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## Racial and ethnic differences in health status and health behavior among breast cancer survivors—Behavioral Risk Factor Surveillance System, 2009

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### Abstract

**Purpose**—Differences in health status and behavioral risk factors may explain racial/ethnic breast cancer disparities. We examined racial/ethnic differences in health status and behaviors among female breast cancer survivors compared to females without breast cancer.

**Methods**—Using cross-sectional data from the 2009 Behavioral Risk Factor Surveillance System, a national state-based, random sample telephone survey, we explored differences in self-rated health, obesity and selected behaviors (physical activity, smoking, alcohol use, fruit, and vegetable consumption) among females aged 18 years and older, who reported a previous breast

cancer diagnosis (survivors,  $n=10,035$ ) and those who reported no breast cancer history ( $n=234,375$ ) by race/ethnicity. Adjusted prevalences of health status and behaviors, accounting for sociodemographics, comorbidities and health care access, were estimated by race/ethnicity.

**Results**—Compared to all other racial/ethnic groups, more white females reported heavy alcohol consumption and more black females reported obesity regardless of their breast cancer status. Among breast cancer survivors, more whites (33.7 %) were former smokers compared to blacks (24.5 %), “others” (20.5 %), and Hispanics (16.2 %) ( $p=0.001$ ). Racial/ethnic differences in obesity also varied by reported time since diagnosis ( $p$  value=0.018). Among long-term survivors (diagnosed 5 years before interview), more black survivors (34.8 %) reported obesity compared to white survivors (23.0 %). Also, among “other” race survivors, long-term survivors (22.0 %) reported more obesity than survivors diagnosed less than 5 years before interview (7.8 %).

**Conclusions**—These findings suggest opportunities to increase health behaviors and reduce racial disparities among breast cancer survivors.

**Implications for Cancer Survivors**—Engaging in healthy behaviors can play a significant role in enhancing health outcomes and quality of life of breast cancer survivors. More research is needed to better understand racial differences in obesity, smoking and alcohol consumption in order to develop effective, culturally appropriate interventions to promote a healthy lifestyle after a breast cancer diagnosis.

### Keywords

Breast cancer; Health behaviors; Health status; Disparity; Race/ethnicity

### Introduction

As of 2007, nearly 2.6 million individuals were living with a previous diagnosis of breast cancer [1]. Because of advances in early detection and treatment of breast cancer, most women can expect to live many years after a breast cancer diagnosis [2]; approximately 90 % of breast cancer survivors are alive 5 years post-diagnosis [3]. However, breast cancer survivors remain at an increased risk for recurrence, second primary cancers and late effects of treatment, which may have a significant adverse impact on their physical health and quality of life [2]. Healthy behaviors (e.g., physical activity, avoiding alcohol) and maintaining a healthy weight may play significant roles in decreasing the risk for recurrence, mitigating negative impacts of cancer and its treatment for breast cancer survivors [4-10]. In addition, a trial found that physically active breast cancer survivors with high vegetable–fruit intake had an approximate 50 % reduction in risk of mortality [11]. A healthy lifestyle is also important for preventing and/or managing comorbid chronic diseases, such as heart disease or diabetes [12], which are associated with low quality of life and poor survival among breast cancer survivors [13, 14].

Population-based studies of the prevalence of behavioral risk factors in the US (e.g., smoking, physical activity, diet, body mass index, alcohol use, sun protection behaviors) reveal few differences between cancer survivors and non-cancer controls [15, 16]. It is unclear whether this holds true among breast cancer survivors. Previous studies have shown that many breast cancer survivors have physical activity levels below recommendations and

low fruit and vegetable consumption [17-19]. Furthermore, after a breast cancer diagnosis, many women reduce their levels of physical activity [18] and experience increased weight and percent body fat [20]. Significant racial and ethnic disparities in diet and physical activity have also been documented among breast cancer survivors [17, 21, 22]. Nevertheless, none of these studies compared breast cancer survivors to non-cancer controls. Further, there are no national prevalence estimates of these risk factors among breast cancer survivors by race/ethnicity, despite evidence of racial and ethnic disparities in early detection, treatment, survival, and quality of life [23, 24]. Differences in health status and health behaviors may explain some of these racial and ethnic disparities.

To address these gaps in the literature, we used data from the Behavioral Risk Factor Surveillance System (BRFSS) to identify racial and ethnic differences in health status and health behavior among female breast cancer survivors. To our knowledge, no population-based studies have specifically focused on these differences among female breast cancer survivors—a group that represents the largest segment of the survivor population. Identifying differences in these factors will help to focus, tailor and prioritize public health interventions for the health and well-being of female breast cancer survivors.

## Methods

### Data Source

The BRFSS is a nationally representative state-based surveillance system that collects data annually using random-digit-dial telephone interview health surveys of non-institutionalized adults, age 18 years and older to monitor health status and risk behaviors in the USA [25]. The data are collected by public health departments in all 50 states, the District of Columbia, and selected US territories (Guam, Puerto Rico, and the U.S. Virgin Islands). In 2009, the overall median response rate was 35 %.

The 2009 BRFSS asked questions on cancer survivorship for the first time [26]. Respondents were asked, “Have you ever been told by a doctor, nurse, or other health professional that you had cancer?”, and those who answered “yes” were then asked, “What type of cancer was it?” Options included a list of cancer sites. Respondents were able to choose more than one response. If respondents indicated more than 1, they were asked “With your most recent diagnosis of cancer, what type of cancer was it?” Female respondents who answered breast as their most recent diagnosis of cancer were classified as breast cancer survivors. All female respondents who either answered no to the question “Have you ever been told by a doctor, nurse, or other health professional that you had cancer?” or indicated they were diagnosed with a cancer site other than breast were identified as females without a history of breast cancer. Any respondents from US territories or with unknown race or ethnicity were excluded from this study. Because BRFSS data are de-identified and publically available, this study protocol was exempt from the Centers for Disease Control and Prevention Institutional Review Board.

## Study Population

The study population included 244,420 females; 10,035 (4.1 %) reported that they had a previous breast cancer diagnosis and 234,385 (95.9 %) reported that they did not. Of breast cancer survivors, 87.9 % were non-Hispanic white (hereafter white), 6.3 % were non-Hispanic black (hereafter black), 3 % were non-Hispanic other race (includes Asian, Native Hawaiian, other Pacific Islander, American Indian, Alaska Native or other; hereafter “other” race), and 2.8 % were Hispanic.

## Measures

**Sociodemographic and Clinical Characteristics**—Sociodemographic and clinical characteristics were selected based on previous studies which indicate that these variables are related to health behaviors and health status [27, 28]. Sociodemographic characteristics were age at the time of the interview and at diagnosis (categorized as 18–39, 40–64, 65–84, or 85+), marital status (married/in a relationship, divorced/widowed/separated, or never married), education (<high school, high school graduate/general education development test (GED), >high school), income (<\$15,000; \$15,000–<\$35,000; \$35,000–<\$50,000; \$50,000–<\$75,000; or \$75,000), employment (employed, unemployed, homemaker/student, retired, or unable to work), and residing in a metropolitan area (center city of a metropolitan statistical area (MSA), outside center city of an MSA but inside the county containing center city, inside a suburban county of MSA, in an MSA that has no center city, not in MSA).

Clinical characteristics included presence of specific comorbid conditions (arthritis, asthma, cardiovascular disease, diabetes, hypertension, none), mean number of comorbidities, and years since diagnosis (0–<5; 5–<10; 10–<15; 15–<20; 20–<25; 25). We also assessed indicators of health care access such as whether they had current health insurance coverage, a usual healthcare provider or were unable to see a doctor due to costs.

**Health Behaviors**—The following health behaviors were assessed in this study: five servings per day of fruits and vegetables, meeting the U.S. Department of Health and Human Services and American College of Sports Medicine physical activity recommendation of 150 min of moderate or vigorous physical activity per week [29, 30], heavy alcohol consumption (having more than one drink per day for women), and smoking status (current or former smoker). Current smokers were defined as respondents who smoked at least 100 cigarettes in their lifetime and now smoke some days or every day. Former smokers include respondents who smoked at least 100 cigarettes in their lifetime but currently do not smoke.

**Health Status and Obesity**—Health status was indicated by self-rated health, which was based on responses to the question, “Would you say that in general your health is excellent, very good, good, fair, or poor?” These responses were dichotomized as “fair” or “poor” versus all other categories (excellent, very good, and good). Obesity was based on self-reported height and weight and dichotomized as body mass index greater than and less than or equal to 30 kg/m<sup>2</sup>.

## Data Analysis

To account for the complex sampling design, all data were weighted and analyzed using SAS-callable SUDAAN version 9.2 (SAS Institute, Cary, North Carolina). Responses were weighted to reflect the probability of respondent selection with post-stratification adjustments for non-response and non-coverage, thus allowing national estimates of the prevalence of health behaviors and outcomes. Sociodemographic and clinical characteristics were stratified by racial/ethnic group and summarized. Differences within the racial/ethnic groups were assessed using the Pearson chi-square statistic (dichotomous) or ANOVA (continuous). *P* values less than or equal to 0.05 were deemed to be statistically significant. Multivariable logistic regression was used to assess the association between race/ethnicity and health status/behavior by breast cancer status, after adjusting for sociodemographics, comorbidities and health care access. In order to produce standardized estimates of each outcome, regression analysis results are presented as predicted marginals (percentages) with corresponding 95 % confidence intervals (95 % CI). Although covariates were sequentially added to the model to determine their effects on the predicted marginals, for most outcomes, there was less than a 15 % difference observed between the unadjusted, partially adjusted, and fully adjusted model; therefore, only the fully adjusted models are presented in the tables. Previous literature suggests that there may be some variation in health behavior and health status by time since diagnosis [31, 32]. Therefore, for each health status and health behavior outcome, an interaction term was used to test for differences in race/ethnicity and years since diagnosis for breast cancer survivors (less than 5 years since diagnosis, greater than or equal to 5 years since diagnosis). Obesity was the only variable for which there were differences in time since diagnosis by race/ethnicity ( $p=0.018$ ) among breast cancer survivors; therefore these results are also presented separately.

## Results

Breast cancer survivors were older (median age, 68 years, range 24–99 years) than females without a history of breast cancer (median age, 55 years, range 18–99 years) at the time of interview. However, the median age at diagnosis for breast cancer survivors was 56 years. Statistically significant differences were observed for most demographic characteristics and health care access indicators by race/ethnicity for breast cancer survivors and females without a history of breast cancer (Table 1).

At the time of interview, the median ages of Hispanic (62.7 years), “other” race (63.8) and black (64.2) female breast cancer survivors were younger than white (68.0) survivors; a smaller proportion of black females were married or in a relationship; and white and “other” race respondents were more likely to have more than a high school education. Compared to all other racial/ethnic groups, Hispanics were more likely to report unemployment (11.1 %) and “other” races were more likely to report being employed (39.3 %). Black and Hispanic breast cancer survivors were more likely to reside in the center city of a metropolitan statistical area (61.1 and 54.4 %, respectively). Fewer Hispanics had their last checkup less than a year prior to interview (75.5 %) (Table 1).

Similar racial and ethnic differences were observed among females without a history of breast cancer, except Hispanics were less likely to have health insurance coverage (67.1 %) or a usual healthcare provider (69.2 %) (Table 1) compared to all other racial/ethnic groups.

### **Comorbidities**

There were large racial and ethnic differences in comorbidities among breast cancer survivors (Table 2). Blacks were more likely than all other racial/ethnic groups to have hypertension (71.1 %), diabetes (30.1 %), or asthma (20.5 %); and also had the highest mean number of comorbidities (1.8). For every racial/ethnic group, a larger proportion of breast cancer survivors reported a previous diagnosis of arthritis, cardiovascular disease, hypertension and diabetes than females without breast cancer. In fact, the magnitude was much greater for hypertension among blacks (71.1 % of survivors versus 39.9 % of females with a history of breast cancer). Overall, breast cancer survivors had a higher mean number of comorbidities than females without a history of breast cancer.

### **Self-rated health**

Table 3 shows that among breast cancer survivors, there were no statistically significant racial/ethnic differences in fair/poor self-rated health status ( $p=0.249$ ) after adjusting for sociodemographic characteristics, comorbid conditions and health care access. However, for every racial/ethnic group, a larger proportion of breast cancer survivors reported fair/poor health compared to females without a breast cancer history.

### **Heavy alcohol consumption**

After adjusting for covariates, more white breast cancer survivors reported heavy alcohol drinking (4.3 %) than black (0.9 %), Hispanic (1.0 %) and “other” race (1.6 %) survivors ( $p<0.001$ ) (Table 3). Similar results were observed among females without breast cancer, although within each race/ethnicity a higher proportion was heavy alcohol drinkers compared to survivors.

### **Smoking Status**

Although there were no statistically significant racial/ethnic differences among breast cancer survivors in the adjusted prevalence of being a current smoker, a greater proportion of white females without a previous breast cancer diagnosis (19.1 %) were current smokers compared to “other” (14.3 %), black (13.5 %) and Hispanic (7.4 %) females (Table 3). Furthermore, more white (33.7 %) breast cancer survivors were former smokers compared to black (24.5 %), “other” (20.5 %), and Hispanic (16.2 %) survivors ( $p<0.001$ ). Within each racial/ethnic group, more breast cancer survivors reported being former smokers compared to females without a previous breast cancer diagnosis; this difference was greatest among whites (33.7 versus 23.7 %, respectively).

### **Consumption of 5 or more servings of fruits and vegetables**

Among breast cancer survivors, there were no racial/ethnic differences in receiving more than five servings of fruits and vegetables per day ( $p=0.955$ ) after adjusting for covariates (Table 3). However, among women without previous diagnosis of breast cancer, a higher

proportion of “other” women (32.3 %) reported consuming this amount compared to Hispanic (28.8 %), white (27.8 %) and black (26.7 %) women.

### **Meet physical activity recommendations**

There were no racial/ethnic differences in the percentage of breast cancer survivors meeting physical activity recommendations after adjusting for covariates ( $p=0.334$ ) (Table 3). Among women without a previous diagnosis of breast cancer, more white women (49.5 %) met the physical activity recommendations. Within each racial/ethnic group, more breast cancer survivors met the recommendation compared to women without a previous diagnosis of breast cancer.

### **Obesity**

Among breast cancer survivors, there were significant differences in obesity by race/ethnicity after adjusting for covariates ( $p=0.007$ ) (Table 3). Relative to the other racial/ethnic groups, blacks had the highest percentage of obese breast cancer survivors (32.3 %). Similarly, among females without breast cancer, a larger proportion of blacks were obese (38.1 %). The difference in obesity between breast survivors and females without breast cancer was greatest among blacks (38.1 % versus 32.3 %).

### **Obesity in long-term versus short-term survivors**

Racial/ethnic differences in obesity varied by reported time since diagnosis ( $p=0.018$ ). Among long-term survivors (diagnosed five or more years before interview), more black survivors (34.8 %) reported obesity compared to Hispanic (27 %), white (23.0 %), and “other” race survivors (22 %) (Table 4). Among recently diagnosed (diagnosed less than 5 years before interview) breast cancer survivors, fewer “other” race respondents reported obesity (7.8 %) than whites (26.2 %), blacks (26.8 %) and Hispanics (28.5 %). More long-term black (34.8 %) and “other” race (22 %) breast cancer survivors reported obesity than recently diagnosed black (26.8 %) and “other” race (7.8 %) survivors, respectively.

### **Discussion**

In this study, significant racial/ethnic differences in health behaviors and health status were identified among females with a history of breast cancer. Specifically, these differences were observed for obesity, heavy alcohol consumption and smoking. Black long-term breast cancer survivors (diagnosed five or more years before interview) were more likely than any other racial/ethnic group to be obese. Furthermore, more black and “other” race long-term survivors were obese compared to survivors diagnosed less than 5 years before interview. Finally, regardless of whether they had a previous breast cancer diagnosis, white females were more likely to heavily consume alcohol and be former smokers than any other racial/ethnic group. These findings may better inform our understanding of breast cancer disparities, especially for black breast cancer survivors who often experience lower quality of life [33] and poorer survival despite having a lower incidence of disease compared to white women [24].

Racial and ethnic differences in health behaviors and health status among cancer survivors have been documented previously [34]. However, to our knowledge, this is the first population-based study to examine racial/ethnic differences across a broad range of health behaviors and health status among female breast cancer survivors. Our findings are consistent with some results from a population-based study that examined racial/ethnic differences among long-term cancer survivors. Similar to our results, Schootman et al. found fewer black survivors reported heavy alcohol consumption and more black survivors reported a height and weight consistent with being overweight or obese compared to white breast cancer survivors [34]. However, their study found racial/ethnic differences in self-rated health and physical activity, whereas ours did not. These discrepancies in findings are likely due to differences between their study population and ours.

Health behaviors, such as engaging in physical activity, maintaining a healthy weight, not consuming large amounts of alcohol and abstaining from smoking, can aid in reducing the risk for cancer recurrence, secondary primary cancers, and may lead to improved physical health, health status and quality of life [4, 5, 7]. Despite the racial and ethnic differences observed, overall, breast cancer survivors were more likely than females without breast cancer to report positive health behaviors such as not currently smoking, less heavy alcohol consumption, more physical activity and eating five or more servings of fruits and vegetables per day. These findings are encouraging; although, it is unclear how much of the findings are due to a “healthy survivors” bias, whereby the healthiest females are more likely to live after a diagnosis of breast cancer. Furthermore, healthier survivors may be more likely to participate in the telephone survey, while survivors who are less healthy may be unwilling or unable to be interviewed. Therefore, our sample may be more representative of healthy survivors.

Healthy behaviors are also important in preventing or attenuating the effect of many other chronic diseases [35]. In this study, blacks, regardless of having a history of breast cancer, were more likely to report the presence of comorbidities, most commonly hypertension and diabetes, and had the greatest mean number of comorbidities overall. The high prevalence of obesity coupled with the large number of comorbidities among blacks especially highlights the need to target this group for intervention, regardless of breast cancer history. Furthermore, among short-term breast cancer survivors, obesity among blacks is similar to whites, but is increased compared to whites among long-term survivors. These differences in obesity and comorbidities may explain the lower quality life and poor survival following a breast cancer diagnosis observed among blacks compared to whites [12, 14, 33]. Additional research is needed to identify when to and who should counsel breast cancer survivors who may not be practicing healthy habits. Oncologists may provide the initial consultation about healthy behaviors, but longer term survivors may benefit from a coordinated effort with primary care physicians to encourage healthy behaviors [36, 37]. Further research is also needed to identify the factors associated with the racial differences observed in this study in order to develop effective, culturally appropriate interventions to promote health among all females, especially those with a previous breast cancer diagnosis and existing comorbidities.

There were several strengths that support the validity of these findings. First, this dataset included a large population-based sample of breast cancer survivors from all 50 states. Next,

guideline-based standards for health behaviors were used allowing comparability with previous studies. Finally, regression analysis was used to explore racial and ethnic differences, thus we were able to adjust for covariates and also present prevalence estimates (predicted marginals) of each outcome for all racial/ethnic groups.

These findings are subject to some limitations. First, due to the low overall median response rates (~35 %), the results may not be generalizable to people who chose not to participate if they substantially differed from those who did participate. Furthermore, due to small numbers, we were unable to report racial sub-categories for “other” race. In addition, this analysis relied on self-reported previous breast cancer diagnoses; as a result, findings may be subject to recall bias and some respondents may have misreported breast cancer history [38]. However, studies have generally found that most BRFSS measures related to health behavior [39], health status [40], physical activity and healthcare access are reliable and valid [41, 42]. Additionally, respondents were asked about their most recent cancer diagnosis and it is possible that some breast cancer survivors were not included. Finally, the BRFSS does not collect any information on tumor characteristics (e.g., stage at diagnosis, grade, and hormone receptor status), phase of care, treatment patterns, recurrence and acculturation, all of which may play a role in health behaviors, health status and quality of life.

In conclusion, racial/ethnic differences in health behaviors were identified and differences varied by time since diagnosis. These findings suggest opportunities for interventions to increase health behaviors and reduce racial disparities among breast cancer survivors [37]. These interventions should be comprised of system, physician and patient components in order to reach patients at different points in the survivorship trajectory, especially those who are most at risk for poor health behaviors, and include other health professionals (e.g., community health workers) and lay health methods that can help patients adopt healthier behaviors following disease diagnosis and treatment.

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**Table 1**

Selected sociodemographic and health care access characteristics of female respondents with or without previous breast cancer diagnoses, by race/ethnicity (percent) – BRFSS, 2009

	Breast cancer survivors (median age=68; n=10,035)				Women without previous breast cancer diagnoses (median age=55; n=234,385)			
	White (n=8825)	Black (n=631)	Hispanic (n=280)	Other (n=299)	White (n=190,455)	Black (n=20,628)	Hispanic (n=14,213)	Other (n=9,089)
Median age (years)	68.0 %	64.2 %	62.7 %	63.8 %	56.7 %	51.7 %	46.8 %	49.6 %
Current age (years) <sup>a,b</sup>								
18-39	1.8	1.1	3.3	0.8	33.3	42.4	54.9	48.8
40-64	42.0	53.0	49.4	62.3	45.4	42.2	36.3	39.2
65-84	48.0	42.6	46.4	33.4	18.4	13.0	8.0	10.1
85+	7.5	3.1	0.8	2.9	2.3	1.5	0.6	1.0
Unknown	0.7	0.1	0.1	0.6	0.5	0.8	0.2	1.0
Marital status <sup>a,b</sup>								
Married/In a relationship	60.1	38.6	65.4	62.5	66.2	36.4	61.9	60.8
Divorced/Widowed/Separated	34.9	48.9	33.5	33.9	20.9	29.8	18.0	15.8
Never married	4.6	12.1	1.1	3.5	12.7	33.3	20.0	23.0
Unknown	0.3	0.4	0.0	0.0	0.2	0.4	0.2	0.3
Education <sup>a,b</sup>								
<High school	5.5	11.1	15.0	8.1	5.9	11.9	31.5	7.8
High school graduate/GED	30.1	36.4	27.4	20.5	27.8	29.5	27.0	20.9
>High school	64.2	52.5	57.6	71.4	66.2	58.4	41.2	71.1
Unknown	0.2	0.0	0.0	0.0	0.1	0.2	0.3	0.3
Income (household) <sup>b</sup>								
<\$15,000	7.1	23.5	11.6	21.4	6.6	17.4	22.4	11.0
\$15,000-<\$35,000	26.3	23.0	21.8	23.4	21.1	32.1	33.1	20.9
\$35,000-<\$50,000	14.7	11.4	14.7	11.1	13.2	12.5	10.9	12.1
\$50,000-<\$75,000	12.2	7.7	11.0	16.5	15.6	11.7	8.4	11.9
>=\$75,000	21.8	16.9	19.2	20.1	29.8	14.2	12.7	31.7
Unknown	17.8	17.6	21.6	7.6	13.8	12.2	12.5	12.4
Employment <sup>a,b</sup>								
Employed	31.6	31.5	25.0	39.3	52.6	52.0	44.4	52.7
Unemployed	3.1	5.7	11.1	4.2	5.7	12.0	11.0	9.5
Homemaker or student	12.5	6.8	26.2	20.0	18.3	11.5	32.3	22.0
Retired	46.9	41.6	25.1	25.7	18.2	14.2	6.6	9.3
Unable to work	5.8	14.1	12.6	10.8	4.9	10.1	5.6	5.8
Unknown	0.2	0.3	0.0	0.0	0.2	0.2	0.2	0.7
Metropolitan status <sup>a,b</sup>								
In the center city of an MSA	33.6	61.1	54.4	36.2	31.0	55.1	50.3	45.5
Outside center city of an MSA	29.1	16.3	27.0	27.7	29.1	21.2	33.1	30.1

	Breast cancer survivors (median age=68; n=10,035)				Women without previous breast cancer diagnoses (median age=55; n=234,385)			
	White (n=8825)	Black (n=631)	Hispanic (n=280)	Other (n=299)	White (n=190,455)	Black (n=20,628)	Hispanic (n=14,213)	Other (n=9,089)
but inside the county containing center city								
Inside a suburban county of MSA/ In an MSA that has no center city	18.0	10.8	7.0	23.4	17.9	13.0	8.9	12.2
Not in MSA	20.1	11.9	11.5	12.7	21.9	10.6	7.7	12.1
Unknown	0.1	0.0	0.1	0.0	0.2	0.1	0.0	0.1
Health care insurance coverage <sup>b</sup>								
Yes	96.8	92.8	85.7	95.0	90.2	81.6	67.1	85.4
No	3.0	7.2	14.1	5.0	9.5	18.1	32.6	14.1
Unknown	0.2	0.1	0.2	0.0	0.2	0.3	0.3	0.5
Usual healthcare provider <sup>b</sup>								
Yes	96.2	93.8	93.3	94.5	89.0	84.2	69.2	80.6
No	3.7	6.2	6.7	5.4	10.9	15.6	30.4	19.3
Unknown	0.2	0.0	0.0	0.1	0.2	0.2	0.4	0.1
Could not see doctor due to cost <sup>a,b</sup>								
Yes	7.3	15.3	13.7	10.4	13.2	22.9	29.7	16.9
No	92.4	84.7	86.2	89.6	86.6	77.0	70.1	82.9
Unknown	0.2	0.0	0.1	0.0	0.1	0.2	0.1	0.1
Time since last checkup <sup>a,b</sup>								
< 1 year	84.2	88.1	75.5	85.9	71.9	82.0	66.9	69.5
1-<2 years	8.5	7.5	17.7	8.5	12.8	10.1	15.1	15.3
2-<5 years	3.4	3.9	5.1	2.4	7.2	4.5	9.5	7.3
5 years	2.6	0.1	0.5	2.2	6.3	2.7	5.8	5.9
Unknown	1.4	0.4	1.3	0.9	1.8	0.8	2.7	2.0
Years since diagnosis								
0 - <5	26.7	33.9	33.0	45.5	-	-	-	-
5 - <10	23.7	18.2	25.2	13.1	-	-	-	-
10 - <15	16.9	10.8	12.9	10.4	-	-	-	-
15 - <20	10.2	9.0	15.9	14.3	-	-	-	-
20 - <25	7.7	8.6	6.5	6.8	-	-	-	-
25	11.8	14.2	6.0	7.8	-	-	-	-

White, Black and "Other" respondents are of non-Hispanic ethnicity. "Other" includes respondents who self-identified as Asian, Native Hawaiian, other Pacific Islander, American Indian, Alaska Native or other. Breast cancer survivors consist of all female respondents who reported a previous diagnosis of breast cancer. Values are expressed as weighted percentage to account for differences in demographic parameters and sampling bias and are representative of the USA population

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<sup>a</sup> Pearson chi-square test for differences in the distribution of demographic and clinical characteristics across the four racial/ethnic groups was significant ( $p<0.01$ ) among breast cancer survivors

<sup>b</sup> Pearson chi-square test for differences in the distribution of demographic and clinical characteristics across the four racial/ethnic groups was significant ( $p<0.01$ ) among non-breast cancer respondents

**Table 2**

Comorbidities reported by female respondents with or without previous breast cancer diagnoses, by race/ethnicity (percent)—BRFSS, 2009

	Breast cancer survivors (median age=68; n=10,035)				Women without previous diagnoses of breast cancer (median age=55; n=234,385)			
	White (n=8,825) %	Black, (n=631) %	Hispanic (n=0280) %	Other (n=299) %	White (n=190,455) %	Black, (n=20,628) %	Hispanic (n=14,213) %	Other (n=9,089) %
Arthritis <sup>a,b</sup>								
Yes	55.2	48.5	32.7	45.3	31.9	28.8	17.7	19.2
No	44.5	51.2	67.2	54.7	67.8	70.7	82.0	80.5
Unknown	0.2	0.2	0.1	0.0	0.3	0.5	0.2	0.3
Asthma <sup>b</sup>								
Yes	13.5	20.5	9.5	10.4	15.2	16.8	13.4	14.6
No	86.3	79.2	90.4	89.6	84.6	83.0	86.5	85.2
Unknown	0.2	0.2	0.1	0.0	0.2	0.2	0.2	0.2
Cardiovascular disease <sup>a,b</sup>								
Yes	14.2	8.8	11.0	9.0	6.6	8.0	4.8	5.5
No	84.8	89.4	88.9	82.7	92.8	91.3	94.4	94.0
Unknown	1.0	1.8	0.1	8.3	0.6	0.8	0.8	0.5
Diabetes <sup>a,b</sup>								
Yes	13.1	30.1	14.2	21.9	7.4	13.3	9.7	8.3
No	86.8	69.8	85.8	78.1	92.5	86.6	90.2	91.6
Unknown	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Hypertension <sup>a,b</sup>								
Yes	45.2	71.1	35.3	41.2	27.6	39.9	20.7	21.4
No	54.6	28.9	64.5	58.2	72.2	60.0	79.2	78.4
Unknown	0.1	0.0	0.2	0.6	0.2	0.1	0.1	0.2
None of the above <sup>a,b</sup>	22.9	13.8	41.1	24.6	53.6	59.0	40.8	41.3
Mean number of comorbidities <sup>c</sup>	1.42	1.79	1.03	1.28	0.89	1.07	0.67	0.69

White, Black and "Other" respondents are of non-Hispanic ethnicity. "Other" includes respondents who self-identified as Asian, Native Hawaiian, other Pacific Islander, American Indian, Alaska Native or other. Breast cancer survivors consist of all female respondents who reported a previous diagnosis of breast cancer. Values are expressed as weighted percentage to account for differences in demographic parameters and sampling bias and are representative of the USA population

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<sup>a</sup> Pearson chi-square test for differences in the distribution of demographic and clinical characteristics across the four racial/ethnic groups was significant ( $p < 0.01$ ) among breast cancer survivors

<sup>b</sup> Pearson chi-square test for differences in the distribution of demographic and clinical characteristics across the four racial/ethnic groups was significant ( $p < 0.01$ ) among non-breast cancer respondents

<sup>c</sup> Analysis of variance  $p$  value testing for differences across the four racial/ethnic groups was significant ( $p < 0.01$ )

**Table 3**

Prevalence estimates of health status and selected health behaviors among female respondents with or without previous diagnoses of breast cancer, by race/ethnicity (percent)—BRFSS, 2009

	Breast cancer survivors (median age=68; n=10,035)			Women without previous diagnoses of breast cancer (median age=55; n=234,385)		
	%	95 % CI	<i>p</i>	%	95 % CI	<i>p</i>
Fair/poor self-rated health			0.249			<0.001
White	25.4	(23.9–27.0)		14.1	(13.8–14.4)	
Black	26.9	(21.1–33.6)		17.1	(16.2–18.0)	
Hispanic	32.7	(25.3–41.1)		23.0	(21.9–24.2)	
Other	28.5	(19.6–39.4)		17.9	(16.3–19.7)	
Heavy alcohol drinker			<0.001			<0.001
White,	4.3	(3.7– 5.0)		5.4	(5.2– 5.7)	
Black	0.9	(0.4– 1.9)		2.4	(2.0–3.0)	
Hispanic	1.0	(0.4– 2.8)		2.9	(2.4– 3.6)	
Other	1.6	(0.4– 5.6)		2.5	(1.8– 3.4)	
Current smoker <sup>a</sup>			0.403			<0.001
White	11.1	(10.0–12.4)		19.1	(18.7–19.6)	
Black	9.1	(5.2–15.7)		13.5	(12.7–14.4)	
Hispanic	8.7	(4.3–16.8)		7.4	(6.6–8.2)	
Other	12.2	(6.9–20.5)		14.3	(12.9–15.8)	
Former smoker <sup>a</sup>			<0.001			<0.001
White	33.7	(32.0–35.4)		23.7	(23.3–24.0)	
Black	24.5	(18.5–31.6)		15.8	(14.9–16.9)	
Hispanic	16.2	(9.1–27.2)		15.5	(14.4–16.7)	
Other	20.5	(12.7–31.4)		12.5	(11.3–13.7)	
5 servings of fruits/vegetables			0.955			<0.001
White	33.8	(32.1–35.5)		27.8	(27.4–28.2)	
Black	33.4	(26.3–41.4)		26.7	(25.3–28.0)	
Hispanic	33.7	(22.7–46.7)		28.8	(27.3–30.3)	
Other	30.1	(19.5–43.4)		32.3	(30.1–34.6)	
Physical activity			0.334			<0.001
White	53.7	(51.8–55.5)		49.5	(49.0–50.0)	
Black	48.9	(40.7–57.1)		39.9	(38.3–41.4)	
Hispanic	46.1	(33.5–59.2)		44.2	(42.5–45.9)	
Other	59.7	(47.1–71.1)		41.0	(38.7–43.4)	
Obese ( ≥ 30.0 kg/m <sup>2</sup> )			0.007		<0.001	
White	23.7	(22.2–25.4)		25.1	(24.7–25.5)	
Black	32.3	(26.3–38.8)		38.1	(36.6–39.5)	
Hispanic	27.6	(19.6–37.3)		31.2	(29.7–32.8)	
Other	16.5	(10.3–25.2)		19.0	(17.5–20.6)	

Prevalence estimates are calculated as predictive margins from logistic regression models and have been adjusted for age, marital status, education, employment status, arthritis, asthma, cardiovascular disease, diabetes, hypertension, healthcare coverage, usual provider, time since last checkup, MSA status, and inability to see doctor due to cost. White, Black and “Other” respondents are of non-Hispanic ethnicity. “Other” includes respondents who self-identified as Asian, Native Hawaiian, other Pacific Islander, American Indian, Alaska Native or other. Breast cancer survivors consist of all female respondents who reported a previous diagnosis of breast cancer

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<sup>a</sup>Predictive margins for smoking calculated from generalized logits model with three categories (current, former, never)

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**Table 4**

Prevalence estimates of obesity (body mass index  $\geq 30.0$  kg/m<sup>2</sup>) among breast cancer survivors, by race/ethnicity (percent)—BRFSS, 2009

	<u>&lt;5 years since diagnosis</u>		<u>5+ years since diagnosis</u>	
	%	95 % CI	%	95 % CI
White, Non-Hispanic	26.2	(23.3–29.4)	23.0	(21.2–24.9)
Black, Non-Hispanic	26.8	(18.6–37.0)	34.8	(27.0–43.5)
Hispanic	28.5	(14.5–48.2)	27.0	(18.3–37.8)
Other	7.8	(3.8–15.4)	22.0	(13.1–34.5)

White, Black and “Other” respondents are of non-Hispanic ethnicity. “Other” includes respondents who self-identified as Asian, Native Hawaiian, other Pacific Islander, American Indian, Alaska Native or other. Breast cancer survivors consist of all female respondents who reported a previous diagnosis of breast cancer. Prevalence estimates are calculated as predictive margins from logistic regression models

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