

# Financial Impact of Breast Cancer in Black Versus White Women

Stephanie B. Wheeler, Jennifer C. Spencer, Laura C. Pinheiro, Lisa A. Carey, Andrew F. Olshan, and Katherine E. Reeder-Hayes

Author affiliations and support information (if applicable) appear at the end of this article.

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Corresponding author: Stephanie B. Wheeler, MPH, PhD, University of North Carolina at Chapel Hill, 135 Dauer Dr, CB#7411, Chapel Hill, NC 27516; e-mail: [stephanie\\_wheeler@unc.edu](mailto:stephanie_wheeler@unc.edu).

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## A B S T R A C T

### Purpose

Racial variation in the financial impact of cancer may contribute to observed differences in the use of guideline-recommended treatments. We describe racial differences with regard to the financial impact of breast cancer in a large population-based prospective cohort study.

### Methods

The Carolina Breast Cancer Study oversampled black women and women younger than age 50 years with incident breast cancer in North Carolina from 2008 to 2013. Participants provided medical records and data regarding demographics, socioeconomic status, and financial impact of cancer at 5 and 25 months postdiagnosis. We report unadjusted and adjusted financial impact at 25 months postdiagnosis by race.

### Results

The sample included 2,494 women who completed follow-up surveys (49% black, 51% white). Since diagnosis, 58% of black women reported any adverse financial impact of cancer (v 39% of white women;  $P < .001$ ). In models adjusted for age, stage at diagnosis, and treatment received, black women were more likely to report adverse financial impact attributable to cancer (adjusted risk difference [aRD], +14 percentage points;  $P < .001$ ), including income loss (aRD, +10 percentage points;  $P < .001$ ), health care–related financial barriers (aRD, +10 percentage points;  $P < .001$ ), health care–related transportation barriers (aRD, +10 percentage points;  $P < .001$ ), job loss (aRD, 6 percentage points;  $P < .001$ ), and loss of health insurance (aRD, +3 percentage points;  $P < .001$ ). The effect of race was attenuated when socioeconomic factors were included but remained significant for job loss, transportation barriers, income loss, and overall financial impact.

### Conclusion

Compared with white women, black women with breast cancer experience a significantly worse financial impact. Disproportionate financial strain may contribute to higher stress, lower treatment compliance, and worse outcomes by race. Policies that help to limit the effect of cancer-related financial strain are needed.

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## INTRODUCTION

With cancer care costs rising rapidly,<sup>1</sup> patients often are burdened by the cost of their treatment, yet financial toxicity is rarely discussed in the clinic, and many patients and providers have little guidance about where to turn for assistance with financial burden.<sup>2</sup> The rising cost of cancer care not only is an increasingly recognized problem on a societal level but also is a potentially devastating facet of the cancer experience for patients.<sup>3</sup> Studies have suggested that patients with cancer carry a high burden of financial distress and are more likely to experience financial crises, such as

bankruptcy.<sup>4</sup> Financial toxicity has been shown to affect both survival and overall quality of life adversely.<sup>5,6</sup>

Having health insurance does not necessarily protect against the financial distress associated with cancer. One study found that 42% of insured patients with cancer report significant or catastrophic financial burden,<sup>7</sup> and a large majority applied for copayment assistance for medications. Many patients have reported wanting to discuss the costs of cancer treatments with their physicians but not having such conversations,<sup>8,9</sup> which may be due to cost-benefit information often being opaque to providers as well as to patients and providers not knowing where to direct

### ASSOCIATED CONTENT



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Appendix  
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patients for financial assistance. As a result, many patients with cancer and their families face difficult decisions on their own and forego, delay, or discontinue treatment in light of competing demands.

An understanding of the effects of financial burden among racial minorities, who shoulder a greater burden of poor cancer outcomes, is important.<sup>10</sup> Black patients with breast cancer, in particular, have higher mortality and lower initiation of and adherence to guideline-recommended treatments,<sup>11-13</sup> which may be closely related to their inability to pay for care. We leveraged a unique prospective cohort enriched for young and working-age women to quantify the financial impact of breast cancer in racially diverse populations.

## METHODS

### Data

Women were recruited in 2008 to 2013 across 44 counties at the time of diagnosis by rapid case ascertainment through the North Carolina state cancer registry. The Carolina Breast Cancer Study is purposefully enriched such that one half of all participants are black and one half are younger than age 50 years.<sup>14</sup> Participants provided consent for access to medical records and self-reported survey data on demographics, socioeconomic status, health-related quality of life, access to care, treatment experiences, and financial impact of cancer at approximately 5 months (baseline) and 25 months (follow-up) postdiagnosis. Study retention was high, with 89.6% of eligible women completing the follow-up survey. Ongoing data collection within this prospective cohort study continues, with final follow-up data expected approximately 10 years postdiagnosis for all participants. This study was approved by the University of North Carolina at Chapel Hill institutional review board.

### Financial Impact Measures

We conceptualized financial impact using a modified model from the National Cancer Institute that describes the direct and indirect contributors to adverse financial impact.<sup>15</sup> We modified this model to describe how race is related to multiple factors that directly influence adverse financial impact (Fig 1). Several questions related to financial impact of cancer diagnosis were self-reported by women at 25 months postdiagnosis.

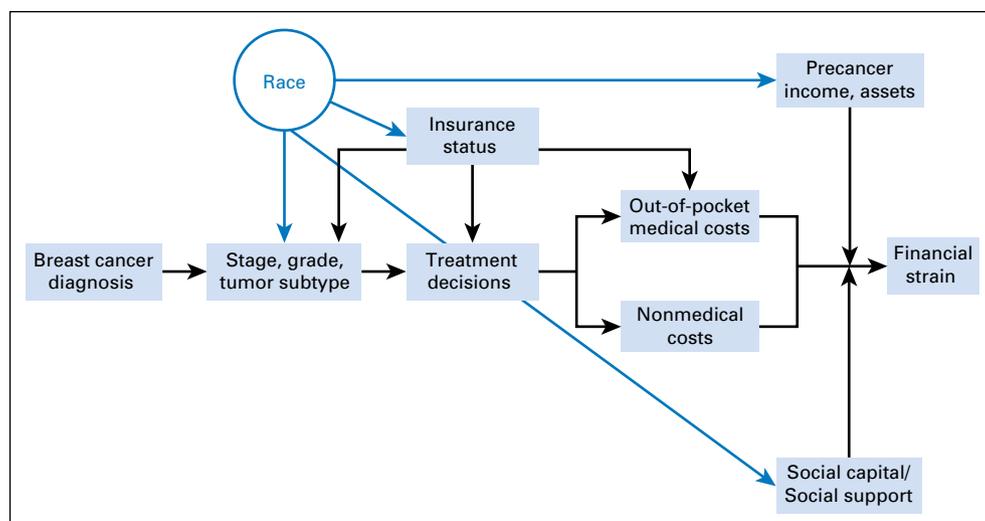
Women reported having lost a job and/or income as a result of breast cancer. Those who reported never having worked ( $n = 15$ ) and who declined to respond about their employment ( $n = 38$ ) were excluded from the analysis for both of these employment-related outcomes. In addition, women reported whether they had been unable to access any medical care as a result of financial and/or transportation barriers since the time of diagnosis. In a separate question, they were asked whether they refused or delayed any recommended cancer treatment because of cost and/or transportation. These health care access and treatment refusal/delay questions were combined into one indicator each for financial and transportation barriers to care after diagnosis.

We also assessed loss of private insurance during the study period to estimate cancer-attributable financial burden. We focused on insurance changes that were likely to result from cancer treatment that rendered women unable to work or to afford private insurance premiums (as opposed to changes in public insurance primarily driven by entitlement programs on the basis of eligibility). Women's insurance status and type of insurance were assessed at both time points. Those who self-identified as having private insurance during the 5-month survey but who were uninsured at the 25-month survey were coded as having lost private insurance. Analyses for this variable, therefore, restricted the sample to only women who had private insurance at the time of the first survey ( $n = 1,834$ ). Finally, we assessed a measure of any adverse financial outcome as a summary indicator that reflected whether an individual reported one or more of the five outcomes studied.

### Control Variables

The primary analyses control for clinical differences (eg, tumor stage) that may vary by race and lead to differences in clinical decision making and treatment-related costs. Medical record abstraction was used to determine tumor stage and treatment history and measured using binary indicators for receipt of mastectomy, chemotherapy, radiation therapy, trastuzumab, and adjuvant endocrine therapy. Comorbidity burden also may vary by race and influence the extent of financial burden and was measured from medical records at the time of diagnosis, including obesity, diabetes, chronic obstructive pulmonary disease, hypertension, and heart disease. Age was self-reported at the baseline survey.

In secondary analyses, we added to the models socioeconomic variables that may vary by race and influence one's ability to cope financially with high medical and nonmedical expenses. Educational attainment, annual household income, and insurance status were self-reported at baseline. Women could report more than one source of insurance, and these were organized into mutually exclusive categories such that dual Medicaid/Medicare beneficiaries were identified as having any



**Fig 1.** Conceptual framework. Conceptual model of racial differences in financial impact. Modified from the National Cancer Institute framework on health and financial outcomes.<sup>15</sup>

Medicaid, and Medicare beneficiaries who also reported supplemental private insurance were classified as having any private coverage. We also included self-reported marital status as one measure of social support because this has been associated with financial vulnerability and cancer outcomes.<sup>16,17</sup>

### Analysis

From 2,998 study participants, we excluded women who reported a race other than black or white ( $n = 82$ ) because it would be inappropriate to analyze these individuals as one group, yet small sample sizes within each category precluded analysis (Appendix Fig A1, online only). We also excluded women who did not complete the follow-up survey ( $n = 422$ ) because of death ( $n = 120$ ) or nonresponse ( $n = 302$ ). Although small in number, we found that those excluded because of death or nonresponse often were, on average, black and younger, had a higher stage at diagnosis, and were of lower socioeconomic status than those who completed the follow-up (Appendix Table A1, online only). Any bias that resulted from exclusion of these more vulnerable groups would likely be small but, if anything, would have shifted the reported findings toward more conservative estimates of financial burden.

We first examined unadjusted racial differences in prevalence of adverse financial impact. To account for a small number of women with missing values for income (5%), tumor stage (2%), or baseline insurance status ( $< 1\%$ ), we performed multiple imputation to estimate values for missing variables. Fifty imputed data sets were created, with results combined as described by Rubin.<sup>18</sup> Sensitivity analysis using only complete cases yielded similar findings for all outcomes.

By following recommendations by the Institute of Medicine,<sup>19</sup> we first specified multivariable logistic regressions for each of the six dichotomous outcomes of interest and adjusted for race and clinical differences only. To determine the extent to which racial differences in adverse financial impact were explained by differences in underlying socioeconomic status, in secondary analyses, we added to these regressions socioeconomic variables, including self-reported education, income, marital status, and insurance status. We examined model fit because these variables were added sequentially. Among clinical variables, age was associated with the largest improvement in model fit, and among socioeconomic variables, income was associated with the largest increase in model fit, with insurance also explaining a large portion of the variation. Results from the primary, partially adjusted models can be interpreted as the total or joint effect of race,<sup>20</sup> whereas results from the secondary, fully adjusted models can be interpreted as the direct residual effect of race.<sup>21</sup>

We also examined potential interactions between race and treatment indicators for radiation therapy and endocrine therapy to explore whether racial differences in financial burden exist within various treatment subgroups. Because these findings were inconsistent in magnitude, direction, and statistical significance and did not meaningfully improve model fit, we reverted to and present our final models without interactions.

Regression results are presented as adjusted risk differences (aRDs), which describe the absolute difference in the likelihood of each outcome for black (relative to white) women, after controlling for other characteristics.<sup>22</sup> We also present adjusted risk ratios in Appendix Table A2 (online only).

Stata 13 software (StataCorp, College Station, TX) was used for the statistical analysis. A significance level of .05 was used for all analyses.

## RESULTS

The final sample included 1,265 white women and 1,229 black women (Table 1). On average, women were 52 years of age at the time of diagnosis, and black women were slightly but significantly younger than white women ( $P = .01$ ). Black women more often presented with higher-stage disease at the time of diagnosis ( $P < .001$ )

and more often received chemotherapy (69% v 58%;  $P < .001$ ) and radiation therapy (75% v 70%;  $P = .003$ ). Black women more often than white women presented with comorbid conditions at diagnosis, including obesity (19% v 10%;  $P < .001$ ), hypertension (58% v 31%;  $P < .001$ ), and diabetes (22% v 8%;  $P < .001$ ). Black women also were more socioeconomically disadvantaged relative to white women, including having lower average household incomes, lower education, and higher rates of both Medicaid and no insurance. Black women were significantly less likely to be married than white women (43% v 72%;  $P < .001$ ).

Negative financial impact was common among all breast cancer survivors (48%), but prevalence was strikingly higher among black versus white women (58% v 39%;  $P < .001$ ). Since diagnosis, black women more often lost private insurance (5% v 1%;  $P < .001$ ), lost a job (14% v 6%;  $P < .001$ ), or experienced a financial barrier to health care (24% v 11%;  $P < .001$ ). Black women also were four times more likely to experience a transportation barrier (14% v 3%;  $P < .001$ ) than white women (Fig 2).

Adjustment for clinical differences explained some of the variation in financial impact, but racial differences remained large and statistically significant (Table 2; Appendix Table A1). Compared with white women, black women were 14.1 percentage points more likely to experience a financial impact ( $P < .001$ ) and after controlling for clinical differences, were significantly more likely to experience each individual measure of financial impact, including a financial barrier (aRD, +10.1 percentage points;  $P < .001$ ), loss of income (aRD, +9.7 percentage points;  $P < .001$ ), transportation barrier (aRD, +9.6 percentage points;  $P < .001$ ), loss of a job (aRD, +6.4 percentage points;  $P < .001$ ), and loss of insurance (aRD, +2.8 percentage points;  $P < .001$ ; Table 2).

Additional adjustment for socioeconomic characteristics explained much of the racial differences for both income loss and financial barriers to care. However, risk differences in other financial outcomes, although attenuated, remained statistically significant (Table 2). After controlling for income, insurance status, marital status, and education, black women remained 5.4 percentage points more likely to experience any financial impact ( $P = .01$ ), 5.0 percentage points more likely to lose income ( $P = .02$ ), 3.6 percentage points more likely to experience transportation barriers ( $P = .002$ ), and 4.0 percentage points more likely to lose a job ( $P = .003$ ) than white women.

In fully adjusted models, each additional year of age reduced the risk of experiencing any financial impact by 0.7 percentage points ( $P < .001$ ; Table 3). Women with stage IV breast cancer at diagnosis were more likely than those with stage I disease at diagnosis to experience any adverse financial impact (aRD, +14.1 percentage points;  $P = .02$ ). Women who received chemotherapy versus those who did not were 9.6 percentage points more likely to experience an adverse financial impact ( $P < .001$ ). Of note, receipt of trastuzumab was negatively associated with experiencing a financial barrier to care (aRD, -5.2 percentage points;  $P = .003$ ) but not with other outcomes.

Compared with women with an annual income  $> \$50,000$ , those with an annual income of \$15,000 to \$29,999 more often reported any adverse financial impact (aRD, +13.9 percentage points;  $P < .001$ ) and having experienced a reduction in income (aRD, +8.8 percentage points;  $P = .02$ ), a financial barrier to care (aRD, +14.0 percentage points;  $P < .001$ ), and a loss of insurance

**Table 1.** Participant Characteristics by Race

Characteristic	White, No. (%)	Black, No. (%)	<i>P</i>
Participants	1,265 (51.0)	1,229 (49.0)	
Mean age at diagnosis, years (SD)	52.96 (11.2)	51.89 (10.9)	<b>.010</b>
AJCC stage			
1	630 (50.4)	458 (37.8)	<b>&lt; .001</b>
2	461 (36.9)	531 (43.8)	
3	139 (11.1)	178 (14.7)	
4	21 (1.7)	45 (3.7)	
Treatment received			
Mastectomy	657 (51.9)	585 (47.6)	<b>.030</b>
Chemotherapy	731 (57.8)	845 (68.8)	<b>&lt; .001</b>
Radiation	889 (70.3)	921 (74.9)	<b>.009</b>
Endocrine therapy	970 (76.7)	770 (62.7)	<b>&lt; .001</b>
Trastuzumab	167 (13.2)	198 (16.1)	<b>.040</b>
Comorbidity			
Obesity	126 (10.0)	239 (19.4)	<b>&lt; .001</b>
Hypertension	389 (30.8)	716 (58.3)	<b>&lt; .001</b>
Diabetes	100 (7.9)	267 (21.7)	<b>&lt; .001</b>
Annual household income, \$			
< 15,000	79 (6.6)	289 (24.8)	<b>&lt; .001</b>
15,000-29,999	155 (12.9)	300 (25.7)	
30,000-49,999	208 (17.3)	239 (20.5)	
50,000	761 (63.3)	338 (29.0)	
Insurance status			
Private	1,105 (87.4)	748 (60.9)	<b>&lt; .001</b>
Medicare	53 (4.2)	92 (7.5)	
Medicaid	70 (5.5)	291 (23.7)	
Uninsured	37 (2.9)	97 (7.9)	
Educational attainment			
Did not complete high school	54 (4.3)	142 (11.6)	<b>&lt; .001</b>
High school graduate	591 (46.7)	711 (57.9)	
Some college/college graduate	620 (49.0)	376 (30.6)	
Marital status			
Single	58 (4.6)	230 (18.7)	<b>&lt; .001</b>
Married/living with partner	914 (72.3)	525 (42.7)	
Widowed	83 (6.6)	121 (9.8)	
Separated/divorced	210 (16.6)	353 (28.7)	

NOTE. Analyses were *t* test for continuous variables or  $\chi^2$  test for categorical variables of black v white women. Bold indicates statistically significant ( $P < .05$ ). Abbreviations: AJCC, American Joint Committee on Cancer; SD, standard deviation.

(aRD, +2.7 percentage points;  $P = .002$ ; Table 3). Women who earned < \$15,000 per year were most likely to report a transportation barrier to care (aRD, +12.6 percentage points;  $P < .001$ ) compared with those who earned > \$50,000 per year.

Insurance also was a strong predictive factor, with uninsured women 28.4 percentage points more likely ( $P < .001$ ) and Medicaid-insured women 21.1 percentage points more likely ( $P < .001$ ) than the privately insured to experience any adverse financial impact (Table 3). Medicaid enrollees were more likely than any other group to experience transportation barriers (aRD, +10.3 percentage points;  $P < .001$ ). Relative to being single, being separated or divorced was associated with an increase of 4.5 percentage points in the probability of losing a job as a result of cancer ( $P = .007$ ) and a increase of 6.4 percentage points in the probability of any adverse financial impact ( $P = .02$ ; Table 3).

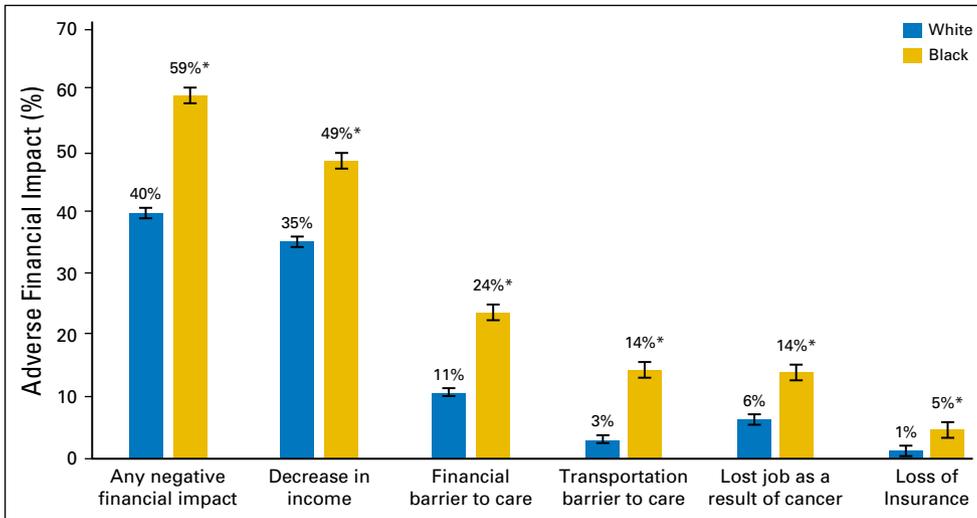
## DISCUSSION

Prevalence of adverse financial impact of cancer is high among all breast cancer survivors, and black women experience a disproportionate share of this burden. Overall, the study found that

adverse financial impact is reported by more than one half of black women and more than one third of white women, a large proportion of which is attributable to lost income postdiagnosis. By controlling for only clinical differences,<sup>20</sup> we found that black women were at greater risk than white women for all measured adverse financial impacts. The effect of black race was somewhat attenuated when baseline education, income, occupation, and health insurance were also included in models but remained significantly associated with the majority of adverse outcomes. The remaining racial differences in adverse financial impact, once both clinical and socioeconomic variables have been controlled for (the direct residual effect), may reflect unmeasured differences in social capital, household economic dynamics (eg, caregiving burden, single-income households), or asset reserves that vary by race and contribute to greater cancer-related financial strain among black women.

High cancer-related financial burden has been shown to affect treatment choice, treatment compliance, and cancer outcomes.<sup>6,23</sup> Although prior studies have drawn attention to the increasing burden of cancer-related financial toxicity,<sup>5,24,25</sup> we are aware of no study that has directly measured and reported on the extent of racial and age-related differences in the financial burden of cancer

## Financial Impact of Breast Cancer in Black Versus White Women



**Fig 2.** Unadjusted probability of adverse financial impact by race. Bars represent SEs. (\*) $P < .001$ , black versus white.

because of insufficient samples of black and young women. Because we oversampled both black and young women in equal proportions, we can report on the experiences of these important subpopulations who shoulder a greater burden of poor cancer outcomes. Of note, racial and age-related disparities in breast cancer outcomes<sup>13,26</sup> may be related, at least in part, to cost-related undertreatment.<sup>27,28</sup> Prior studies of commercially insured populations have shown that high out-of-pocket costs and younger age are related to nonadherence to aromatase inhibitors but lack detail on racial identification.<sup>28</sup> An increased focus on financial strain as a potential driver of outcome disparities may help to reduce differences in recurrence and survival.<sup>29</sup>

Several limitations should be considered. First, this study reflects racial differences within a single region that may not be representative of experiences elsewhere, particularly in states where additional policy differences, such as Medicaid expansion or out-of-pocket restrictions on oral chemotherapy drug pricing, may reduce overall cost burden for patients with cancer. Nevertheless, North Carolina is an ideal state in which to examine these issues because of its large size and socioeconomic diversity. Of North Carolina's 9.9 million residents, approximately 30% are minorities,

and 22% are African American compared with the national average of 13%.<sup>30</sup> Economic conditions are in line with national averages, with slightly more than a quarter being college educated and 18% living below the poverty line. Therefore, we believe that the findings are largely generalizable, particularly for states with few policies to address financial burden. In addition, we do not have information that reflects actual out-of-pocket health care spending for study participants, only a perceived burden as a result of cancer care costs. However, our goal was to measure the differences in patient-perceived rather than objective hardship as a result of high cancer costs; therefore, we believe that our measure is an accurate reflection of the effect of cancer costs on patients. Although we recognize the vital importance of the Affordable Care Act-related health insurance expansions that occurred during the study period, which likely affected financial vulnerability, the study did not capture longitudinal changes in health insurance enrollment with any granularity. Future studies should examine in more detail the role of insurance changes in cancer-related financial vulnerability over time to ensure sufficient samples of public and private insurance plan enrollees. Finally, we were limited to only 2 years of follow-up data, but because Carolina Breast Cancer Study data capture is ongoing,

**Table 2.** Unadjusted and Adjusted Risk Differences of Race: Adverse Financial Impact of Breast Cancer

Model	Adjusted Risk Difference (SE)					
	Any Financial Impact	Income* Loss	Financial Barrier	Transport Barrier	Job† Loss	Insurance‡ Loss
1. Unadjusted effect of black race only (ref. white)	<b>+18.81§ (1.97)</b>	<b>+13.25§ (1.98)</b>	<b>+13.09§ (1.50)</b>	<b>+11.39§ (1.12)</b>	<b>+7.63§ (1.20)</b>	<b>+3.37§ (0.83)</b>
2. Partially adjusted, including clinical factors only	<b>+14.09§ (2.11)</b>	<b>+9.69§ (2.12)</b>	<b>+10.12§ (1.59)</b>	<b>+9.59§ (1.14)</b>	<b>+6.41§ (1.27)</b>	<b>+2.82§ (0.84)</b>
3. Fully adjusted, including clinical factors and socioeconomic status	<b>+5.42   (2.16)</b>	<b>+5.03¶ (2.24)</b>	+2.71 (1.61)	<b>+3.63¶ (1.16)</b>	+4.03 (1.34)	+1.32 (0.78)

NOTE. Results are interpreted as average change in predicted risk of outcome for black relative to white. Adjusted results are from logistic regressions that controlled for additional characteristics. Model 2 adjusts for stage, receipt of mastectomy, chemotherapy, radiation therapy, hormone therapy, trastuzumab, and comorbidity. Model 3 adjusts for all clinical characteristics plus insurance, household income, education, and marital status. Bold indicates statistically significant ( $P < .05$ ).

Abbreviation: ref., referent.

\*Analysis excludes women who had never worked before diagnosis or declined to respond ( $n = 2,440$ ).

†Analysis excludes women who had never worked before diagnosis ( $n = 2,480$ ).

‡Analysis is only for women privately insured at the time of the baseline survey ( $n = 1,852$ ).

§ $P < .001$ .

|| $P < .05$ .

¶ $P < .01$ .

**Table 3.** Fully Adjusted Risk Differences of Race and All Control Variables: Adverse Financial Impact of Breast Cancer

Variable	Adjusted Risk Difference (SE)					
	Any Financial Impact	Income* Loss	Financial Barrier	Transport Barrier	Job† Loss	Insurance‡ Loss
Black race (ref. white)	<b>+5.42§ (2.16)</b>	<b>+5.03§ (2.24)</b>	+2.71 (1.61)	<b>+3.63   (1.16)</b>	<b>+4.03   (1.34)</b>	+1.32 (0.78)
Age	<b>-0.70¶ (0.10)</b>	<b>-0.47¶ (0.11)</b>	<b>-0.56¶ (0.08)</b>	<b>-0.15§ (0.06)</b>	<b>-0.18   (0.07)</b>	<b>-0.12   (0.05)</b>
Stage (ref. stage 1)						
2	+2.14 (2.32)	+3.12 (2.42)	-2.88 (1.77)	+1.25 (1.29)	+0.90 (1.49)	+0.18 (.87)
3	+5.46 (3.61)	+3.75 (3.68)	-1.93 (2.54)	+0.55 (1.75)	+0.41 (2.07)	+0.20 (1.38)
4	<b>+14.09§ (6.22)</b>	<b>+14.70   (6.40)</b>	+2.04 (4.33)	+4.33 (3.07)	<b>+10.00§ (4.48)</b>	-1.08 (1.55)
Treatment received						
Mastectomy	-1.36 (2.40)	-2.03 (2.46)	-0.04 (1.72)	-0.02 (1.22)	<b>-2.98§ (1.42)</b>	+1.01 (0.97)
Chemotherapy	<b>+9.59¶ (2.53)</b>	<b>+9.66¶ (2.61)</b>	<b>+5.66¶ (1.79)</b>	<b>+3.34   (1.29)</b>	+2.95 (1.54)	<b>+1.20 (0.85)</b>
Radiation	-0.06 (2.62)	+0.83 (2.69)	-0.02 (1.91)	-2.80 (1.46)	+1.70 (1.5)	-1.08 (1.25)
Hormone therapy	+0.78 (2.09)	-0.13 (2.17)	-0.15 (1.53)	+1.15 (1.08)	-1.93 (1.33)	+0.06 (0.77)
Trastuzumab	+0.72 (2.73)	+1.99 (2.8)	<b>-5.19   (1.75)</b>	+0.71 (1.42)	-0.03 (1.58)	-0.10 (0.96)
Comorbidity						
Obesity	+5.38 (2.75)	<b>+3.34 (2.83)</b>	<b>+3.43 (2.00)</b>	+2.71 (1.41)	+1.26 (1.69)	-0.20 (0.98)
Hypertension	+3.82 (2.20)	<b>+0.79 (2.27)</b>	<b>+2.25 (1.62)</b>	+2.08 (1.15)	-0.13 (1.34)	<b>+0.77 (0.85)</b>
Diabetes	-4.73 (2.81)	<b>-1.30 (2.96)</b>	<b>+1.42 (2.1)</b>	-1.30 (1.30)	-1.69 (1.67)	<b>+0.17 (1.15)</b>
Income, \$ (ref. > \$50,000)						
< 15,000	+7.79 (4.54)	+2.59 (4.40)	<b>+11.12¶ (3.22)</b>	<b>+12.58¶ (2.46)</b>	-3.30 (2.06)	+4.95 (2.80)
15,000-29,999	<b>+13.92¶ (3.33)</b>	<b>+8.73§ (3.4)</b>	<b>+14.02¶ (2.65)</b>	<b>+5.86¶ (1.53)</b>	+1.43 (2.06)	<b>+2.66§ (1.18)</b>
30,000-49,999	<b>+9.79¶ (2.86)</b>	<b>+7.92   (2.95)</b>	<b>+7.71¶ (2.12)</b>	<b>+4.29¶ (1.44)</b>	+3.61 (1.96)	<b>+2.00§ (0.93)</b>
Insurance (ref. private)						
Medicare	+8.01 (4.48)	-6.20 (4.48)	<b>+9.15§ (3.66)</b>	<b>+5.94§ (2.38)</b>	<b>-5.35   (1.89)</b>	
Medicaid	<b>+21.11¶ (3.75)</b>	<b>+9.19   (3.72)</b>	<b>+10.11¶ (2.61)</b>	<b>+10.27¶ (1.93)</b>	<b>+4.89§ (2.25)</b>	
Uninsured	<b>+28.45¶ (4.74)</b>	<b>+20.42¶ (4.88)</b>	<b>+26.93¶ (4.35)</b>	<b>+7.18   (2.24)</b>	<b>+8.74   (3.32)</b>	
Education (ref. college)						
High school only	+4.40 (3.87)	+3.98 (3.94)	+0.30 (2.41)	-0.83 (1.45)	-2.18 (2.69)	-1.54 (2.75)
< High school	-2.09 (4.24)	-2.65 (4.31)	-1.74 (2.76)	-0.52 (1.85)	<b>-5.84   (2.84)</b>	-4.29 (2.75)
Marital status (ref. married)						
Single	-4.43 (3.27)	-3.45 (3.33)	-2.73 (2.07)	-0.13 (1.49)	+2.23 (1.92)	+0.15 (1.06)
Widowed	+0.59 (3.80)	-0.85 (4.01)	+1.19 (2.87)	+0.35 (1.89)	+2.40 (2.66)	+1.14 (1.14)
Separated/divorced	<b>+6.35§ (2.67)</b>	+4.08 (2.73)	+2.96 (1.93)	+2.56 (1.39)	<b>+4.53   (1.67)</b>	+1.36 (1.04)

NOTE. Results are interpreted as average change in predicted risk of outcome relative to ref. category. Estimates are from logistic regressions that controlled for all other characteristics listed. Bold indicates statistically significant ( $P < .05$ ).

Abbreviation: ref., referent.

\*Analysis excludes women who had never worked before diagnosis or declined to respond ( $n = 2,440$ ).

†Analysis excludes women who had never worked before diagnosis ( $n = 2,480$ ).

‡Analysis is only for women privately insured at the time of the baseline survey ( $n = 1,852$ ).

§ $P < .05$ .

|| $P < .01$ .

¶ $P < .001$ .

we eventually will examine the longer-term financial burden; cancer-related outcomes such as endocrine therapy adherence, recurrence, and breast cancer-specific mortality; and emotional and physical sequelae associated with this financial burden.

An urgent need exists for research on the financial needs of diverse patients with breast cancer as well as for the development of interventions and support tools that identify and match patients to resources for financial assistance, can be delivered broadly across a variety practice settings, and are user friendly to facilitate discussions between patients and providers about addressing financial barriers to treatment. Policies and programs that help to limit and mitigate the effects of cancer-related financial strain are needed, including ensuring greater price transparency. Finally, providers should recognize and communicate with patients about the potential for cancer-related financial strain and, where possible, offer higher-value treatment alternatives, particularly for minority women who may be more financially vulnerable. In the absence of such interventions, black women will continue to shoulder a disproportionate burden of cancer-related financial strain and downstream disparate cancer outcomes.

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Disclosures provided by the authors are available with this article at [jco.org](http://jco.org).

#### AUTHOR CONTRIBUTIONS

**Conception and design:** Stephanie B. Wheeler, Jennifer C. Spencer, Laura C. Pinheiro, Lisa A. Carey, Katherine E. Reeder-Hayes

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**Administrative support:** Stephanie B. Wheeler, Jennifer C. Spencer

**Provision of study materials or patients:** Andrew F. Olshan

**Collection and assembly of data:** Stephanie B. Wheeler, Andrew F. Olshan

**Data analysis and interpretation:** All authors

**Manuscript writing:** All authors

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**Accountable for all aspects of the work:** All authors

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**Affiliations**

**Stephanie B. Wheeler, Jennifer C. Spencer, Lisa A. Carey, Andrew F. Olshan, and Katherine E. Reeder-Hayes**, University of North Carolina at Chapel Hill, Chapel Hill, NC; and **Laura C. Pinheiro**, Weill Cornell Medicine, New York, NY.

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**Financial Impact of Breast Cancer in Black Versus White Women**

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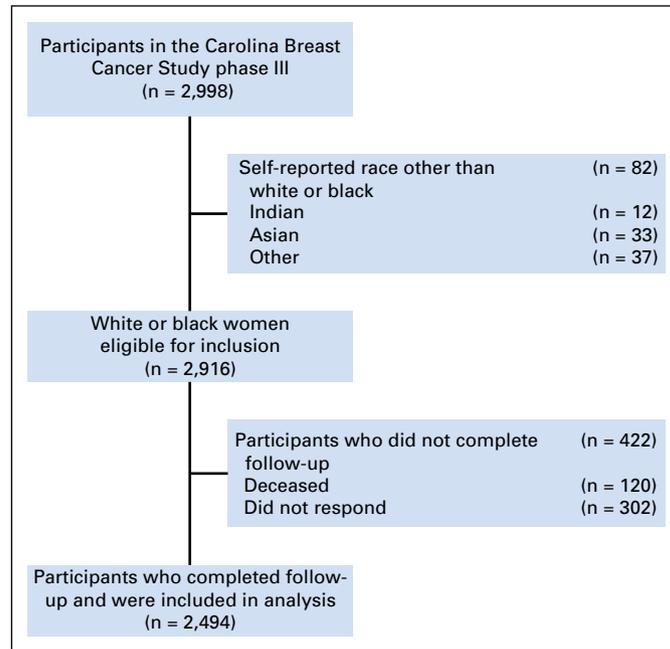
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**Appendix**



**Fig A1.** Inclusion/exclusion of study participants.

**Table A1.** Characteristics of Included Versus Excluded Study Participants

Characteristic	Included, No. (%)	Excluded, No. (%)	<i>P</i>
No. of participants	2,494	422	
Race			
White	1,265 (51)	156 (37)	<b>&lt; .001</b>
Black	1,229 (49)	286 (63)	
Mean age at diagnosis, years (SD)	52.4 (11.1)	48.6 (10.5)	<b>&lt; .001</b>
AJCC stage			
1	1,088 (44)	101 (24)	<b>&lt; .001</b>
2	992 (40)	175 (42)	
3	317 (13)	101 (24)	
4	68 (3)	42 (10)	
Treatment received			
Mastectomy	1,242 (50)	234 (55)	<b>&lt; .001</b>
Chemotherapy	1,576 (63)	306 (72)	<b>&lt; .001</b>
Radiation	1,810 (73)	289 (68)	.080
Endocrine therapy	1,740 (70)	223 (53)	<b>&lt; .001</b>
Trastuzumab	365 (15)	58 (14)	.630
Comorbidity			
Obesity	365 (15)	82 (19)	.010
Hypertension	1,105 (44)	179 (42)	.470
Diabetes	367 (15)	68 (16)	.450
Annual household income, \$			
< 15,000	368 (16)	84 (21)	.010
15,000-29,999	445 (19)	78 (20)	
30,000-49,999	447 (19)	74 (19)	
50,000	1,099 (46)	158 (40)	
Insurance status			
Private	1,853 (74)	260 (62)	<b>&lt; .001</b>
Medicare	145 (6)	21 (5)	
Medicaid	361 (15)	104 (25)	
Uninsured	134 (5)	35 (8)	
Marital status			
Single	228 (12)	73 (17)	<b>&lt; .001</b>
Married/living with partner	1,439 (58)	194 (46)	
Widowed	204 (8)	31 (7)	
Separated/divorced	562 (23)	123 (29)	
Educational attainment			
Did not complete high school	196 (8)	36 (9)	.060
High school graduate	1,302 (52)	242 (58)	
Some college/college graduate	996 (40)	143 (34)	

NOTE. Analyses were *t* test (continuous) or  $\chi^2$  test (categorical) of included v excluded. Bold indicates statistically significant ( $P < .05$ ). Abbreviations: AJCC, American Joint Committee on Cancer; SD, standard deviation.

Financial Impact of Breast Cancer in Black Versus White Women

**Table A2.** Partially Adjusted Risk Differences: Adverse Financial Impact of Breast Cancer

Variable	Adjusted Risk Difference (SE)					
	Any Financial Impact	Income* Loss	Financial Barrier	Transport Barrier	Job† Loss	Insurance‡ Loss
Black	<b>14.09§ (2.11)</b>	<b>9.69§ (2.12)</b>	<b>10.12§ (1.59)</b>	<b>9.59§ (1.14)</b>	<b>6.41§ (1.27)</b>	<b>2.82§ (0.84)</b>
Age	<b>-0.68§ (0.10)</b>	<b>-0.50§ (0.10)</b>	<b>-0.54§ (0.08)</b>	<b>-0.16§ (0.06)</b>	<b>-0.22   (0.06)</b>	<b>-0.09¶ (0.04)</b>
Stage (ref. stage 1)						
2	3.80 (2.43)	3.86 (2.46)	-0.78 (1.82)	2.40 (1.30)	1.19 (1.48)	0.38 (0.86)
3	<b>9.70   (3.73)</b>	5.76 (3.73)	1.95 (2.82)	<b>4.40¶ (2.15)</b>	1.25 (2.11)	0.53 (1.45)
4	<b>18.52   (6.22)</b>	<b>17.37   (6.42)</b>	6.02 (4.91)	7.29 (3.73)	<b>11.66¶ (4.74)</b>	-0.74 (1.71)
Treatment received						
Mastectomy	-0.89 (2.47)	-1.79 (2.48)	0.17 (1.83)	0.27 (1.35)	<b>-2.80¶ (1.43)</b>	1.12 (1.00)
Chemotherapy	<b>9.20§ (2.63)</b>	<b>9.73§ (2.65)</b>	<b>4.90¶ (1.90)</b>	2.75 (1.41)	<b>3.19¶ (1.54)</b>	1.29 (0.86)
Radiation	-1.56 (2.71)	0.23 (2.73)	-1.14 (2.09)	<b>-3.93¶ (1.73)</b>	1.54 (1.53)	-1.40 (1.40)
Hormone therapy	0.09 (2.18)	-0.33 (2.20)	-0.19 (1.62)	1.25 (1.16)	-1.70 (1.33)	-0.06 (0.79)
Trastuzumab	0.43 (2.83)	1.84 (2.84)	<b>-5.06   (1.84)</b>	0.54 (1.51)	-0.10 (1.59)	-0.15 (0.97)
Comorbidity						
Obesity	<b>6.39¶ (2.83)</b>	3.67 (2.88)	3.95 (2.17)	<b>3.43¶ (1.62)</b>	1.44 (1.74)	-0.26 (0.99)
Hypertension	<b>6.65   (2.26)</b>	2.46 (2.30)	<b>4.51¶ (1.75)</b>	<b>3.43   (1.28)</b>	0.49 (1.39)	0.99 (0.90)
Diabetes	-2.93 (2.94)	-0.66 (3.01)	2.78 (2.33)	-0.12 (1.53)	-1.45 (1.73)	0.41 (1.26)

NOTE. Results are interpreted as average change in predicted risk of outcome relative to ref. category. Estimates are from logistic regressions that controlled for all other characteristics listed. Bold indicates statistically significant ( $P < .05$ ).

Abbreviation: ref. referent.

\*Analysis excludes women who had never worked before diagnosis or declined to respond ( $n = 2,440$ ).

†Analysis excludes women who had never worked before diagnosis ( $n = 2,480$ ).

‡Analysis is only for women privately insured at the time of the baseline survey ( $n = 1,852$ ).

§ $P < .001$ .

|| $P < .01$ .

¶ $P < .05$ .

**Table A3.** Unadjusted and Adjusted Risk Ratios of Black Race: Adverse Financial Impact of Breast Cancer

Model	Risk Ratio (SE)					
	Any Financial Impact	Income* Loss	Financial Barrier	Transport Barrier	Job† Loss	Insurance‡ Loss
1. Unadjusted	<b>1.48§ (0.06)</b>	<b>1.38§ (0.07)</b>	<b>2.21§ (0.21)</b>	<b>4.67§ (0.80)</b>	<b>2.21§ (0.29)</b>	<b>3.86§ (1.25)</b>
2. Partially adjusted, including clinical factors only	<b>1.34§ (0.06)</b>	<b>1.26§ (0.07)</b>	<b>1.85§ (0.19)</b>	<b>3.73§ (0.67)</b>	<b>1.96§ (0.27)</b>	<b>3.22§ (1.10)</b>
3. Fully adjusted, including clinical factors and socioeconomic status	<b>1.13   (0.05)</b>	<b>1.13¶ (0.06)</b>	1.17 (0.11)	<b>1.59¶ (0.26)</b>	<b>1.52   (0.22)</b>	1.75 (0.62)

NOTE. Results are interpreted as proportional change in predicted risk of outcome for black relative to white. Adjusted results are from logistic regressions that controlled for additional characteristics. Model 2 adjusts for stage, receipt of mastectomy, chemotherapy, radiation therapy, hormone therapy, and trastuzumab, and comorbidities. Model 3 adjusts for all clinical characteristics plus insurance, household income, education, and marital status. Bold indicates statistically significant ( $P < .05$ ).

\*Analysis excludes women who had never worked prior to diagnosis or declined to respond ( $n = 2,440$ ).

†Analysis excludes women who had never worked prior to diagnosis ( $n = 2,480$ ).

‡Analysis is only for women privately insured at the time of the baseline survey ( $n = 1,852$ ).

§ $P < .001$ .

|| $P < .01$ .

¶ $P < .05$ .