	1.01	(0.68, 1.48)
Remaining debt	249	25.5	74	18.3	175	30.7	1.68	(1.32, 2.13)
Utilized assets to pay for cancer care	66	6.7	38	9.3	28	4.8	0.68	(0.51, 0.90)
Refinanced or sold home	9	0.9	7	1.7	2	0.4	0.20	(0.04, 0.97)
Sold stock or other investments	15	1.5	8	2.0	7	1.2	0.62	(0.23, 1.69)
Withdrew money from retirement	56	5.7	31	7.6	25	4.3	0.57	(0.34, 0.95)
Experienced a decrease in income	275	29.4	109	28.0	166	30.5	1.09	(0.89, 1.33)
Any care limitations	171	17.6	57	14.2	114	20.0	1.41	(1.05, 1.89)
Skipped doses of prescribed medication	71	7.2	23	5.6	48	8.3	1.48	(0.91, 2.39)
Refused recommended treatment due to cost	49	5.0	21	5.2	28	4.9	0.94	(0.54, 1.64)
Needed to see a doctor but did not go due to cost	111	11.4	33	8.2	78	13.7	1.66	(1.13, 2.45)

Note: Responses are not mutually exclusive. "Any financial hardship" includes borrowing, debt, utilizing assets, and experiencing a decrease in income. "Any care limitations" includes skipping doses of prescribed medication, refusing recommended treatment, and needing to see a doctor but not going due to cost.

Abbreviations: CI – confidence interval, RR – risk ratio

Associations between financial hardship and limiting care due to cost and total and site-specific measures of health-related quality of life and physical, social, emotional, and functional wellbeing subscales

Table 4.

Observed Range	Mean	SD	Financial Hardship		Financial Hardship		Limiting Care Due to Cost		Limiting Care Due to Cost	
			Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
			Diff. in FACT-G score	Diff. in FACT-G score	Diff. in FACT-G score	Diff. in FACT-G score	Diff. in FACT-G score	Diff. in FACT-G score	Diff. in FACT-G score	Diff. in FACT-G score
			95% CI	95% CI	95% CI	95% CI	95% CI	95% CI	95% CI	95% CI
FACT-G	76.0	18.0	-7.5 (-9.8, -5.2)	-4.2 (-6.4, -2.0)	-12.3 (-15.2, -9.4)	-8.0 (-10.7, -5.3)				
White	79.5	17.9	-10.6 (-14.3, -7.0)	-3.1 (-6.8, 0.7)	-15.3 (-20.8, -9.8)	-6.1 (-10.8, -1.3)				
African American	73.3	17.6	-4.6 (-7.5, -1.7)	-4.4 (-7.2, -1.6)	-9.9 (-13.3, -6.4)	-9.0 (-12.3, -5.6)				
$P_{\text{interaction}}$			0.011	0.77	0.10	0.45				
PWB	20.9	5.9	-2.6 (-3.3, -1.8)	-1.5 (-2.3, -0.8)	-3.5 (-4.5, -2.5)	-2.5 (-3.5, -1.6)				
SWB	19.4	5.9	-1.0 (-1.8, -0.3)	-0.7 (-1.5, 0.0)	-2.3 (-3.3, -1.3)	-1.3 (-2.2, -0.3)				
EWB	18.6	4.5	-1.4 (-2.0, -0.8)	-0.7 (-1.3, -0.1)	-2.3 (-3.0, -1.5)	-1.7 (-2.5, -0.9)				
FWB	17.2	6.8	-2.5 (-3.4, -1.6)	-1.2 (-2.0, -0.4)	-4.3 (-5.3, -3.2)	-2.6 (-3.5, -1.6)				
FACT-B	100.6	24.3	-10.0 (-14.6, -5.4)	-4.9 (-9.3, -0.4)	-18.7 (-24.2, -13.3)	-12.5 (-17.9, -7.1)				
FACT-C	94.6	21.3	-7.8 (-16.4, 0.8)	-1.8 (-11.4, 7.8)	-10.7 (-24.9, 3.4)	-6.4 (-21.7, 8.9)				
FACT-L	85.9	16.9	-5.5 (-10.5, -0.5)	-3.8 (-8.9, 1.2)	-6.5 (-13.3, 0.3)	-2.7 (-8.5, 3.0)				
FACT-P	111.5	23.7	-12.9 (-19.3, -6.6)	-5.7 (-12.1, 0.6)	-20.5 (-28.2, -12.7)	-14.0 (-21.4, -6.7)				

Abbreviations: CI – confidence interval, Diff. – difference, EWB – emotional wellbeing, FACT-B – Functional Assessment of Cancer Therapy – Breast, FACT-C – Functional Assessment of Cancer Therapy – Colorectal, FACT-G – Functional Assessment of Cancer Therapy – General, FACT-L – Functional Assessment of Cancer Therapy – Lung, FACT-P – Functional Assessment of Cancer Therapy – Prostate, FWB – functional wellbeing, PWB – physical wellbeing, SD – standard deviation; SWB – social wellbeing

Adjusted models control for age, sex, race, marital status, income, education, employment status, health insurance, cancer site, and treatments received.

Proportion of the association between financial hardship and health-related quality of life explained by limiting care due to cost

Table 5.

	ACME		Direct Effect		Total Effect		Proportion Mediated		Sensitivity Analysis (p)
	Mean	95% CI	Mean	95% CI	Mean	95% CI	%	95% CI	
FACT-G	-1.6	(-2.4, -0.9)	-2.4	(-4.7, 0.0)	-4.0	(-6.3, -1.7)	40.5	(25.5, 92.7)	-0.19
White	-0.8	(-1.8, -0.1)	-3.6	(-7.4, 0.2)	-4.4	(-8.1, -0.7)	18.4	(9.7, 88.7)	-0.12
African American	-2.1	(-3.4 - 1.1)	-2.1	(-5.2, 1.1)	-4.2	(-7.3, -1.1)	50.5	(29.1, 188.1)	-0.23

Abbreviations: ACME – average causal mediated effect, CI – confidence interval, FACT-G – Functional Assessment of Cancer Therapy – General

These models control for mean-centered continuous age and for sex, race, marital status, income, education, employment status, comorbid conditions, health insurance, cancer site, stage at diagnosis, and treatments received. Because the mediation models do not allow for dummy-variable adjustment, marital status, employment status and stage at diagnosis were treated as binary variables (married/cohabitating vs. not; employed full- or part-time vs. not, stage I vs. stages II-IV, respectively) and ordinal income and education were treated as continuous variables.