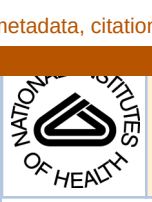

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Determinants of breast cancer treatment delay differ for African American and White women

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Abstract

Background—Timeliness of care may contribute to racial disparities in breast cancer mortality. African American women experience greater treatment delay than White women in most, but not all studies. Understanding these disparities is challenging since many studies lack patient-reported data and use administrative data sources that collect limited types of information. We used interview and medical record data from the Carolina Breast Cancer Study (CBCS) to identify determinants of delay and assess whether disparities exist between White and African American women (n=601).

Methods—The CBCS is a population-based study of North Carolina women. We investigated the association of demographic and socioeconomic characteristics, healthcare access, clinical factors, and measures of emotional and functional well-being with treatment delay. The association of race and selected characteristics with delays of >30 days were assessed using logistic regression.

Results—Household size, losing a job due to one's diagnosis, and immediate reconstruction were associated with delay in the overall population and among White women. Immediate reconstruction and treatment type were associated with delay among African American women. Racial disparities in treatment delay were not evident in the overall population. In the adjusted models, African American women experienced greater delay than White women for younger age groups: odds ratio (OR), 3.34; 95% confidence interval (CI), 1.07–10.38 for ages 20–39, and OR, 3.40; 95% CI, 1.76–6.54 for ages 40–49.

Conclusions—Determinants of treatment delay vary by race. Racial disparities in treatment delay exist among women <50 years old.

Impact—Specific populations need to be targeted when identifying and addressing determinants of treatment delay.

Keywords

breast cancer; disparities; treatment delay; Carolina Breast Cancer Study

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Conflict of interest

The authors declare that they have no conflicts of interest to disclose.

Introduction

African American women have a higher breast cancer mortality compared to White women, even after accounting for clinical and prognostic factors(1–4) and socioeconomic characteristics(5). Timeliness has been used as an indicator of quality of care (6, 7) and may contribute in part to these persistent disparities. African American women demonstrate greater delays in care than White women at multiple points along the treatment pathway from detection to medical consultation/diagnosis ("diagnostic delay")(7–12) and from diagnosis to the initiation of treatment (“treatment delay”)(7–9, 13–17). Although the majority of studies demonstrate that African American women are more likely than White women to experience treatment delay (8, 14, 15, 17–20), not all studies find differences between these groups (21–23).

The impact of socioeconomic characteristics has been heavily investigated, but does not fully explain racial disparities in timeliness of care. A study on Medicare beneficiaries found that African American women were more likely than White women to experience delays between initial consultation (a diagnostic imaging procedure or consultation for symptoms) and diagnosis, as well as between diagnosis and treatment(9). In a Washington, D.C. cohort, African American women were more likely than White women to experience delay between the identification of a suspicious finding and diagnostic resolution even among women with the same type of insurance coverage (private or government)(10). Even among low-income, uninsured women enrolled in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP), African American women are more likely to experience diagnostic delay and treatment delay(7).

Limitations in the assessment of socioeconomic characteristics may affect the validity and interpretation of the results for many studies performed to date. First, detailed socioeconomic data is often unavailable in investigations with large study populations(24). Area-level data (e.g. census tracts, zip codes) are used as a proxy for individual-level income and education (8, 9, 15, 25–29). These measures may be unreliable when there is marked heterogeneity within the area being analyzed(30). Additionally, they may not adequately control for confounding since studies suggest that area-level and individual-level characteristics independently impact breast cancer outcomes(31, 32). Second, studies often combine persons with Medicare and Medicaid coverage into a single category (10, 13, 14). Results for this heterogeneous category are difficult to interpret, particularly given the marked distinctions in breast cancer outcomes for these groups(15, 16, 33).

Identifying additional determinants of treatment delay will improve our understanding of racial disparities and is critical for developing interventions and policy to ensure timely care. Investigations based solely on administrative, cancer registry, or medical record data are fairly limited in the types of information they collect and thus are less amenable to discovering novel determinants of delay(7, 28). The goals of this study were to identify determinants of breast cancer treatment delay and to determine whether disparities in treatment delay exist between White and African American women. We use data from a population-based study to assess the association of demographic and socioeconomic characteristics, indicators of healthcare access, clinical factors, and measures of emotional and functional well-being with treatment delay. By combining medical record and patient-reported data, we were able to assess several factors that are not typically evaluated in other investigations and to obtain individual-level socioeconomic data.

Materials and Methods

Study Population

The Carolina Breast Cancer Study (CBCS) phase III is an ongoing population-based study of breast cancer in North Carolina. The design is similar to earlier phases (34, 35), except that it is a case-only study and has a larger recruitment area (44 counties). Eligible participants are 1) 20–74 years old, 2) North Carolina residents at the time of diagnosis, and 3) have incident, pathologically-confirmed invasive primary breast cancer. Women with a previous diagnosis of invasive breast cancer are excluded. A random sample of eligible women is selected from the following strata: 1) African Americans <50 years old, 2) African Americans ≥50 years old, 3) non-African Americans <50 years old, and 4) non-African Americans ≥50 years old. The sampling fractions are 100%, 60%, 40%, and 15%, respectively. At baseline participants are interviewed by a nurse, complete a quality-of-life questionnaire, and provide written consent for medical record requests.

The present study uses abstracted medical record data and baseline nurse-administered interview and questionnaire data for women diagnosed between May 1, 2008 and January 29, 2010 (N=771). Participants were non-Hispanic White ("White") or non-Hispanic African American ("African American"), received either surgery or neoadjuvant chemotherapy and/or hormone therapy ("neoadjuvant therapy") as their first course of treatment, had a known treatment date, and were diagnosed based on a core needle biopsy (CNB) prior to treatment. Participants who received pre-operative chemotherapy or hormonal therapy, or pre- and post-operative chemotherapy or hormone therapy were classified as having received neoadjuvant therapy as their first course of treatment. Hispanics and other racial groups were not analyzed due to small numbers (<3% for both). The final study population consisted of 601 women (Figure 1). This study was approved by the Office of Human Research Ethics at the University of North Carolina at Chapel Hill.

Study variables

The main exposure, race, was obtained from self-report. We calculated treatment delay (main outcome) as the time in days between the date of the CNB used to diagnose invasive disease and the initiation of the first course of treatment. Treatment delay was dichotomized as >30 days ("delay") or ≤30 days. Although this is a commonly used threshold (7, 9, 16, 17), the clinically relevant delay for first course of treatment is unknown. Additional details on the study variables are provided in Supplementary Material 1.

Statistical Analysis

The percentages shown in Tables 1–2 were weighted to obtain North Carolina population estimates (hereafter referred to as the "overall population"). The sample sizes shown in the tables are unweighted. The study design was accounted for in tests of associations between categorical variables. Logistic regression was used to estimate the odds ratios (ORs) and 95% confidence interval (95% CIs) for the association between each exposure and delay. Separate models were developed for each exposure (race and characteristics of delay identified in bivariate analyses) to account for the different sets of explanatory variables necessary to control for confounding (36, 37). Based on the literature, the following explanatory variables were included in the adjusted models to estimate the direct effect of race (White or African American) on delay: age (20–39, 40–49, 50–64, 65–74); income (≤ $20,000, $20,000-$30,000, >$30,000); insurance coverage (private, Medicare, Medicaid, none); education (0–12 years, but no high school degree; high school graduate; some college; technical or business school; college degree or higher); lost a job due to one's diagnosis (yes or no); American Joint Committee on Cancer (AJCC) disease stage (I, IIA, IIB, III/IV); symptoms (yes or no); first treatment/reconstruction (breast conserving surgery

[BCS], mastectomy without reconstruction, mastectomy with reconstruction, neoadjuvant therapy); and marital status (married, unmarried). We estimated the total effect of the following characteristics on delay: the number of people supported by the household income ("household size"; explanatory variables: age, race, marital status), losing a job due to one's diagnosis (explanatory variables: age, race, education), and first treatment/reconstruction (explanatory variables: age, race, education, income, insurance, education, disease stage). All variables were treated as categorical. An interaction term between age and race was included in all models to account for the study design. The study population rather than the overall population was used in the models to ensure a sufficient number of women of both races for each age group. All P values were two-sided and $P < 0.05$ was considered statistically significant. Statistical analyses were performed using SAS 9.2 (SAS Institute Inc., Cary, North Carolina).

Results

Population characteristics

The contact rate for the study (number of women selected for the study - number of women who could not be located or did not respond) was 95.4%. The cooperation rate (number of women who completed interviews/number of women contacted and eligible) was 80.2%. The overall response rate (number of completed interviews/[number of women selected - number ineligible or deceased]) (38) was 75.9%. The median time elapsed between diagnosis and the baseline interview was 5.1 months (interquartile range [IQR] = 4.0–6.2 months). The median time from diagnosis until treatment was 27.0 days (IQR = 18.0–37.0 days) for the study population and 26.2 days (IQR = 16.3–36.1 days) for the overall population. The majority (84.2%) of women in the overall population had a CNB prior to treatment. There was no association between receipt of a CNB and race ($P = 0.39$) in the overall population (or study population). There was a significant association between receipt of a CNB and income ($P = 0.047$) in the overall population: 93.3% of women with an income of >$100,000 had a CNB versus 79.2%–81.6% of women with lower incomes.

As shown in Table 1, delay was significantly associated with household size ($P = 0.011$), losing a job due to one's diagnosis ($P < 0.01$), and immediate reconstruction after mastectomy ($P < 0.01$). Women with smaller households were more likely than women with larger households to experience delay: 35.2%–47.3% for households of ≤ 3 people versus <30% for households of >3 people. Women who lost a job due to their diagnosis and who underwent immediate reconstruction were nearly twice as likely to experience delay compared to women who did not (73.6% versus 37.8%, and 64.9% versus 35.6%, respectively). The prevalence of women in the overall population with households of ≤ 3 people, who lost a job due to their diagnosis, and who underwent immediate reconstruction was 17.0%, 3.5%, and 10.6%, respectively. The latter value is the product of the immediate reconstruction and mastectomy rates. African American women were slightly more likely than White women to experience delay (43.4% versus 38.4%; $P = 0.24$). None of the other characteristics were significantly associated with delay.

Few women experienced a delay of >60 days (2.6%; data not shown). Race was strongly associated with delays of this length, with African American women being more than three times as likely as White women to experience delay (6.0% versus 1.7%; $P = 0.013$). For most categories, less than 5% of women experienced a delay of >60 days. Women in the following categories were exceptions: underwent immediate reconstruction (12.9%), were unable to see a doctor in the past 10 years due to a lack of transportation (9.3%), completed technical or business school (6.3%), underwent mastectomy (6.1%), had not accepted their illness at all (6.1%), had Medicaid coverage (5.5%), and had a household of 4 people (5.3%).

Race, population characteristics, and breast cancer treatment delay

African American women differed markedly from White women for nearly every demographic and socioeconomic characteristic, measure of healthcare access, and clinical factor (Table 2). The following characteristics were exceptions: working since diagnosis ($P = 0.69$), family history ($P = 0.35$), first course of treatment ($P = 0.46$), and immediate reconstruction ($P = 0.079$). Race was not associated with the measures of emotional and functional well-being: $P = 0.67$ and $P = 0.26$ for the degree of satisfaction with their coping and acceptance of their illness, respectively. Among the characteristics associated with delay, African American women were more than twice as likely as White women to lose a job due to their diagnosis (6.6% versus 2.7%), slightly more likely to have a household of ≤ 3 people, (84.6% versus 82.5%), and less likely to undergo immediate reconstruction (25.2% versus 37.9%).

The stratified data (Table 2) revealed that the determinants of delay are not equivalent for White and African American women. The only determinant common to both groups was immediate reconstruction ($P < 0.01$ for each group). Household size and losing a job due to one's diagnosis were significantly associated with delay among White women ($P = 0.027$ and $P < 0.01$, respectively), while the first course of treatment was significantly associated with delay among African American women ($P < 0.01$).

While race was not associated with delay in the aggregated data, the stratified data revealed racial disparities for women with similar characteristics (e.g. same educational level). African American women were more likely than White women to experience delay for most characteristics. For instance, 55.6% of African American women with stage IIB disease experienced delay versus 36.5% of White women with stage IIB disease. The frequency of delay for African American women exceeded the frequency for White women by >30% for the following categories: detection by a method other than a routine mammogram, clinical breast exam, or self-or spouse-detection (70.0% for African American women versus 33.3% for White women), no insurance coverage (48.9% for African American women versus 15.3% for White women), households of 4 people (53.5% for African American women versus 23.2% for White women), and undergoing immediate reconstruction (92.5% for African American women versus 60.6% for White women).

Losing a job due to one's diagnosis was associated with the highest probability of delay among White women. It was also the only characteristic in which the frequency of delay among White women was >30% higher than for African American women: 87.2% versus 52.6%. Having no insurance coverage was associated with the lowest probability of delay among White women (15.3%). Age ($P = 0.067$) and symptoms ($P = 0.051$) also showed evidence of an association with delay among White women. Women ages 50–64 and without symptoms tended to be more likely to experience delays. Undergoing immediate reconstruction was associated with the highest probability of delay among African American women, while having less than a high school degree was associated with the lowest probability of delay (26.4%). Income ($P = 0.090$) showed evidence of an association with delay among African American women, but there was no clear trend among categories.

Association of selected study population characteristics with delay

In the fully adjusted models, women with 2-person households were more likely than single person households to experience delay (OR, 2.08; 95% CI, 1.19–3.63) (Table 3). The probability of delay decreased with increasing household size for households of ≥2 people. Women who lost a job due to their diagnosis were more likely to experience delay compared to women who did not (OR, 2.19; 95% CI, 1.00–4.81), although the result was not significant ($P = 0.050$). Women who underwent mastectomy with immediate reconstruction

(OR, 6.18; 95% CI, 3.27–11.68) and neoadjuvant therapy (OR, 2.06; 95% CI, 1.16–3.66) were more likely than women who received BCS to experience delay.

Association of race with delay for the study population

Racial disparities in delay were significant among women <50 years old (Table 4). The disparity was largely explained by the low likelihood of delay among younger White women. African American women were more than three times as likely as White women to experience delay among women 20–39 years old (OR, 3.34; 95% CI, 1.07–10.38) and 40–49 years old (OR, 3.40; 95% CI, 1.76–6.54). Among White women, delays were less likely for 20–39 year old and 40–49 year old women (OR, 0.32; 95% CI, 0.13–0.80 and OR, 0.38; 95% CI, 0.20–0.73, respectively) relative to women 50–64 years old. The likelihood of delay for African American women did not differ significantly based on age.

Discussion

This study found that African American women were more likely than White women to experience delay among younger age groups (<50 years), but not among older age groups. This disparity was not evident in the overall population, as we found no association between race and delay in the aggregated data. Household size, losing a job due to one's diagnosis, and immediate reconstruction were associated with delay in the overall population and among White women, respectively. Among African American women, who were a minority in the overall population, immediate reconstruction and first course of treatment were associated with delay. The adjusted models demonstrated that women with 2-person households experienced greater delay than women with other household sizes and women who had mastectomy with immediate reconstruction experienced greater delay than women who received other treatments.

It is unclear why a smaller household size was associated with delay. Further investigation is needed to understand this finding. Increased delay among women who lose a job due to their diagnosis may be related to a loss of employer-based insurance coverage, greater financial constraints, or an unsupportive work environment. We are unaware of any quantitative studies of treatment delay that evaluate employment changes. Losing a job may impact delay only among White women because they are more likely to have private coverage(1, 29, 39, 40). African American women were more likely than White women to lose a job due even though the frequency of working since one's diagnosis was comparable for both racial groups. This result is in agreement with a study that found that African American women were more likely than White women, to stop working (OR, 3.0; 95% CI, 1.3–6.7) or miss work for >1month (OR, 3.0; 95% CI, 1.2–7.4), respectively, compared to missing work for ≤ 1 month(41). African American women are also less likely than White women to be employed 18 months following diagnosis (OR, 0.35; 95% CI, 0.18–0.68)(42).

The additional time necessary for consultation and coordination of the schedules of the plastic surgeon and primary surgeon may explain the increased delay associated with immediate reconstruction. This is not the first study to report increased delay associated with this procedure(19, 43), but most studies on treatment delay do not consider this factor. Immediate reconstruction was the only factor associated with delay for both racial groups. African American women were less likely than White women to undergo immediate reconstruction, but more likely to experience delays if they underwent this procedure. Although not significant, our finding that African American women are less likely to undergo immediate reconstruction has been observed in several studies(44–46). First course of treatment was associated with delay only among African American women and was not explained by differences in the types of treatment received. African American and White women may differ in this determinant because they receive care at different types of

healthcare facilities as a result of insurance status and income(16, 47, 48), residential segregation(49, 50), and urban/rural residence(48). Healthcare facility characteristics are known to affect treatment delay(15, 17). Immediate reconstruction rates also vary based on the healthcare facility (51).

It is challenging to compare the frequency of treatment delay across studies due to variations in study design, recruitment criteria, and study population characteristics. The start point of the treatment delay period has been defined in various ways, including the date of first clinical confirmation (15, 23), a suspicious finding (15), and pathological diagnosis (7). Eligibility restrictions based on disease stage (15, 21, 43) and type of treatment received (e.g. one type (16, 43, 52) versus all types (14, 47)) also limit comparability. Recruitment of women from a specific healthcare facility or set of facilities (e.g. single versus multiple, public/public safety net versus private)(16, 23, 53) and a specific program(22, 52) may lead to marked differences in population characteristics. The frequency of delay (>30 days) reported in the literature (7–9, 14–18, 52) ranges from 21.8% (7) to 68.9% (16). Our result (39.4%) is similar to the results from two different national studies (15, 17) that obtained values of 34.9% and 42.6%, respectively.

The frequency of delay reported in the literature for African American and White women (7–9, 14, 16–18) ranges from 18.7% (14) to 70.8% (16) and 4.7% (14) to 56.1% (16), respectively. Our results (43.3% and 38.4% for African American and White women, respectively) are fairly similar to those from a national study that reported values of 53.0% and 40.4%, respectively (17). Delays of >60 days were uncommon in this population, but are more frequent in studies focusing on women who are uninsured, have Medicaid coverage, or have low incomes(23, 54). Our finding that African American women are more likely to experience a delay of >60 days is consistent with other studies(17, 18). Since the determinants of delay identified in bivariate analysis are highly dependent on the predominant study population characteristics, this may explain the conflicting literature on racial disparities in treatment delay. Studies that do not report an association between race and delay tend to restrict the study population based on socioeconomic characteristics, disease stage, or the healthcare facility at which they receive care(21–23, 52). Differences in the determinants of treatment delay and racial disparities in delay are likely diminished for more homogeneous populations.

The findings of this study suggest the need to focus on well-defined populations when using treatment delay to make comparisons between groups, monitor changes over time, or assess quality of care. Interpreting this measure is not straightforward since it is affected by many factors, including disease stage (15), education (14), poverty index (14), urban/rural residence (9), marital status (14, 16), comorbidities (14, 15, 17), signs/symptoms at presentation (55), mammography history (14), hospital type(15–17, 47), whether diagnosis and treatment occur at the same or different hospitals (15), and year of diagnosis(15, 17). Treatment delay has been used to evaluate the quality of the NBCCEDP and the impact of policy changes(56). Although 94% of women meet their target of initiating treatment ≤60 days after diagnosis, racial disparities exist and could be related to programmatic differences and geographic distinctions among other factors(7, 56). Therefore, interpreting and addressing this disparity is challenging even though participants share many characteristics and follow similar treatment guidelines.

Our findings also suggest that developing effective interventions for treatment delay require studies targeting specific populations. The impact of treatment delay on survival has been investigated in highly selected populations, including women in a program targeting underserved populations (22), with Medicaid coverage(54), with triple negative breast cancer(57), receiving care at two hospitals served by the same providers following identical

clinical protocols (47), and with metastatic disease (21). The results may not be generalizable, but these studies are helpful for identifying specific populations who may experience negative outcomes and the clinically relevant delay period. For instance, a study of Medicaid recipients in North Carolina found that a treatment delay of ≥60 days was associated with higher breast cancer–specific mortality among women with late stage disease (hazard ratio, 1.85; 95% CI, 1.04–3.27), but not among women with early stage disease(54). Characterizing and addressing the determinants of delay for this specific subgroup of Medicaid recipients could have a major public health impact.

One study limitation is that baseline interviews are conducted 5 months after diagnosis. Treatments subsequent to the first course of treatment may affect responses, and some factors may have changed during this interval. Recall bias may also influence the results. Detailed household composition information (e.g. number of children, wage earners) was not collected, which limits our ability to interpret findings for this determinant. We could not calculate poverty indices based on household size and income because we only collect information on income categories.

Several factors known to impact timeliness of care were not captured in our study. We did not have information on the healthcare facility where the women received care (e.g. urban/rural location, type). A greater number of comorbidities is associated with increased treatment delay (14, 15, 17) and African American race(14, 17), but was not assessed in our analysis. Finally, we did not collect information from participants about their interaction with providers. African American women are less trusting of their cancer treatment team(58). Providers also communicate differently with African American and White patients(59).

In conclusion, we found that the determinants of treatment delay vary by race, a finding that may help explain the conflicting literature on racial disparities. Further investigation is needed to determine the clinical relevance of the determinants we identified. Younger African American women may need additional support to ensure timely care comparable to White women. Our findings support targeting specific populations when identifying and addressing determinants of treatment delay.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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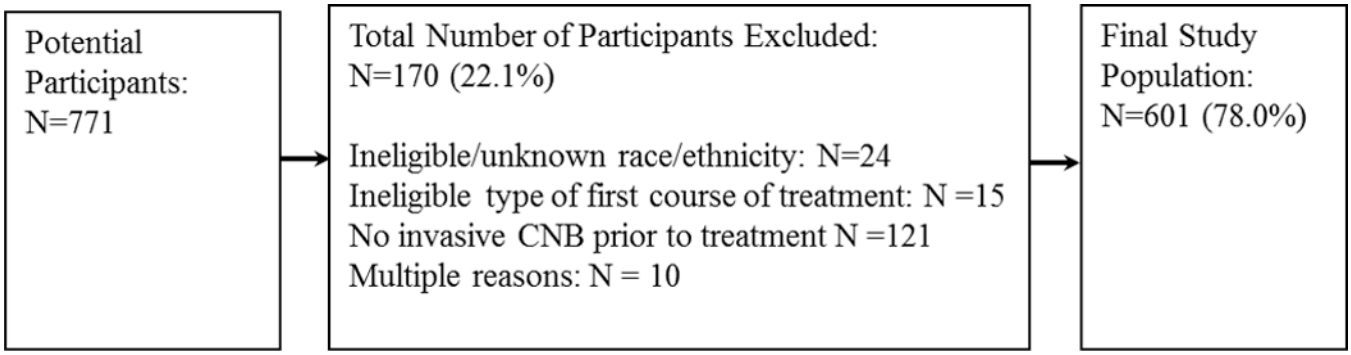

Figure 1.
Study inclusion criteria
CNB: core needle biopsy

Table 1

Population characteristics and breast cancer treatment delay

				Treatment Delay > 30 days		
	N[a]	%[b]	Mean Treatment Delay (SE) [days]	N	%[b]	P[c]
All	601	100.0	28.0 (0.7)	240	39.5	
Race						
White	314	79.0	27.3 (0.9)	112	38.4	0.24
African American	287	21.0	30.4 (1.0)	128	43.4	
Age at diagnosis (years)						
20–39	69	6.9	26.9 (1.4)	27	36.5	0.22
40–49	221	21.3	27.0 (1.0)	86	34.2	
50–64	214	46.8	29.3 (1.2)	91	44.3	
65–74	97	25.1	26.6 (1.5)	36	35.7	
Education						
0–12 years, no high school degree	65	10.1	27.9 (2.3)	21	40.4	0.23
High school graduate/GED	119	19.9	28.1 (1.6)	55	43.8	
Technical or business school	59	10.7	28.3 (2.4)	24	42.5	
Some college	125	20.3	24.5 (1.5)	42	27.8	
College degree or higher	233	39.0	29.6 (1.1)	98	42.2	
Income ($)						
≤20,000	124	20.1	28.6 (1.5)	50	39.0	0.45
20,000 – 30,000	67	8.6	32.9 (2.0)	38	54.6	
30,000 – 50,000	98	19.0	27.8 (1.8)	38	37.2	
50,000 – 100,000	162	29.2	28.0 (1.5)	62	39.6	
>100,000	109	23.1	26.8 (1.6)	40	36.0	
Marital status						
Married	336	59.3	27.8 (0.9)	135	41.0	0.72
Formerly married	191	33.1	28.1 (1.3)	76	36.9	
Never married	74	7.6	28.9 (2.2)	29	38.8	
Household size						

				Treatment Delay > 30 days		
	N[a]	%[b]	Mean Treatment Delay (SE) [days]	N	%[b]	P[c]
1	151	28.0	27.4 (1.5)	51	35.2	0.011
2	212	42.6	29.3 (1.1)	102	47.3	
3	103	12.4	28.6 (1.8)	45	40.7	
4	84	10.4	25.6 (1.9)	29	28.5	
>4	50	6.6	24.1 (1.8)	13	22.7	
Working since diagnosis						
No	303	54.0	26.4 (1.0)	110	36.6	0.24
Yes	295	46.0	29.7 (1.1)	129	42.5	
Lost job due to diagnosis						
No	568	96.5	27.5 (0.7)	221	37.8	<0.01
Yes	29	3.5	38.1 (3.3)	17	73.6	
Current insurance						
Private	404	69.2	28.3 (0.9)	165	41.3	0.31
Medicare	88	19.9	26.0 (1.6)	30	34.3	
Medicaid	66	6.0	29.6 (2.7)	29	45.7	
None	38	4.9	28.1 (2.0)	14	26.5	
Unable to see a doctor because of finances (in past 10 years)						
No	475	83.9	27.6 (0.8)	184	39.0	0.67
Yes	126	16.1	29.7 (1.6)	56	41.7	
Unable to see a doctor because of lack of transportation (in past 10 years)						
No	568	97.1	27.9 (0.7)	226	39.4	0.82
Yes	33	2.9	30.0 (3.4)	14	41.6	
Family history						
None	345	56.3	28.6 (1.0)	137	40.6	0.90
First-degree	81	14.0	26.2 (1.7)	33	40.1	
Second-degree	132	21.6	28.1 (1.5)	53	38.3	
Both	43	8.1	26.4 (2.4)	17	33.8	
Method of detection						

				Treatment Delay > 30 days		
	N[a]	%[b]	Mean Treatment Delay (SE) [days]	N	%[b]	p[c]
Routine mammogram	260	52.6	29.3 (1.1)	111	44.0	0.27
Clinical breast exam	33	5.5	24.2 (3.0)	11	31.5	
Self-or spouse-detected	293	40.1	26.5 (0.9)	110	34.7	
Other	12	1.9	32.3 (6.1)	6	40.5	
Symptoms						
No	384	68.5	28.9 (0.9)	163	42.5	0.064
Yes	217	31.5	26.0 (1.2)	77	32.9	
AJCC disease stage						
I	245	47.4	27.6 (1.1)	94	39.5	0.60
IIA	160	26.3	28.9 (1.5)	67	42.2	
IIB	94	13.1	28.6 (1.6)	47	41.9	
III/IV	101	13.1	26.8 (1.7)	32	31.7	
First treatment						
Breast conserving surgery	312	55.2	26.3 (1.0)	104	35.6	0.16
Mastectomy	180	30.0	30.8 (1.4)	89	46.0	
Neoadjuvant therapy	109	14.8	28.3 (1.6)	47	40.7	
Immediate reconstruction[d]						
No	112	64.6	26.0 (1.5)	43	35.6	<0.01
Yes	68	35.4	39.4 (2.1)	46	64.9	
I am satisfied with how I am coping						
Quite a bit/very much	423	71.1	27.6 (0.8)	166	38.0	0.50
Somewhat/ a little bit	153	24.3	28.4 (1.5)	63	41.9	
Not at all	23	4.6	31.1 (3.7)	11	51.0	
I have accepted my illness						
Quite a bit/very much	471	80.1	28.0 (0.8)	193	39.6	0.75
Somewhat/ a little bit	118	18.4	27.9 (1.8)	41	37.9	
Not at all	11	1.5	26.3 (5.7)	6	53.4	

SE: standard error; AJCC: American Joint Committee on Cancer

[a]Category totals may not sum to 601 (study population total) due to missing values

[b] Percentages represent overall population estimates calculated using weighted frequency data

[c] p value from χ^2 test

[d] Percentages were calculated based on women who underwent mastectomy as their first course of treatment

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Table 2

Race, population characteristics, and breast cancer treatment delay

						Treatment Delay >30 days			
	White		African American			White		African American	
	N	%[a]	N	%[a]	p[b]	N	%[a]	N	%[a]
Age at diagnosis (years)									
20–39	39	6.7	30	7.8	<0.01	13	33.3	14	46.7
40–49	114	19.6	107	27.6		32	28.1	54	50.5
50–64	101	46.3	113	48.7		46	45.5	45	39.8
65–74	60	27.5	37	15.9		21	35.0	15	40.5
Education									
0–12 years, but no high school degree	23	8.8	42	15.0	<0.01	9	46.8	12	26.4
High school graduate/GED	51	18.5	68	25.0		22	42.1	33	48.6
Technical or business school	27	10.4	32	12.1		11	43.1	13	40.7
Some college	60	20.0	65	21.4		12	23.1	30	44.2
College degree or higher	153	42.3	80	26.5		58	41.1	40	48.7
Income ($)									
≤20,000	41	16.9	83	31.7	<0.01	16	38.4	34	40.2
20,000 – 30,000	17	5.7	50	19.2		8	48.4	30	61.5
30,000 – 50,000	52	19.6	46	16.8		17	35.7	21	43.4
50,000 – 100,000	94	30.4	68	24.4		34	39.8	28	38.6
>100,000	87	27.2	22	7.8		28	34.6	12	54.8
Marital status									
Married	212	63.6	124	43.2	<0.01	77	40.1	58	45.4
Formerly married	82	31.3	109	39.9		29	35.2	47	42.1
Never married	20	5.2	54	16.9		6	36.7	23	41.3
Household size									
1	71	27.4	80	30.1	0.046	23	35.4*	28	34.9
2	114	44.3	98	36.3		52	46.8*	50	49.8
3	43	10.8	60	18.1		16	38.6*	29	45.2

						Treatment Delay >30 days			
	White		African American			White		African American	
	N	%[a]	N	%[a]	P[b]	N	%[a]	N	%[a]
4	55	10.9	29	8.7		13	23.2*	16	53.5
>4	30	6.6	20	6.7		8	20.9*	5	29.5
Working since diagnosis									
No	151	53.7	152	55.3	0.69	48	35.8	62	39.5
Yes	162	46.3	133	44.7		63	40.8	66	48.9
Lost job due to diagnosis									
No	303	97.3	265	93.4	0.032	103	36.5*	118	43.1
Yes	9	2.7	20	6.6		7	87.2*	10	52.6
Current insurance									
Private	238	72.3	166	57.5	<0.01	89	40.6	76	44.4
Medicare	47	20.6	41	17.1		15	33.7	15	37.1
Medicaid	12	3.0	54	17.6		5	49.0	24	43.6
None	14	4.2	24	7.8		2	15.3	12	48.9
Unable to see a doctor because of finances (in past 10 years)									
No	272	87.3	203	70.9	<0.01	98	38.6	86	41.1
Yes	42	12.7	84	29.1		14	37.1	42	49.1
Unable to see a doctor because of lack of transportation (in past 10 years)									
No	311	99.2	257	89.1473	<0.01	110	38.4	116	43.7
Yes	3	0.8	30	10.8527		2	42.9	12	41.3
Family history									
None	170	55.0	175	61.2	0.35	62	40.2	75	41.8
First-degree	44	14.1	37	13.5		17	40.9	16	36.9
Second-degree	72	22.1	60	19.8		24	35.5	29	50.0
Both	28	8.8	15	5.4		9	30.5	8	54.0
Method of detection									
Routine mammogram	154	55.6	106	41.0	<0.01	64	44.2	47	43.0
Clinical breast exam	17	5.5	16	5.2		4	28.1	7	45.0

						Treatment Delay >30 days			
	White		African American			White		African American	
	N	%[a]	N	%[a]	P[b]	N	%[a]	N	%[a]
Self-or spouse-detected	136	37.0	157	52.0		42	32.0	68	41.7
Other	6	1.9	6	1.7		2	33.3	4	70.0
Symptoms									
No	214	70.5	170	60.8	0.018	85	42.2	78	43.6
Yes	100	29.5	117	39.2		27	29.3	50	43.1
AJCC disease stage									
I	144	50.3	101	36.8	<0.01	52	39.5	42	39.8
IIA	83	26.3	77	26.4		34	42.9	33	39.4
IIB	41	11.9	53	17.7		17	36.5	30	55.6
III/IV	45	11.5	56	19.1		9	26.0	23	44.6
First treatment									
Breast conserving surgery	158	55.2	154	55.1	0.46	51	36.1	53	33.6*
Mastectomy	102	30.7	78	27.4		42	43.1	47	58.2*
Neoadjuvant therapy	54	14.1	55	17.5		19	37.2	28	51.2*
Immediate reconstruction[c]									
No	56	62.1	56	74.8	0.079	16	32.4*	27	46.6*
Yes	46	37.9	22	25.2		26	60.6*	20	92.5*
I am satisfied with how I am coping									
Quite a bit/very much	226	71.4	197	69.9	0.66	78	36.4	88	44.2
Somewhat/ a little bit	75	23.8	78	26.4		28	41.9	35	41.8
Not at all	13	4.8	10	3.6		6	51.2	5	50.0
I have accepted my illness									
Quite a bit/very much	250	80.7	221	77.8	0.26	90	37.9	103	46.2
Somewhat/ a little bit	61	18.2	57	19.3		20	39.3	21	32.7
Not at all	3	1.1	8	2.9		2	57.9	4	47.1

AJCC: American Joint Committee on Cancer

[a]Percentages represent overall population estimates calculated using weighted frequency data

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[b] P-value from χ^2 test

[c] Percentages were calculated based on women who underwent mastectomy as their first course of treatment

[*] P value from χ^2 test <0.05 for the association of the characteristic with delay

Table 3

Association of selected characteristics with treatment delays of >30 days in the study population

	Odds Ratio (95% CI)	
Characteristic	**Crude Model**	**Fully Adjusted Model**
Household size		
1	1.00 (ref)	1.00 (ref)
2	1.89 (1.22–2.94) *	2.08(1.19–3.63) *
3	1.48 (0.85–2.58)	1.61(0.86–3.02)
4	1.18 (0.64–2.20)	1.30(0.64–2.68)
>4	0.79 (0.37–1.66)	0.87(0.38–2.01)
Lost job due to diagnosis		
No	1.00 (ref)	1.00 (ref)
Yes	2.04 (0.94–4.42)	2.19(1.00–4.81)
First treatment/reconstruction		
Breast conserving surgery	1.00 (ref)	1.00 (ref)
Mastectomy without reconstruction	1.30 (0.82–2.05)	1.45 (0.84–2.50)
Mastectomy with reconstruction	5.82 (3.16–10.73) *	6.18 (3.27–11.68) *
Neoadjuvant therapy	1.68 (1.05–2.71) **	2.06 (1.16–3.66) **

CI: confidence interval; **Crude Model**: adjusted for race, age, race x age; **Fully Adjusted models**: Household size additionally adjusted for marital status; Lost job due to diagnosis additionally adjusted for education; First treatment/reconstruction additionally adjusted for income, insurance, education, disease stage

* $P < 0.01$

** $P < 0.05$

Table 4

Association of race with treatment delays of >30 days in the study population

	Odds Ratio (95% CI)			
Race, Age range	**Crude Model**	**Model 1**	**Model 2**	**Fully Adjusted Model**
White, 20–39	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
African American, 20–39	1.75 (0.66–4.66)	1.52 (0.55–4.15)	1.91 (0.68–5.37)	3.34(1.07–10.38) **
White, 40–49	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
African American, 40–49	2.61 (1.50–4.56) *	2.45 (1.37–4.39) *	2.56 (1.42–4.64) *	3.40(1.76–6.54) *
White, 50–64	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
African American, 50–64	0.79 (0.46–1.36)	0.84 (0.47–1.52)	0.84 (0.46–1.52)	0.95 (0.51–1.77)
White, 65–74	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
African American, 65–74	1.27 (0.54–2.94)	1.38 (0.54–3.53)	1.34 (0.51–3.51)	1.45 (0.54–3.91)
White, 20–39	0.60 (0.28–1.29)	0.64 (0.29–1.42)	0.57 (0.25–1.30)	0.32(0.13–0.80) **
White, 40–49	0.47 (0.26–0.82) *	0.52 (0.29–0.93) **	0.49 (0.27–0.89) **	0.38(0.20–0.73) *
White, 50–64	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
White, 65–74	0.64 (0.33–1.24)	0.81 (0.37–1.78)	0.77 (0.34–1.75)	0.87(0.38–2.02)
African American, 20–39	1.32 (0.59–2.97)	1.15 (0.50–2.67)	1.30 (0.55–3.08)	1.12(0.44–2.86)
African American, 40–49	1.54 (0.90–2.63)	1.49 (0.85–2.62)	1.48 (0.84–2.63)	1.37(0.75–2.48)
African American, 50–64	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
African American, 65–74	1.03 (0.48–2.20)	1.32 (0.54–3.20)	1.23 (0.50–3.03)	1.33(0.52–3.40)

CI: confidence interval; **Crude Model**: adjusted for age, race x age; **Model 1**: adjusted for age, race x age, income, insurance; **Model 2**: adjusted for Model 1 variables, education, lost job; **Fully Adjusted Model**: adjusted for Model 2 variables, marital status, disease stage, symptoms, first treatment/reconstruction

* $P < 0.01$

** $P < 0.05$