



Published in final edited form as:

Qual Life Res. 2018 August ; 27(8): 2067–2075. doi:10.1007/s11136-018-1862-z.

Health-related quality of life of African-American female breast cancer survivors, survivors of other cancers, and those without cancer

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Abstract

Purpose—The purpose of this study was to compare differences in health-related quality of life (HRQOL) between African-American female breast cancer survivors, African-American female survivors of other cancers, and African-American women with no history of cancer.

Methods—Using data from the 2010 National Health Interview Survey (NHIS), the HRQOL of African-American women aged 35 years or older was compared by cancer status. Physical and mental health items from the Patient-Reported Outcomes Measurement Information System (PROMIS) global health scale were used to assess differences in HRQOL.

Results—For summary physical and mental health measures, no significant differences were found between breast cancer survivors and women with no history of cancer; survivors of other cancers reported poorer physical and mental health than did women with no history of cancer. Similar differences were found at the item level. When we examined the two African-American female cancer survivor groups, we found that cancer survivors whose cancer was being treated reported substantially poorer physical health and mental health than did those whose cancer was not being treated. Survivors who had private insurance and were cancer free reported better physical and mental health than did those who did not have private insurance and those who were not cancer free. Breast cancer survivors reported slightly better physical and mental health than did survivors of other cancers.

Conclusions—Our findings highlight the need for public health agencies to adopt practices to improve the mental and physical health of African-American female survivors of cancer.

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Compliance with ethical standards

Conflict of interest The authors have no financial conflicts of interest to report.

Research involving human participants This article does not contain any studies with human participants performed by any of the authors.

Keywords

Cancer; Oncology; Breast cancer; Health-related quality of life; African American; Female

Introduction

Breast cancer survivors are the largest group of female cancer survivors worldwide [1]. Although the number of breast cancer survivors is increasing because of continual improvements in diagnostic screening and cancer treatments [1–3], significant survival disparities exist by race and ethnicity. African-American women have the lowest breast cancer survival rate of any racial/ethnic group in the United States (US), and they have a mortality rate that is 41% higher than that of white women [1, 3]. As a result, there has been considerable interest in understanding the health-related quality of life (HRQOL) of African-American female breast cancer survivors [4].

African-American women are also disproportionately affected when it comes to other cancers as well. Similar to breast cancer, disparities exist among female reproductive cancers, colon cancer, lung cancer, and thyroid cancer [2]. Overall, African-American women have higher mortality rates and shorter survival when compared to other racial ethnic groups for most cancer types [2]. However, little is known about the HRQOL of African-American women who are survivors of other cancers.

HRQOL is a multidimensional population health outcome that supplements the more traditional measures of morbidity and mortality and is useful in providing broad summary measures of perceived health [5, 6]. HRQOL refers to a person's subjective assessment of physical, emotional, social, and cognitive functioning in the context of disease symptoms and treatment [7]. Its constructs include measures of overall health, physical health, mental health, and social functioning [8, 9].

Over the past decade, analyses have been conducted to improve the understanding of factors that affect HRQOL among various breast cancer survivor groups, but studies that investigate how HRQOL differs among African-American women with and without cancer are lacking. This study is among the first to examine and compare HRQOL among African-American women with and without breast cancer using a nationally representative sample and adjusting for confounders. The purpose of this study was to compare the differences in HRQOL between African-American female breast cancer survivors, African-American female survivors of other cancers, and African-American women with no history of cancer.

Methods

Participants

Data for this study were obtained from the 2010 National Health Interview Survey (NHIS), an annual, nationwide, in-person survey used to monitor the health of the US population on a range of health topics. Data collection for the NHIS uses multistage sampling to obtain a representative sample of the US civilian, non-institutionalized population. One adult (aged 18 years) per sampled household is randomly selected and invited to participate in the

Sample Adult Core component of the survey. The annual response rate of NHIS is approximately 73% of the eligible adults in the sample. The NHIS has been conducted annually since 1957 [10].

To focus on issues pertaining to cancer knowledge, attitudes, and practices in cancer-related health behaviors, the Centers for Disease Control and Prevention and the National Cancer Institute co-sponsored and developed a cancer control supplement for the NHIS. Since 2000, the NHIS cancer control supplement has been administered approximately every 5 years [10].

We analyzed data from the 2010 NHIS to assess the HRQOL of three groups of African-American women: survivors of breast cancer, survivors of other cancers, and those without cancer. The participants were adult African-American women (including black, black Hispanic, and non-Hispanic black women) aged 35 years or older. On the basis of questions about whether a physician had told participants that they had a specific type of cancer, women were categorized into three mutually exclusive groups: those who had ever been told they had breast cancer, those who had ever been told they had cancer other than breast cancer, and those who had never been told they had cancer. Data were drawn from the person, sample adult, and cancer control supplement (sample adult cancer) files [10].

Measures

Sociodemographic variables were self-reported age (35–54 years or ≥ 55 years), education level (less than a high school diploma, high school graduate, or college graduate), marital status (married, separated/divorced or widowed, or never married/unmarried), insurance status (private or other), and body mass index (BMI; underweight < 18.5 kg/m², normal weight = 18.5–24.9 kg/m², overweight = 25.0–29.9 kg/m², or obese ≥ 30.0 kg/m²). Income was not included as a sociodemographic variable because a substantial proportion of respondents—in particular, older respondents—often do not answer this question, and the sample sizes for each cancer group would have been reduced, resulting in sparse cell sizes and statistical comparisons with low power. There were 8148 African-American women in the 2010 NHIS sample. African-American women younger than 35 were excluded because of the small likelihood of cancer in this group, resulting in a total sample of 1702 African-American women aged 35 or older.

Cancer status was defined according to the response to two self-reported cancer history questions: “Have you ever been told by a physician that you have cancer?” and “Have you ever been told by a physician that you have breast cancer?” To create cancer status categories, respondents who replied yes to the question “Have you ever been told by a physician that you have cancer?” but no to the question “Have you ever been told by a physician that you have breast cancer?” were categorized as having other cancers ($n = 74$) (Appendix Table 5); respondents who replied yes to both questions were categorized as having breast cancer ($n = 62$); and respondents who replied no to both questions were categorized as being without cancer ($n = 1566$). Being “cancer free” was defined according to the response to one self-reported cancer history question: “To the best of your knowledge, are you now free of cancer?” Being “currently in treatment” was defined according to the response to a similar question: “Are you currently in active treatment?”

The 10-item Patient-Reported Outcomes Measurement Information System (PROMIS) global health scale was used to assess HRQOL for both physical and mental health. PROMIS is a National Institutes of Health initiative to use item response theory and computer adaptive testing to develop and automate the administration of efficient, precise, and valid item banks measuring common patient-reported clinical outcomes (e.g., pain, fatigue, physical function, and depression) [10]. An effort within PROMIS was to develop a set of global health items to assess general perceptions of health [9]. The 10 items developed for the global health scale consist of five general health items assessed by the question “In general, would you say your health is (excellent, very good, good, fair, or poor)” and five items derived from the core domains of the initial PROMIS item banks (i.e., physical function, pain, fatigue, emotional distress, and social activities).

For the summary *T* scores for physical and mental health, each domain contained four items (Appendix Table 6). For the physical health *T* scores, the items were overall physical health, being able to carry out every day physical activity, pain, and fatigue. For the mental health *T* scores, the items were quality of life, mental health, satisfaction with social activities, and emotional problems [10]. The physical and mental health summary scores were transformed to *T* score distributions. Higher PROMIS scores represented better HRQOL.

For item level analysis, each item was coded into two categories: Good HRQOL (excellent, very good, good; not at all, a little bit, somewhat; none to mild; or pain rating of 0–5 days) and poor HRQOL (fair, poor; quite a bit, very much; moderately to very severe; or pain rating of 6–10 days).

Analytic plan

All statistical analyses were performed with SAS version 9.2 (SAS Institute, Inc.). Descriptive frequencies and χ^2 tests were conducted for each sociodemographic variable and individual PROMIS item by cancer status. At the item level, adjusted logistic regression models were used to assess differences in HRQOL by cancer status. For the PROMIS physical and mental health domain scores, adjusted multiple regression models were used to assess differences by cancer status. All analyses were adjusted for age, marital status, education level, and private insurance. In addition, subgroup analyses were conducted to assess both group differences and cancer-specific health history factors. Using linear regression analyses, we assessed the effect of current cancer treatment, whether individuals were considered to be cancer free, and private insurance status on the global physical and mental health *T* scores. Summary *T* scores were computed to test for mean differences by each cancer group. All parameter estimates were considered significant at $p < .01$.

Results

Descriptive statistics of study population

African-American female breast cancer survivors and survivors of other cancers tended to be older and more likely to be unmarried than African-American women with no history of cancer. (Table 1) African-American female survivors of other cancers were significantly less likely to have private insurance than were women in the other groups, and African-American

female breast cancer survivors were more likely to be overweight than women in the other groups. BMI was a significant predictor for HRQOL, and women who were obese had poorer health than women who were not.

Descriptive statistics for PROMIS physical and mental health items

Significant univariate differences by cancer status for six of the eight PROMIS domain-specific items were found among African-American women. For physical health, breast cancer survivors and women with no history of cancer had similar levels of self-reported health for all four items. Specifically, breast cancer survivors often reported excellent to good physical health (78.4%), being moderately or completely able to carry out physical activities (84.1%), low levels of fatigue (68.5%), and low levels of pain (75.3%) (Table 2).

In contrast, compared with women with no history of cancer, survivors of other cancers reported poorer self-reported physical health on all four physical health items: poor physical health (OR = 2.33; 95% CI, 1.33–4.06), difficulty carrying out physical activities (OR = 2.58; 95% CI, 1.41–4.74), fatigue (OR=2.17; 95% CI, 1.18–3.98), and pain (OR = 2.87; 95% CI, 1.72–4.78). For two of the four mental health domain specific items, women with no history of cancer reported better health than did survivors of other cancers. Compared with women with no history of cancer, survivors of other cancers were more likely to report poorer mental health (OR=2.01; 95% CI, 1.11–3.64) and lower satisfaction with social activities and relationships (OR=2.03; 95% CI, 1.14–3.63).

Weighted adjusted analyses by cancer status for PROMIS physical and mental health items

Results from the weighted analyses (adjusted for age, marital status, education level, and insurance status) were similar to those of the unadjusted analyses for the four PROMIS physical health items, by cancer status (Table 3). No significant differences on any physical health items were found between breast cancer survivors and women with no history of cancer. In contrast, compared with women with no history of cancer, survivors of other cancers were more than twice as likely to report poorer HRQOL on all four physical items.

For the weighted adjusted analyses, no significant differences were found between breast cancer survivors and women with no history of cancer on any of the four mental health items. Similar to the results of univariate comparisons for the mental health items, compared with women with no history of cancer, survivors of other cancers reported poorer HRQOL on two mental health items: mental health (AOR = 1.93; 95% CI, 1.07–3.47) and satisfaction with social activities and relationships (AOR = 1.94; 95% CI, 1.11–3.40).

Weighted adjusted analyses by cancer status for PROMIS physical and mental health summary T scores

After adjusting for age, marital status, education, insurance status, and BMI, survivors of other cancers reported lower scores on the physical health domain than did women with no history of cancer (T score = - 5.40; 95% CI, - 8.43 to - 2.38) (Appendix Table 7), representing a more than 50% difference in standard deviation. In contrast to that finding, no significant difference was found on the physical health domain between breast cancer

survivors and women with no history of cancer. For the mental health domain, African-American female survivors of other cancers reported lower mental health scores than African-American women with no history of cancer (T score = -3.10; 95% CI, -5.65 to -0.54), but the difference was not as large as the difference in physical health T scores (i.e., about a third of a standard deviation difference). No significant difference in mental health was found between breast cancer survivors and women with no history of cancer.

After adjusting for age, marital status, education level, treatment effects, cancer-free status, and insurance status, we found that breast cancer survivors reported better physical health and mental health than survivors of other cancers (Table 4). Furthermore, women who did not have private insurance and were receiving cancer treatment reported substantially poorer physical health than did their counterparts. The effect of current treatment on mental health was significant but less than half the effect size of that found for physical health. Women who reported themselves as being cancer free reported both better physical and mental health than did women who had breast cancer or who were survivors of other cancer.

Discussion

The Healthy People 2020 initiative of the US Department of Health and Human Services emphasized HRQOL outcomes, recognizing them as a public health concern and including them as one of the four overarching goals. Examining and measuring HRQOL can help determine the burden of preventable diseases and provide valuable new insights into the relationships between HRQOL and risk factors. Most studies on HRQOL among African-American female breast cancer survivors have made comparisons between only African-American women and non-African-American women [11–14]; they also have been limited by the lack of comparison groups within African-American women with other cancers and African-American women with no history of cancer. We found only one previous study of African-American women that made comparisons within this group [15] by including a control group of African-American women who self-reported that they had previous breast cancer diagnosis. We believe that our study is the first to use a nationally representative sample and to compare various HRQOL measures among African-American female breast cancer survivors, African-American female survivors of other cancers, and African-American women with no history of cancer (control group). Furthermore, few previous studies of African-American female cancer survivors have adjusted for confounders such as age, education level, BMI, insurance status, and marital status or examined the effects of treatment and remission effects.

The salient findings of this study were comparisons within subgroups of African-American women. Breast cancer survivors and women with no history of cancer reported better physical and mental health, as determined by global HRQOL summary measures, compared with survivors of other cancers [12, 13]. For the physical health domain, survivors of other cancers reported poor physical health, difficulty carrying out physical activities, fatigue, and pain. For the mental health domain, survivors of other cancers reported poor mental health and satisfaction with social activities and relationships. In the one study that made comparisons similar to ours [15], results were similar except that Von Ah et al. found significantly poorer outcomes for African-American female breast cancer survivors than for

African-American women with no history of cancer for fatigue and satisfaction with social activities. The differences could be because the groups in the Von Ah et al. study were drawn from convenience samples and were not nationally representative or because Von Ah et al. selected African-American female breast cancer survivors who were 2–20 years post diagnosis. Overall, our results suggest resilience among breast cancer survivors in terms of physical and mental health compared with survivors of other cancers. In general, we found that, after adjustment for socio-demographic factors, African-American female breast cancer survivors were functioning, both physically and mentally, as well as or better than African-American female survivors of other cancers and African-American women with no history of cancer. For individual mental and physical health items, this was not always the case.

Our study was also the first to make comparisons between the two cancer groups by cancer status, treatment effects, and remission effects. Interestingly, we found large physical health differences between breast cancer survivors and survivors of other cancers and between those who were currently being treated and those who were not. The group differences in mental health were smaller than the physical health differences for both cancer status and treatment. Conversely, the effect of being cancer free was similar across the physical and mental health domains. These findings suggest that the potential to improve the physical and mental health of African-American female cancer survivors is substantial following the diagnosis and treatment of cancer, in particular for survivors of other cancers.

There are strengths and limitations to our study. First, the NHIS data are self-reported, so reporting and recall bias may have occurred for the cancer outcomes, treatment variables, and HRQOL outcomes. Because of small sample size, we could not adjust for comorbidities; however, previous studies indicate that comorbidities have an effect on the HRQOL in African-American female breast cancer survivors and African-American survivors of other cancers [16]. Another limitation is the use of binary outcomes for the item-level analyses. This may have reduced the statistical power of the analyses and led to the nonsignificant findings for the comparisons between African-American female breast cancer survivors and African-American women with no history of cancer in this study. Another limitation of this study is the uncertainty regarding the time after diagnosis based on the survey data. This is the only study we are aware of that has used a nationally representative sample that provided comparisons on HRQOL indices between African-American female breast cancer survivors, African-American female survivors of other cancers, and African-American women with no history of cancer. We also adjusted for known confounders: age, marital status, insurance status, BMI, education level, and treatment effects. Although NHIS data are weighted to be representative of the US population, the cancer subgroups used in this study may not be nationally representative.

Our findings highlight the need for public health agencies to adopt practices to improve the mental and physical health of all African-American female survivors of cancer and provide evidence for where the most substantial differences occur among African-American women. In particular, future research should investigate potential interventions for improving HRQOL among African-American female survivors of cancers other than breast cancer. Future research should also investigate why African-American women survivors of other cancers differ strongly from African-American breast cancer survivors. The findings of this

study have implications for further clinical research and practices as well. Assessing disparities in HRQOL can contribute to improving breast cancer care and improved treatment. This information can provide scientific evidence for clinical-decision making regarding patients' experiences after treatment and during survivorship. Mindfulness-based stress reduction, behavioral techniques, and exercise interventions are practices that, if implemented, may increase HRQOL related to mental and physical health [17–20]. The survival rate of women with breast cancer increases when the disease is diagnosed and treated early. As advancements in technologies and research improve early detection and treatment, the number of breast cancer survivors will continue to increase. Therefore, it is necessary to consider factors that affect HRQOL among breast cancer survivors and develop strategies that will improve their HRQOL.

Acknowledgments

Funding This study was funded by The National Cancer Institute (U54CA118638) and (RO1CA166785) and the National Institute on Minority Health and Health Disparities (P20MD006881).

Appendix

See Tables 5, 6 and 7.

Table 5

Types of cancers other than breast cancer, African-American women aged 35 or older, National Health Interview Survey, 2010

| Cancer type | Frequency ^a |
|--------------------|------------------------|
| Cervix | 15 |
| Uterus | 11 |
| Colon | 10 |
| Ovary | 8 |
| Lung | 6 |
| Thyroid | 4 |
| Leukemia | 3 |
| Other | 3 |
| Bladder | 2 |
| Blood | 2 |
| Esophagus | 2 |
| Lymphoma | 2 |
| Stomach | 2 |
| Bone | 1 |
| Brain | 1 |
| Liver | 1 |
| Melanoma | 1 |
| Skin (don't know) | 1 |
| Skin (nonmelanoma) | 1 |

| Cancer type | Frequency ^a |
|----------------|------------------------|
| Throat/pharynx | 1 |

^aAmong the 71 subjects that provided responses to the types of other cancers they had, six individuals reported two different cancers

Table 6

PROMIS physical and mental health items, National Health Interview Survey, 2010

| PROMIS item | Response categories | Item subdomain |
|--|------------------------------|----------------------|
| Physical health domain | | |
| In general, how would you rate your physical health? | Excellent (5)–poor (1) | Physical health |
| Does your health now limit you in doing vigorous activities such as running, lifting heavy objects, participating in strenuous sports? | Not at all (5)–can’t do (1) | Physical functioning |
| In the past 7 days, how much did pain interfere with your day-to-day activities? | Very much (5)–not at all (1) | Pain |
| In the past 7 days, how often did you feel tired? | Very much (5)–not at all (1) | Fatigue |
| Mental health domain | | |
| In general, how would you say your quality of life is? | Excellent (5)–poor (1) | Quality of life |
| In general, how would you rate your mental health, including your mood and your ability to think? | Excellent (5)–poor (1) | Mental health |
| In general, how would you rate satisfaction with your social activities and relationship? | Excellent (5)–poor (1) | Social discretionary |
| In the past 7 days, how often have you been bothered by emotional problems such as feeling anxious, depressed or irritable? | Always (5)–never (1) | Emotional problems |

PROMIS patient reported outcomes measurement information system

Table 7

Multivariable linear regression for PROMIS *T* scores, National Health Interview Survey, 2010

| PROMIS global health domain | <i>T</i> score | Standard error | 95% CI |
|-----------------------------|----------------|----------------|------------------|
| Physical | | | |
| Breast cancer | – 0.18 | 1.22 | – 2.57 to 2.22 |
| Other cancer | – 5.40 | 1.54 | – 8.43 to – 2.38 |
| No cancer | 1 [reference] | | |
| Mental | | | |
| Breast cancer | – 0.55 | 0.94 | – 2.40 to 1.30 |
| Other cancer | – 3.10 | 1.30 | – 5.65 to – 0.54 |
| No cancer | 1 [reference] | | |

Adjusted for age, marital status, and education level

PROMIS patient reported outcomes measurement information system

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Descriptive statistics for African-American women aged 35 or older by cancer status, National Health Interview Survey, 2010

Table 1

| Demographic characteristic | No. (weighted%) | | <i>p</i> value |
|--------------------------------------|--|---|----------------|
| | Breast cancer survivors (<i>n</i> = 62) | Other cancer survivors (<i>n</i> = 74) | |
| | | No history of cancer (<i>n</i> = 1566) | |
| Age (years) | | | |
| 35–54 | 15 (24.2) | 22 (29.7) | 855 (54.6) |
| 55 | 47 (75.8) | 52 (70.3) | 711 (45.4) |
| Marital status | | | |
| Married | 15 (24.2) | 11 (14.9) | 444 (28.4) |
| Not married | 47 (75.8) | 63 (85.1) | 1122 (71.7) |
| Education | | | |
| Less than a high school diploma | 17 (28.3) | 14 (19.4) | 348 (22.3) |
| High school graduate or more | 43 (71.7) | 58 (80.6) | 1212 (77.7) |
| Private insurance | | | |
| Yes | 31 (50.0) | 23 (31.1) | 755 (48.3) |
| No | 31 (50.0) | 51 (68.9) | 808 (51.7) |
| Body mass index (kg/m ²) | | | |
| Underweight (< 18.5) | 1 (1.7) | 1 (1.4) | 22 (1.5) |
| Normal (18.5–24.9) | 8 (13.6) | 17 (23.3) | 332 (22.0) |
| Overweight (25.0–29.9) | 23 (39.0) | 22 (30.1) | 464 (30.7) |
| Obese (≥ 30.0) | 27 (45.8) | 33 (45.2) | 692 (45.8) |

Table 2
 Descriptive Statistics for PROMIS physical and mental health items by cancer status, National Health Interview Survey, 2010

| Domain/characteristic | No. (weighted%) | | |
|---|-------------------------------------|------------------------------------|---------------------------------------|
| | Breast cancer survivors (n = 62) | Other cancer survivors (n = 74) | No history of cancer (n = 1566) |
| Physical | | | |
| Physical health | | | |
| Excellent to good | 44 (78.4) | 44 (60.2) | 1162 (75.3) |
| Fair to poor | 18 (21.6) | 30 (39.3) | 404 (24.7) |
| Carry out physical activity | | | |
| Completely to moderately | 50 (84.1) | 49 (64.2) | 1347 (86.9) |
| A little to not at all | 12 (15.9) | 25 (35.8) | 219 (13.1) |
| Fatigue during the past 7 days | | | |
| None to mild | 41 (68.5) | 37 (52.3) | 1082 (67.3) |
| Moderately to very severe | 21 (31.5) | 37 (47.7) | 484 (32.8) |
| Pain (no. of days during the past 7 days) | | | |
| 0–5 | 16 (75.3) | 30 (59.4) | 377 (75.9) |
| 6–10 | 46 (24.8) | 44 (40.6) | 1189 (24.2) |
| Mental | | | |
| Quality of life | | | |
| Excellent to good | 50 (86.4) | 57 (82.4) | 1325 (84.9) |
| Fair to poor | 12 (13.6) | 17 (17.6) | 241 (15.1) |
| Mental health | | | |
| Excellent to good | 55 (92.9) | 57 (79.4) | 1339 (86.2) |
| Fair to poor | 7 (7.1) | 17 (20.6) | 227 (13.8) |
| Satisfaction with social activities and relationships | | | |
| Excellent to good | 51 (82.7) | 52 (73.0) | 1327 (84.7) |
| Fair to poor | 11 (17.3) | 22 (27.0) | 239 (15.3) |
| Bothered with emotional problems | | | |
| Never to rarely | 46 (73.3) | 42 (61.2) | 1113 (70.5) |

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| Domain/characteristic | No. (weighted%) | | |
|-----------------------|-------------------------------------|------------------------------------|------------------------------------|
| | Breast cancer survivors (n = 62) | Other cancer survivors (n = 74) | No history of cancer (n = 1566) |
| Sometimes to always | 16 (26.7) | 32 (38.8) | 453 (29.5) |

PROMIS patient reported outcomes measurement information system

Table 3
 Weighted multivariable logistic regression models comparing no history of cancer group to breast cancer survivors and other cancer survivors to predict PROMIS physical and mental health items

| Domain/dependent variable | Breast cancer survivors | | Other cancer survivors | |
|---|-------------------------|---------|------------------------|---------|
| | AOR (95% CI) | p value | AOR (95% CI) | p value |
| Physical | | | | |
| Physical health | 1.21 (0.62–2.36) | .57 | 2.17 (1.25–3.76) | .006 |
| Carry out physical activity | 0.81 (0.42–1.56) | .53 | 2.37 (1.29–4.36) | .005 |
| Fatigue during the past 7 days | 0.99 (0.50–1.98) | .99 | 2.00 (1.08–3.71) | .03 |
| Pain during the past 7 days | 1.04 (0.59–1.83) | .90 | 2.74 (1.65–4.56) | <.001 |
| Mental | | | | |
| Quality of life | 0.89 (0.46–1.73) | .73 | 1.42 (0.80–2.53) | .23 |
| Mental health | 0.92 (0.47–1.78) | .80 | 1.93 (1.07–3.47) | .03 |
| Satisfaction with social activities and relationships | 0.85 (0.45–1.60) | .61 | 1.94 (1.11–3.40) | .02 |
| Bothered with emotional problems | 0.99 (0.47–2.13) | .99 | 1.62 (0.88–3.00) | .12 |

Adjusted for age, marital status, education, and private insurance; non-cancer group was the reference group

PROMIS patient reported outcomes measurement information system, AOR adjusted odds ratio, CI confidence interval

Weighted multivariable linear regression models for PROMIS physical and mental health *T* scores, National Health Interview Survey, 2010

Table 4

| Outcome/predictors | Model 1: physical health | | | Model 2: mental health | | |
|--------------------|--------------------------|------|----------|------------------------|------|----------|
| | β | SE | <i>p</i> | β | SE | <i>p</i> |
| Cancer status | | | | | | |
| BCS | 3.81 | 0.14 | <.001 | 1.11 | 0.14 | <.001 |
| OCS | 1 [reference] | | | | | |
| Private insurance | | | | | | |
| Yes | 4.11 | 0.14 | <.001 | 4.69 | 0.14 | <.001 |
| No | 1 [reference] | | | | | |
| Current treatment | | | | | | |
| Yes | -5.38 | 0.01 | <.001 | -1.39 | 0.01 | <.001 |
| No | 1 [reference] | | | | | |
| Cancer free | | | | | | |
| Yes | 2.14 | 0.17 | <.001 | 2.45 | 0.16 | <.001 |
| No | 1 [reference] | | | | | |

Adjusted for age, marital status, and education level, treatment effects, cancer-free status, and insurance status

For Model 1, the β value (SE) for breast cancer survivors was 5.05 (1.95) at $p < .05$. For Model 2, the β value (SE) for breast cancer survivors was 3.30 (1.62) at $p < .05$

PROMIS patient reported outcomes measurement information system, BCS breast cancer survivor, NA not applicable, OCS other cancer survivor, SE standard error