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PATIENT-REPORTED FINANCIAL TOXICITY AND HEALTH-RELATED QUALITY OF LIFE AMONG A MODERN POPULATION-BASED COHORT OF GEORGIA WOMEN DIAGNOSED WITH BREAST CANCER

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2017

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ABSTRACT

PATIENT-REPORTED FINANCIAL TOXICITY AND HEALTH-RELATED QUALITY OF
LIFE AMONG A MODERN POPULATION-BASED COHORT OF GEORGIA WOMEN
DIAGNOSED WITH BREAST CANCER

By: Oyindamola Mercy Adisa

Background and purpose: Financial toxicity (FT) is the adverse impact of a cancer diagnosis on a patient's well-being resulting from direct and/or indirect costs of cancer care, and breast cancer patients face the highest increases in national medical costs of continuing cancer care in the US than any other group. This study examined the significance of the association of several factors with patient-reported financial toxicity, some of which include age, race, employment status, education, insurance status, annual household income and chemotherapy status. The association between patient-reported FT and health-related quality of life (HRQoL) was also assessed.

Methods: A total of 1063 women aged 20-79 years with newly diagnosed early-stage breast cancer (stages 0 to II) who were treated in 2014 and 2015 and identified through the Georgia Surveillance, Epidemiology, and End Results (SEER) registry were surveyed. Patient-reported FT was measured by asking respondents if their worsened financial situation resulted from their illness and was dichotomized into "yes" vs. "no." HRQoL was measured by creating a 6-item composite score on participants' general well-being and categorizing the score as low, moderate, and high. Multivariate associations between financial toxicity and HRQoL were reported.

Results: FT was experienced by 42% of the respondents. Income at the time of diagnosis, lost income due to cancer, current insurance status, current debt due to cancer, and surgery status, were predictors found to be significantly associated with financial toxicity. Experiencing FT (OR = 0.51, 95% CI = 0.29 – 0.89) was also associated with being less likely to have a high HRQoL composite score.

Conclusions: The significant association between FT and HRQoL exemplifies the urgent need for more awareness of FT. Little is known about the impact of patient-reported financial toxicity on health-related quality of life (HRQoL), and understanding it is necessary to create awareness amongst providers on the unique financial, mental and physical quality of life (QoL) challenges breast cancer patients face.

Keywords: breast cancer, health-related quality of life, patient-reported financial toxicity, financial burden, financial distress, United States of America

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CHAPTER 1

INTRODUCTION

One of the major consequences of a rapidly expanding and aging population is an increase in the incidence of diseases that affect older people, one of them being cancer. With the rise in incidence, the costs of cancer care are expected to rise along with advances in diagnostic technology and novel targeted treatment [National Cancer Institute]. In the United States and worldwide, cancer remains one of the most expensive medical conditions to treat. Most cancer treatment regimens will involve multiple modes of treatment, including surgery, chemotherapy, and radiation therapy, sometimes requiring lengthy hospitalizations. While the economic burden of cancer is well documented, most evidence focuses on monetary measures such as direct and indirect medical expenses/out-of-pocket expenses and objective measures such as productivity losses, adjustments to one's living standards to save costs, acquisition of debt or filing for bankruptcy and finally, subjective measures such as patients' perceptions of cancer-related financial burden [Gordon et al. (2017)]. Fewer studies [Arastu et al. (2020), Delgado-Guay et al. (2015), Ramsey et al. (2013), Fenn et al. (2014), Kale et al. (2016), Ver Hoeve et al. (2021), Blum-Barnett et al. (2019)] have focused on its impact on health-related quality of life on cancer patients, and even fewer have assessed this in a diverse cohort of women with breast cancer.

Breast cancer, which can occur in any area of the breast, but most begin in the ducts or lobules, remains one of the most common cancers in women worldwide and a major cause of public health concern worldwide. One in eight women in the US will develop invasive breast cancer over the course of her life [American Cancer Society]. In 2018 alone, the US saw over 255,000 new cases of female breast cancer and over 42,000 deaths from breast cancer and according to recent statistics from the Centers for Disease Control, for every 100,000 women, 127 new female breast cancer cases were reported, and 20 women died of this cancer [Centers for Disease Control and Prevention]. It is well established that one's risk of breast cancer increases with age, however, cancer surveillance data has shown that over the years, the incidence of breast cancer continues to increase in younger women [Johnson et al. (2013)], a worrying trend that has already had a consequential impact on the affordability of cancer care for this growing younger demographic of breast cancer patients. Overall, total medical expenditures have increased in the US and the cost of cancer care as a share of overall medical expenditure have also matched this increase [Tangka et al. (2010)]. Between 2010 and 2020, the national associated costs of cancer care in the US, were projected to have increased by 27%, with one of the largest increases seen in the lifetime costs of the continuing care phase of female breast cancer care, despite the prevailing trend of the highest costs in care being in the initial and last year of life phases of care for most common cancers [Mariotto et al. (2011), Campbell et al. (2009)]. Breast cancer accounts for approximately 13% of all cancer treatment costs in the US and it is estimated that a woman with employer-sponsored health coverage can expect to pay $5,800 out of pocket, including premiums for her care [Singleterry (2017), Ekwueme et al. (2014)]. The stage of breast cancer at diagnosis also determines the cost of treatment, as breast cancer is associated with a significant increase in incremental costs [Blumen et al. (2016), Mittmann et al. (2014), Sun et al. (2018), Subramanian et al. (2011)]. Consequently, these cost findings support the importance of breast cancer screening programs that aim to promote early detection and diagnosis of early disease.

Financial toxicity (FT) is commonly used to describe the problems a cancer patient has related to the cost of treatment, as several studies have shown that cancer patients and survivors are more likely to experience financial toxicity in excess than people without cancer and even those with other chronical illnesses, due to large out-of-pocket expenses and annual losses in work productivity (more than $1,000 higher), as a result of missed worked days and a reduced ability to perform tasks, owing to illness, disability, or distress [Gordon et al. (2017), Asaad et al. (2021), Bernard et al. (2011), Allaire et al. (2016), Zheng et al. (2015), Guy et al. (2014), Davidoff et al. (2013)]. The term was coined by Zafar & Abernathy (2013), who referred to the phenomenon as the "growing recognition that high out-of-pocket (OOP) expenditures during cancer treatment are putting many families into severe financial distress, bankruptcy and, in some cases, leading to refusal of treatment or nonadherence to recommended treatment." Financial toxicity has also been defined as encompassing the "monetary burden of paying for cancer care (e.g., chemotherapy, surgery) and the negative consequences of such treatments on patients' financial security. The term has been used interchangeably with phrases like "financial or economic burden," "financial distress," "financial catastrophe," and "financial strain or stress" in the literature. It is also frequently assessed in terms of average self-reported medical OOP costs.

In most studies assessing financial toxicity, there is the issue of the inconsistency in measures of financial toxicity. For example, most studies focus more on monetary measures such as out-of-pocket (OOP) medical spending greater than 30% of annual household income and/or objective measures such as an increase in debt, while others focused on more subjective measures of FT such as patients' perceptions of illness-related financial burden [Gordon et al (2017)]. Cancer survivors with comorbidities are further burdened with significant excess OOP costs [Rim et al. (2016)]. Financial toxicity has also been associated with privation; cancer patients often find that they need to cut back on essential spending, on leisure activities or they need to spend their savings or incur massive debts [Zafar et. al (2013)]. Equally, if not more concerning, is its effect on medication non-adherence and treatment discontinuation. A pilot study on OOP expenses and the experience of insured U.S. cancer patients, by Zafar et al. (2013) found that "20% [of participants] took less than the prescribed amount of medication, 19% partially filled prescriptions, and 24% avoided filling prescriptions altogether," in order to save on treatment costs. Similarly, Kent et al. (2013) found that cancer survivors were more likely to delay or forgo medical care, including prescription medication usage. Treatment costs also influenced surgical decision-making, and this was observed even among women with higher income, where 65% of higher-income earning women were fiscally unprepared for the higher-than-expected treatment costs of cancer [Asaad et al. (2021), Greenup et al. (2019)].

Financial toxicity has been shown to be associated with a negative health-related quality of life (HRQoL). Severe financial distress due to cancer and a resultant bankruptcy is a risk factor for early mortality [Ramsey et al. (2016)]. It is also linked to a poorer rating of quality of life, [Fenn et al. (2014)] and has been associated with heightened fear of cancer recurrence, uncertainty, and hopelessness among cancer survivors [Kang et al. (2022)]. Additionally, FT can negatively affect the mental health of those experiencing it. For example, older adults with advanced cancer experiencing FT, have a greater likelihood of experiencing higher levels of depression, anxiety, and distress [Arastu et al. (2020)]. In a similar study, FT was found to be strong predictor of patient-reported anxiety, fatigue, physical functioning, and social functioning [Ver Hoeve et al. (2021)]. A systematic review of 25 studies found that commonly reported factors associated with financial toxicity include being female, being of a younger age, having low income at baseline, requiring adjuvant therapies, and having a more recent diagnosis, having advanced disease and no health insurance. However, majority of the studies were cross-sectional, thus neither temporality nor directionality could be assured [Gordon et al. (2017)].

There is little research specifically investigating race as a predictor of financial toxicity. However, few studies that have assessed the impact of severe financial distress on health outcomes among patients with cancer, have found that patients that filed for bankruptcy are more likely to be “younger, female, non-white and have local- or regional-stage disease at diagnosis” [Ramsey et al. (2016)] and that among participants who had medical debt 4-years post-diagnosis, black and Spanish-speaking Latina women had higher percentages of debt and higher odds of privation compared to white women [Jagsi et al. (2014)]. Age has also been found to be a predictor as younger women aged 21-44 had a higher prevalence of later-stage disease and higher within-stage costs, than older women [Trogdon et al. (2017)]. A more recent systematic of 74 observational studies of financial burdens among patients with cancer, support these observations; “socioeconomic predictors of worse financial burdens with treatment were lack of health insurance, lower income, unemployment, and younger age at cancer diagnosis" [Smith et al. (2019)]. The review found that having no health insurance was found to double the risk of financial burdens and cancer medication nonadherence and being unemployed led to a greater risk of financial toxicity, regardless of time since diagnosis. Lower-income and lower credit scores have also been associated with financial distress [Asaad et al. (2021)]. While most evidence supports that the odds of reporting financial toxicity are greater for female survivors, there is some evidence that odds were greater for younger, unmarried males with low education, low socioeconomic status, or without paid employment [Pearce et al. (2019)].

We used cross-sectional data from the Individualized Cancer Care (iCanCare) study to (a) estimate the prevalence of financial toxicity in this cohort (b) assess the significance and strength of each of the financial toxicity predictors; age at diagnosis, race/ethnicity, employment status pre-and post-diagnosis, level of education attainment, current insurance status, annual total household income, financial losses attributable to illness, cancer stage at diagnosis and other treatment-related variables; and (c) examine the association of financial toxicity with health-related quality of life (HRQoL) post-diagnosis in women with early-stage breast cancer and the predictors associated with this relationship. We hypothesized that each of the sociodemographic and disease/treatment-related measures would be significantly associated with and be strong predictors of patient-reported financial toxicity and a lower HRQoL.

CHAPTER 2

METHODOLOGY

2.1 METHODS

2.1.1 Study Design, Data Source and Study Population:

The Individualized Cancer Care (iCanCare) study is a large, diverse, population-based survey study of women with early-stage breast cancer and their providers, that examined women's breast cancer treatment experiences and decision making; it has been described previously [Hawley et al. (2017), Jagsi et al. (2017), Wallner et al. (2017)]. We identified and accrued women aged 20 to 79 years with newly diagnosed early-stage breast cancer (stages I and II) as reported to the Surveillance, Epidemiology, and End Results (SEER) registries of Georgia and Los Angeles counties from 2013 to 2015. Eligible patients were identified via pathology reports from "definitive" surgical procedures (those intended to remove the tumor with clear margins) in 2014 – 2015 (n = 3880). Patients who were deceased or extremely ill, who had a previous cancer diagnosis and/or later-stage breast cancer (Stage III or IV), who lived outside the Georgia and Los Angeles SEER registry areas and who were unable to complete a survey in English or Spanish were deemed ineligible (n = 249).

Only 2,578 women out of 3,631 eligible women returned the surveys and actively participated in the study. We were interested in selecting only eligible women from the Georgia area for our analytic sample and after dealing with missing and duplicate data, we were left with a sample of 1063 women.

2.1.2 Data Collection:

Patients were sent surveys approximately 2 months after surgery. We provided a $20 cash incentive and used a modified Dillman method for patient recruitment, as done in prior work [Dillman et al. (2009)]. All materials were sent in English and Spanish to those with Spanish surnames. Survey responses were then merged with clinical data from SEER. The study was approved by the Institutional Review Boards of the University of Michigan, University of Southern California and Emory University and the Committee for the Protection of Human Subjects and the California Cancer Registry.

2.1.3 Questionnaire Design and Content:

Patient questionnaire content was guided by a conceptual framework, research questions, and hypotheses. We chose established measures when available and developed new measures, when necessary, drawing from literature and our prior research [Jagsi et al. (2015), Janz et al. (2011), Hawley et al. (2009)]. Standard techniques to assess content validity, including review by survey design experts, cognitive pre-testing with patients were employed.

2.2. MEASURES

2.2.1 Sociodemographic and Disease/Treatment-related Characteristics:

We collected sociodemographic characteristics that we hypothesized to be predictors of patient-reported financial toxicity. The factors include race/ethnicity (White; Black/African American; Latina; Asian; Other/Unknown), employment status before diagnosis (full-time; part-time; not employed), current employment status (employed; retired; unemployed), level of education attainment (high school or less; some college;

college graduate or higher), current insurance status (none; Medicaid; Medicare; private and Veteran Affairs; other), annual total household income (categories: >$20,000, $20,000-$29,999, $30,000-$39,999, $40,000-$59,999, $60,000-$89,999 and >$90,000), lost income since breast cancer diagnosis (categories: 0, $1-$500, $501-$2000, $2001-$5000, $5001-$10,000, and >$10,000) and current debt status due to illness (yes; no). We also collected information on disease and treatment-related characteristics such as cancer stage at diagnosis, surgery and chemotherapy status. Age at diagnosis and marital status (married/partnered versus not) information was also included.

2.2.2 Patient-reported Financial Toxicity (FT):

In the survey, we inquired from breast cancer patients whether they perceived themselves to be worse off in terms of their financial status (yes or no) **[Table 1a]** , since their breast cancer diagnosis. Among those who reported that they perceived their financial status as worse off since their diagnosis, we further inquire to what degree they felt this was as a result of their breast cancer and treatment. The options for the latter question were “not at all”, “a little”, “somewhat”, “quite a bit” and “very much”, which for the purpose of measuring patient-reported or subjective financial toxicity, “we dichotomized as yes or “a little” versus no or “not at all” in our analysis **[Table 1b].**

2.2.3 Health-related Quality of Life (HRQoL):

The iCanCare survey assessed health-related quality of life (HRQoL) with 12 questions in the first section of the survey titled, “How Are You Doing?” These questions were culled from two validated instruments for HRQoL assessment; the Functional

Assessment of Cancer Therapy-General (FACT-G) and the standard 4-item set of Healthy Days core questions (CDC HRQOL-4). The CDC Healthy Days measure has been used for population surveillance of HRQoL for more than 25 years and it measures “self-rated general health and the number of recent days when a person was physically unhealthy, mentally unhealthy or limited in usual activities” [Moriarty et al. (2003)]. FACT-G is a widely used and validated 27-item questionnaire with subscales that measure four domains of HRQoL in cancer patients; physical, social, emotional, and functional well-being [Cella et al. (1993), Yanez et al. (2013)]. The domains have five-point Likert scales, and a total weighted score can range from 0 to 108, with 108 representing the highest overall HRQoL. For the purpose of our analysis, we created a HRQoL composite score using only the first six questions of the survey on participants’ general well-being to ensure scale consistency **[Table 3]**. Participants were asked to rate their general well-being on a 5-point Likert scale with 1 being rated as poor and 5 as excellent. The first question (Q1) asked participants to rate their general health; the second (Q2), their quality of life; the third (Q3), their physical well-being (PWB); the fourth (Q4, their emotional well-being (EWB); the fifth (Q5), their social and family well-being (SWB) and finally, the sixth (Q6), both their functional (FWB) and social and family well-being.

2.3 STATISTICAL ANALYSIS

All analyses were conducted using SAS statistical software, version 9.4 (SAS Institute Inc). Using descriptive statistics, we described the study sample characteristics and the prevalence of patient-reported FT in the cohort (mean [SD] or number [%]) and then compared participants who met the criteria for financial toxicity with participants who did not. We calculated the composite HRQoL score by reverse coding items 1-6 **[Table 3]** and adding up the score of all 6 items so that a higher composite score indicated a higher HRQoL. Using the lower and upper quartiles, as well as the range, the HRQoL composite score was categorized into three – low, which corresponds to scores under 18; moderate, for scores between 18 and 24; high, for scores 24 and above. We used Cronbach's alpha to measure the internal consistency reliability of our composite score. Our second aim was to examine the significance of the association of our hypothesized predictors (sociodemographic and disease/treatment-related characteristics) with patient-reported FT and we used pooled t-tests (for continuous predictors), Chi-Square tests for associations between categorical predictors, and Fisher's exact tests for associations between categorical predictors where the expected values were less than 5. All the predictors that were significant from the bivariate analyses with our primary exposure of interest, patient-reported FT, were considered as potential confounders of the relationship between FT and HRQoL and adjusted for in our multivariate polytomous logistic regression model of the association. To check for multicollinearity amongst the significant predictors, we employed collinearity diagnostics under the regression function. We tested the significance of the model using the Likelihood Ratio test. The fit and quality of the logistic regression model was assessed using several statistics: -2lnL Criterion, Akaike's Information Criterion (AIC), Schwarz-Bayesian Criterion (SBC), and the concordance statistic (C statistic). We used the low HRQoL composite score group as our reference group. We calculated the odds ratios (OR), 95% confidence intervals

(95% CI), and *p* values for each significant predictor. In our analysis, *P* values less than 0.05 were considered statistically significant.

CHAPTER 3

RESULTS

3.1 Respondents' characteristics:

A total of 1063 respondents from Georgia were included in our final analysis. The average age of respondents was 59.4 years old (SD = 10.9). Most respondents were White (71.9%), had a college education or higher (41.3%), were not employed before their diagnosis (50.3%), were married or partnered (65.1%), were privately insured (48.8%), not currently employed post-diagnosis (58.6%), and had incurred some debt due to their illness (41.8%). The annual household income at the time of diagnosis was more evenly distributed across categories, however, the "$90,000 or more" category had the highest overall proportion (26.3%). Most respondents had also spent more than $2000 in out-of-pocket medical expenses related to their illness by the time of the survey. In terms of disease and treatment-related characteristics, most respondents had stage IA breast cancer (56.0%), had undergone breast-conserving surgery (BCS) (64.6%), and were chemotherapy naïve at the time of the survey (71.1%). The characteristics of the respondents are shown in **Table 2.**

3.2 Prevalence of patient-reported financial toxicity (FT) and associated predictors:

Among the respondents (*n* = 1063), 42% (*n* = 443) reported that they had faced financial toxicity. In the bivariate analyses, age at diagnosis, race, educational level, employment status pre- and post-diagnosis, annual household income at diagnosis, lost income due to cancer, current insurance status, current debt status due to cancer, out-of-pocket medical expenditure and chemotherapy status were found to have statistically significant associations with patient-reported FT **[Table 2]** and we included these predictors in the multivariate analyses, after testing the significance of their association with HRQoL in **Table 4.**

3.3 Associations of patient-reported FT with HRQoL:

After running collinearity regression diagnostics on the significant predictors, we found that there were no condition indices greater than 30 (our cut-off value), as soon as we removed the employment predictors and annual household income. We concluded that there was little evidence of collinearity in our final model. The predictors, educational level, insurance status, current debt status due to cancer, chemotherapy status and lost income due to illness, were significantly associated with both FT and HRQoL in separate bivariate analyses and thus were included in the multivariate model. In the multivariate analyses **[Table 5],** respondents who report financial toxicity were less likely (OR = 0.51, 0.52 95% CI = (0.29 – 0.89),(0.32 – 0.83) to have a high or moderate HRQoL composite score than those who do not report experiencing financial toxicity ($p < 0.05$), after adjusting for all significant predictors. Similarly, those with a high school education or less were less likely (OR = 0.43, 0.57 95% CI = (0.27 – 0.68), (0.42 – 0.77)) to have a high or moderate HQROL compared to respondents with college education.

CHAPTER 4

DISCUSSION

This study estimated the prevalence of FT in a cohort of Georgia women aged 20 to 79 years with early-stage breast cancer, and assessed the significance of the association of sociodemographic and disease/treatment-related factors with FT and then evaluated the association between FT and HRQoL adjusting for the factors significantly associated with FT. Our study findings indicated that almost 43% of women in this Georgia cohort with early-stage breast cancer, experience a degree of FT, which is alarming. The average age of this cohort was 59 years or older, and most respondents were college-educated and privately insured and were not currently working post-cancer diagnosis. Most of our sample population had not initiated chemotherapy at the time of the survey; however, they had undergone surgery, which still put them at risk for FT because being in active care for cancer increases financial burden generally [Allaire et al. (2015)]. Patients with financial toxicity were less likely to report high or moderate HRQoL, even after adjusting for annual household income and lost income due to illness and this is in line with previous findings that suggest that FT has a negative impact on HRQoL, and even mortality, in some cases [Arastu et al. (2020), Fenn et al. (2014), Kang et al. (2022), Ramsey et al. (2013), Ver Hoeve et al. (2020)]

Current findings indicate that most patients, high income or not, desire to have important cost conversations with their health providers, but these conversations are not taking place at the frequency they should [Asaad et al. (2021)].This study has limitations. One such limitation is the way in which we measured patient-reported FT;

the two questions have not yet been validated and were only used for ease of administration and analysis. This is not an unusual situation, most research studies that have measured outcomes of FT, have had widely varied and mostly unvalidated methods that covered monetary, objective and subjective indictors of FT [Gordon et al. (2017)]. Despite not being validated, the questions still provide us with some information with regards to the degree of subjective or patient-reported FT, women in the cohort experienced as a result of their diagnosis. In addition to this, we also assessed the strength of previously studied predictors of objective FT; sociodemographic and disease and treatment-related factors such as out-of-pocket medical expenditure and insurance coverage type or status [Gordon et al. (2017)]. Secondly, more than half of the breast cancer patients in our study sample were white, college-educated and privately insured, with more than 25% having an annual household income of greater than $90,000. Thus, our findings may not be generalizable to a non-white, younger, less educated or lower income patient population and it is important to make this distinction because previous research has found that younger women, lower income women, African Americans and Latinas may be at a higher risk of FT and poor health outcomes [Allaire et al. (2017), Ekwueme et. al (2016), Jagsi et al. (2014), Trogdon et al. (2017)]. The third limitation is that our findings may be restricted to patients with early stage breast cancer - the iCanCare study only included women with stage I or II breast cancer, and may not be applicable to patients in later stages, as prior research has established that the costs of care tend to increase by stage of breast cancer [Blumen et al. (2016), Mittman et al. (2014), Pisu et al. (2018)]. Lastly, the nature of this study is cross-sectional; thus, we are unable to determine causation for our findings.

CHAPTER 5

CONCLUSIONS

Patient-reported or subjective financial toxicity is highly prevalent in this cohort of mostly older and mostly stage IA breast cancer patients and it significantly lowers the odds of having a high or moderate HRQoL. Our findings highlight the importance of having health practitioners engage patients and their families in cost conversations, earlier on in the treatment process - maybe even after the official diagnosis of cancer, as we see that financial toxicity can affect patients much earlier than we might believe. Additionally, our study found that annual household income at diagnosis and income losses after diagnosis were associated with both FT and HRQoL. We hope to expand our research to include the impact of FT and ensuing cost-consciousness on treatment and surgical decision-making, treatment adherence and/or treatment delays. Future directions of research we recommend include the development of an efficient and easy-to-use standardized screening tool for FT which could be used in clinical practice and advocacy, increasing knowledge of stage-specific cost data among health practitioners, and ensuring that the FT screening tool is validated in a diverse cohort of cancer patients, in order to improve HRQoL for all, but particularly for the vulnerable subgroups.

1.1: Table 1a: Distribution of responses from survey questions on financial status post-breast cancer diagnosis used to define patient-reported financial toxicity (*n* = 1063)

Section K: Home and Work	Item	***n*** (%)
Q15	**Since your breast cancer diagnosis, <u>are you worse off</u> regarding your financial status**	
	Yes	448 (42.1)
	No	615 (57.9)
Q15a	**If <u>yes</u>, how much is this due to your breast cancer and treatment?**	
	Not at all	18 (3.9)
	A little	89 (19.3)
	Somewhat	120 (26.0)
	Quite a bit	122 (26.5)
	Very much	112 (24.3

1.2: Table 1b: Distribution of primary exposure of interest, patient-reported financial toxicity (*n* = 1063)

Variable	***n*** (%)
Patient-reported Financial Toxicity (primary exposure)	
Yes	443 (41.7)
No	620 (58.3)

1.3: Table 2: Association between respondent's characteristics and patient-reported financial toxicity (*n* = 1063)

		Patient-reported financial toxicity (FT)		
		No (*n* = 620)	Yes (*n* = 443)	Chi-square (χ^2) or Fisher's exact test or pooled t-test
Variables	***N***	*n* (%)	*n* (%)	*P* value
Age at diagnosis, mean (SD), y	59.4 (10.9)	62.0 (10.6)	55.8 (10.2)	**< 0.001*** **
Age group at diagnosis, y				
< 40	22 (2.2)	10 (1.6)	12 (2.7)	**< 0.001*** **
40 - < 50	158 (14.9)	62 (10.0)	96 (21.7)	
50 - < 60	258 (24.3)	126 (20.3)	132 (29.8)	
60 - <70	347 (32.6)	205 (33.1)	142 (32.1)	
70+	278 (26.2)	217 (35.0)	61 (13.8)	
Race				
White	764 (71.9)	481 (77.6)	283 (63.9)	**< 0.001*** **
Black/African American	220 (20.7)	100 (16.1)	120 (27.1)	
Latina	43 (4.1)	19 (3.1)	24 (5.4)	
Asian	25 (2.4)	17 (2.7)	8 (1.8)	
Other/Unknown	11 (1.0)	3 (0.5)	8 (1.8)	
Educational level				
High school or less	293 (27.6)	187 (30.2)	106 (23.9)	**0.035***

Some College	316 (29.7)	177 (28.6)	139 (31.4)	
College graduate or higher	439 (41.3)	244 (39.4)	195 (44.0)	
Missing	15 (1.4)	12 (1.9)	3 (0.7)	
Income at time of diagnosis (annual household), $				
< $20,000	127 (11.9)	58 (9.4)	69 (15.6)	**< 0.001*** **
$20,000- < $40,000	167 (15.7)	80 (12.9)	87 (19.6)	
$40,000- < $60,000	162 (15.2)	91 (14.7)	71 (16.0)	
$60,000- < $90,000	171 (16.1)	98 (15.8)	73 (16.5)	
$90,000 or more	279 (26.3)	186 (30.0)	93 (21.0)	
Don’t know	60 (5.6)	39 (6.3)	21 (4.7)	
Missing	97(9.1)	68 (11.0)	29 (6.6)	
Lost income due to cancer, $				
None	666 (62.7)	460 (74.2)	206 (46.5)	**< 0.001*** **
$1-$500	32 (3.0)	16 (2.6)	16 (3.6)	
>$500-$2000	78 (7.3)	34 (5.5)	44 (9.9)	
>$2000-$5000	68 (6.4)	23 (3.7)	45 (10.2)	
>$5000-$10,000	55 (5.2)	14 (2.3)	41 (9.3)	
>$10,000	44 (4.1)	6 (1.0)	38 (8.6)	
Missing	120 (11.3)	67 (10.8)	53 (12.0)	

Employment status before diagnosis				
Full time	403 (37.9)	186 (30.0)	217 (49.0)	**<0.001*****
Part time	125 (11.8)	70 (11.3)	55 (12.4)	
Not employed	535 (50.3)	364 (58.7)	171 (38.6)	
Current employment status[a]				
Employed	438 (41.4)	238 (38.6)	200 (45.5)	**0.025***
Not employed	619 (58.6)	379 (61.4)	240 (54.6)	
Current insurance status				
None	12 (1.1)	7 (1.1)	5 (1.1)	**<0.001*****
Medicaid	41 (3.9)	26 (4.2)	15 (3.4)	
Medicare	283 (26.6)	200 (32.3)	83 (18.7)	
Private or Veteran Affairs	519 (48.8)	257 (41.5)	262 (59.1)	
Missing	137 (12.9)	82 (13.2)	55 (12.4)	
Other	71 (6.7)	48 (7.7)	23 (5.2)	
Out-of-pocket medical expenses due to cancer, $				
None	85 (8.0)	75 (12.1)	10 (2.3)	**<0.001*****
$1-$500	190 (17.9)	153 (24.7)	37 (8.4)	
>$500-$2000	207 (19.5)	126 (20.3)	81 (18.3)	
>$2000-$5000	266 (25.0)	130 (21.0)	136 (30.7)	
>$5000-$10,000	205 (19.3)	73 (11.8)	132 (29.8)	
>$10,000	49 (4.6)	17 (2.7)	32 (7.2)	
Missing	61 (5.7)	46 (7.4)	15 (3.4)	

Current debt due to cancer[b]				
Yes	438 (41.8)	114 (18.7)	324 (74.0)	**<0.001*****
No	611 (58.3)	497 (81.3)	114 (26.0)	
Marital status				
Married or partnered	692 (65.1)	414 (66.8)	278 (62.8)	0.175
Not married or partnered	371 (35.0)	206 (33.2)	165 (37.3)	
Surgery				
No surgery after biopsy	8 (0.8)	5 (0.8)	3 (0.7)	0.521
BCS	687 (64.6)	409 (66.0)	278 (62.8)	
Mastectomy	368 (34.6)	206 (33.2)	162 (36.6)	
Chemotherapy				
Not initiated at the time of the survey	756 (71.1)	471 (76.0)	285 (64.3)	**< 0.001*****
Yes	307 (28.9)	149 (24.0)	158 (35.7)	
Cancer stage at diagnosis (AJCC-7)				
Stage 0	169 (16.0)	101 (16.3)	68 (15.4)	0.419
Stage IA	595 (56.0)	358 (57.7)	237 (53.5)	
Stage IB	31 (2.9)	18 (2.9)	13 (2.9)	
Stage IIA	193 (18.2)	104 (16.8)	89 (20.1)	
Stage IIB	68 (6.4)	34 (5.5)	34 (7.7)	

Stage unknown	7 (0.7)	5 (0.8)	2 (0.5)

***$p < 0.001$; **$p < 0.01$ *$p < 0.05$

[a,b] Values may not sum to the total due to missing data.

Abbreviations: AJCC-7, 7th edition of the American Joint Committee on Cancer staging system; BCS, breast-conserving surgery; FT, financial toxicity; SD, standard deviation

1.4: Table 3: HRQoL composite score

	Item[a]	Mean	SD	Lower quartile	Median	Upper quartile	Range
Q1.	In general, would you say your health is…	3.46	0.88	3	3	4	1-5
Q2.	In general, would you say your quality of life is…	3.70	0.88	3	4	4	1-5
Q3.	In general, how would you rate your physical health?	3.33	0.90	3	3	4	1-5
Q4.	In general, how would you rate your mental health, including your mood and your ability to think?	3.67	0.97	3	4	4	1-5
Q5.	How would you rate your satisfaction with your social activities and relationships?	3.60	1.03	3	4	4	1-5

Q6.	Please rate how well you carry out your usual social activities and roles (This includes activities at home, at work, and in your community, and responsibilities as a parent, child, spouse, employee, friend, etc.)	3.60	0.99	3	4	4	1-5
	Summary Score	21.36	5.65	18	22	24	6 - 30

[a] All items are rated on a 5-point Likert scale with 1= poor; 2= fair; 3= good; 4= very good; 5= excellent and were reverse scored.

SD = Standard Deviation

1.5: Table 4: Association of respondents' characteristics and patient-reported financial toxicity with health-related quality of life (*n* = 1063)

	Health-related quality of life (HRQoL)			
Variables[a]	Low[b] HRQoL score **6 – <18** (*N* = 293) *n*(%)	Moderate HRQoL score **18 – <24** (*N* = 502) *n*(%)	High HRQoL score **24-30** (*N* = 268) *n*(%)	Chi-square or Fisher exact test *P* value
Patient-reported financial toxicity *(primary exposure)*				
Yes	153 (52.2)	198 (39.4)	92 (34.3)	**<0.001*****

No	140 (47.8)	304 (60.6)	176 (65.7)	
Age group at diagnosis, y				
< 40	6 (2.1)	9 (1.8)	7 (2.6)	0.819
40 - < 50	42 (14.3)	70 (13.9)	46 (17.2)	
50 - < 60	68 (23.2)	123 (24.5)	67 (25.0)	
60 - <70	98 (33.5)	173 (34.5)	76 (28.4)	
70+	79 (27.0)	127 (25.3)	72 (26.9)	
Race				
White	194 (66.2)	372 (74.1)	198 (73.9)	0.176
Black/African American	79 (27.0)	93 (18.5)	48 (17.9)	
Latina	11 (3.8)	21 (4.2)	11 (4.1)	
Asian	6 (2.1)	10 (2.0)	9 (3.4)	
Other/Unknown	3 (1.0)	6 (1.2)	2 (0.8)	
Educational level				
High school or less	118 (40.3)	131 (26.1)	44 (16.4)	**<0.001*** **
Some College	91 (31.1)	152 (30.3)	73 (27.2)	
College graduate or higher	78 (26.6)	212 (42.2)	149 (55.6)	
Missing	6 (2.1)	7 (1.4)	2 (0.8)	
Employment status before diagnosis				
Full time	102 (34.8)	207 (41.2)	94 (35.1)	**<0.001*** **
Part time	17 (5.8)	62 (12.4)	46 (17.2)	

Not employed	174 (59.4)	233 (46.4)	128 (47.8)	
Current employment status				
Employed	72 (24.6)	229 (45.6)	129 (48.1)	**<0.001*******
Not employed	221 (75.4)	273 (54.4)	139 (51.9)	
Current insurance status				
None	4 (1.4)	7(1.4)	1 (0.4)	**<0.001*******
Medicaid	22 (7.5)	16 (3.2)	3 (1.1)	
Medicare	88 (30.0)	125 (24.9)	70 (26.1)	
Private or Veteran Affairs	106 (36.2)	260 (51.8)	153 (57.1)	
Missing	52 (17.8)	57 (11.4)	28 (10.5)	
Other	21 (7.2)	37 (7.4)	13 (4.9)	
Current debt due to cancer[c]				
Yes	149 (51.2)	205 (41.3)	84 (32.1)	**<0.001*******
No	142 (48.8)	291 (58.7)	178 (67.9)	
Out-of-pocket medical expenses due to cancer, $				
None	31 (10.6)	34 (6.8)	20 (7.5)	0.527
$1-$500	63 (21.5)	87 (17.3)	40 (14.9)	
>$500-$2000	48 (16.4)	102 (20.32)	57 (21.3)	
>$2000-$5000	68 (23.2)	130 (25.9)	68 (25.4)	
>$5000-$10,000	51 (17.4)	98 (19.5)	56 (20.9)	
>$10,000	13 (4.4)	24 (4.8)	12 (4.5)	
Missing	19 (6.5)	27 (5.4)	15 (5.6)	

Chemotherapy				
Not initiated at the time of the survey	184 (62.8)	351 (69.9)	221 (82.5)	**<0.001*** **
Yes	109 (37.2)	151 (30.1)	47 (17.5)	
Income at time of diagnosis (annual household), $[d]				
< $20,000	64 (20.8)	50 (9.7)	19 (6.9)	**<0.001*** **
$20,000- < $40,000	58 (18.9)	82 (16.0)	32 (11.6)	
$40,000- < $60,000	43 (14.0)	95 (18.5)	29 (10.5)	
$60,000- < $90,000	41 (13.4)	83 (16.2)	51 (18.4)	
$90,000 or more	41 (13.4)	143 (27.9)	98 (35.4)	
Don’t know	22 (7.2)	26 (5.1)	14 (5.1)	
Missing	38 (12.4)	34 (6.6)	34 (12.3)	
Lost income due to cancer, $[e]				
None	176 (60.1)	330 (65.7)	160 (59.7)	**0.028***
$1-$500	9 (3.1)	12 (2.4)	11 (4.1)	
>$500-$2000	21 (7.2)	40 (8.0)	17 (6.3)	
>$2000-$5000	18 (6.1)	31 (6.2)	19 (7.1)	
>$5000-$10,000	13 (4.4)	27 (5.4)	15 (5.6)	
>$10,000	23 (7.9)	15 (3.0)	6 (2.2)	
Missing	33 (11.3)	47 (9.4)	40 (14.9)	

***$p < 0.001$; *$p < 0.05$

[a] Only predictors significant in bivariate analysis with the primary exposure of interest, FT ($P < 0.05$) in Table 2 were included in Table 4

[b] Reference category

[c,d,e] Values may not sum to the total due to missing data.

1.6: Table 5: Association of respondents' characteristics and patient-reported financial toxicity with health-related quality of life (*n* = 1063)

Variables[a]	Multivariate logistic regression for High vs Low HRQoL composite score Adjusted OR (95% CI)	Multivariate logistic regression for Moderate vs Low HRQoL composite score Adjusted OR (95% CI)
Patient-reported financial toxicity *(primary exposure)* (*n* = 717)[b]		
Yes	**0.51 (0.29 - 0.89)*****	**0.52 (0.32 – 0.83)*****
No	Reference	
Educational level (*n* = 1048)		
High school or less	**0.43 (0.27 – 0.68)*****	**0.57 (0.42 – 0.77)*****
Some College	Reference	
College graduate or higher	**2.44 (1.61 – 3.71)*****	**0.43 (0.27– 0.68)*****
Insurance status (*n* = 926)		
Yes	Reference	
No	0.24 (0.03 – 2.22)	0.93 (0.27 – 3.26)
Current debt due to cancer (*n* = 1049)		
Yes	Reference	
No	**1.80 (1.19 – 2.71)****	1.19 (0.84 – 1.69)

Chemotherapy (*n* = 1063)		
Not initiated at the time of the survey	**2.58 (1.73 - 3.84)*** **	1.30 (0.95 – 1.77)
Yes	Reference	
Lost income due to cancer, $ (*n* = 943)		
<$5000	Reference	
>$5000-$10,000	1.62 (0.74 – 3.56)	1.11 (0.60 – 2.03)
>$10,000	**0.39 (0.15 – 1.00)***	1.63 (0.74 – 3.57)

Model: Likelihood Ratio test, χ^2 (18) = 116.14, $p < 0.0001$

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

[a] Only predictors significant in bivariate analysis with the primary exposure of interest, FT and HRQoL ($P < 0.05$) were included in the multivariate analyses.

[b, c, d] Missing observations for variables

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