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Racial Disparities in Healthy Behaviors and Cancer Screening among Breast Cancer Survivors and Women without Cancer: National Health Interview Survey 2005

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Abstract

Purpose—We investigated racial disparities in healthy behaviors and cancer screening in a large sample from the US population.

Methods—This analysis used the data from 2005 National Health Interview Survey and included women at age 40 years who completed the cancer questionnaires (2,427,075 breast cancer survivors and 57,978,043 women without cancer). Self-reported information on cancer history, healthy behaviors (body mass index, smoking, alcohol use, physical activity, fruit/vegetable consumption, sunscreen use). We compared distributions of each factor among Caucasian, African American and Hispanic women with and without breast cancer history.

Results—Caucasian breast cancer survivors as compared to their cancer-free counterparts were less likely to be current smokers (8.3 vs.16.9%, $p<0.001$) and to have regular mammograms (51.5 vs.36.9%, $p<0.05$). Differences in associations between cancer survivors and respondents without cancer among African American and Hispanic women did not reach statistical significance.

Conclusions—Certain breast cancer survivor groups can benefit from tailored preventive services that would address concerns related to selected healthy behaviors and screening practices. However, most of the differences are suggestive and do not differ by race.

Keywords

healthy behaviors; cancer screening; breast cancer survivors; population-based survey; multistage sampling

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Conflict of interest.

The authors declare that they have no conflict of interest.

Introduction

According to the American Cancer Society, over 230,000 new breast cancer cases are expected in 2013 [1]. Recent advances in breast cancer detection and treatment have resulted in improved survival, which increased the prevalence of cancer survivors [2]. Based on the statistics from Surveillance, Epidemiology and End Results, more than 2.8 million women in the United States were breast cancer survivors in 2010, the largest survivor group among women with cancer [3]. Breast cancer survivors are at a greater risk of developing a second primary cancer of breast, ovaries, colon, and rectum, as well as physical and psychological complications of treatment, and other comorbidities including obesity, cardiovascular disease and hypertension, osteoporosis, and diabetes [4-9]. Healthy lifestyle choices help to manage long-term health consequences of cancer by controlling and preventing the incidence of many of these conditions [10-12]. Recommended healthy behaviors, such as increased physical activity, proper nutrition, refraining from tobacco and alcohol use, maintaining healthy weight, and adherence to recommended cancer screening guidelines, have shown to reduce incidence of adverse health outcomes and to improve overall quality of life among cancer survivors [13-22]. However, despite potential benefits of healthy lifestyle choices, cancer survivors often do not meet all behavioral and medical guidelines recommendations [14, 23, 24].

The data on differences in healthy behaviors and screening practices between breast cancer survivors and women without a cancer history from population-based studies is limited. A few studies in the US breast cancer survivors compared healthy behaviors by breast cancer survivorship status, but did not examine these differences by race/ethnicity. This analysis aimed to compare healthy behaviors and cancer screening practices among breast cancer survivors and respondents without cancer separately in Caucasian, African American, and Hispanic women. Understanding these differences may help to develop tailored and culturally adapted clinical preventive services to ensure long-term health benefits among breast cancer survivors.

Methods

Survey population and design

The National Health Interview Survey (NHIS) is a cross-sectional household survey administered to the non-institutionalized US population by the National Center for Health Statistics of the Centers for Disease Control and Prevention to monitor the health of the US population and to collect data for epidemiologic studies and policy analyses to address ongoing public health issues [25].

The survey utilizes a multistage probability sample design that has been previously described in detail [25]. The NHIS questionnaire collects information on basic health and demographics (core questionnaire), healthcare access and utilization, health insurance, and income and assets, and on current health topics. The data are collected separately from adults and children in each family. The 2005 NHIS survey includes a supplement that covers

a variety of cancer-related topics such as diet, physical activity, tobacco and alcohol use, and cancer screening.

Study population

This analysis used 2005 NHIS data and was limited to adult female participants (age 18 and older) who completed the cancer questionnaires (Figure 1). From 17,666 women who completed the survey, we excluded 20 participants (0.1%) with missing data on cancer history and 1,041 women (5.9%) diagnosed with cancers other than breast (including non-melanoma skin). Women who reported a history of breast cancer were referred to as breast cancer survivors (n=435). Participants reporting that they never had a cancer diagnosis were referred to as respondents without cancer (n=16,170). We further restricted this analysis to women at age 40 and older (97.0% of survivors and 60.7% of cancer-free respondents) due to a very small number of younger breast cancer survivors (n=13). Furthermore, 12 cancer survivors and 400 respondents without cancer that reported race other than Caucasian, African American or Hispanic were also excluded. Final sample for this analysis included 410 breast cancer survivors and 9,412 respondents without cancer. Among these women, 6,973 were Caucasian (71.0%), 1,496 were African American (15.2%) and 1,353 were Hispanic (13.8%).

Healthy behaviors and cancer screening

We selected the following indicators of healthy behaviors to compare cancer survivors and respondents without cancer: body mass index (BMI), smoking status, alcohol use, physical activity, fruit/vegetable consumption, sunscreen use, and screening for breast, cervical, and colorectal cancer. Self-reported height and weight were used to calculate BMI (kg/m^2). BMI categories were defined as 24.9 (underweight or normal weight), 25-29.9 (overweight), 30-34.9 (obese), and $>35 \text{ kg}/\text{m}^2$ (morbidly obese). Smoking status of the participants was categorized as never, former smoker, current smoker, and unknown. Dietary Guidelines for Americans for 2005 were used to define the woman's alcohol use status as never use, former use, current use below the recommended limit of >7 drinks per week, and current use above the recommended limit [26]. Use of sunscreen was categorized as always, sometimes, never, and unknown (including participants who reported not going into the sun). Participants answered questions about weekly frequency and average duration of moderate and vigorous physical activities. From these, we calculated total minutes per week of vigorous or moderate activity and categorized physical activity as inactive (total minutes=0), insufficiently active (total minutes more than 0 and less than 150), and sufficiently active (total minutes equal to 150 or more) [27].

To estimate the intake of 18 food categories, the 5-Factor Screening was administered as part of the 2005 NHIS questionnaire [28]. For this study, adjusted cup equivalents of vegetables (excluding French fries) per day and adjusted cup equivalents of fruit were used to determine if participants met the US Department of Agriculture 2005 guidelines for adequate fruit/vegetable consumption (4.5 cups daily) [26].

Participants were asked about their participation in cancer screening (colonoscopy for colorectal cancer, Pap smear for cervical cancer, and mammogram for breast cancer) and to

specify when they had their last screening. Based on the provided information, compliance with the screening for breast and cervical cancer was categorized as screening within the last 2 years (compliant or regular), screening within the last 2-5 years, and screening more than 5 years ago. For colorectal cancer screening, the categories were defined as screening within the last 5 years (compliant or regular), screening within the last 5-10 years, and screening more than 10 years ago.

Statistical Analyses

All analyses were performed using SAS version 9.3 (SAS Institute, Inc, Cary, NC, USA) and SAS callable SUDAAN10 (Research Triangle Institute, NC, USA). We accounted for the complex survey structure (multistage probability sample design) throughout the analyses by specifying NHIS household- and person-level weights in analytical statements [29]. Because of this complex sampling design, all the results are presented in the form of weighted estimates, which in this case, are more appropriate than the sample statistics. After weighting, our analyses included 2,427,075 breast cancer survivors and 57,978,043 respondents without cancer, which correspond to 410 and 9,412 participants in the sample, respectively.

We used χ^2 test to compare distributions of the following socio-demographic characteristics among cancer survivors and respondents without cancer within each racial group separately: age (40-49, 50-59, and 60 years), marital status (married or partner, other), education (less than high school level, high school graduate or equivalent, some college or associate degree, bachelor's degree or above), employment (employed, unemployed) and insurance (uninsured, private insurance, Medicare, and other plans). χ^2 test was also used to compare distributions of the following healthy behaviors and screening practices among cancer survivors and respondents without cancer and was carried out separately for each racial group: BMI (24.9, 25-29.9, 30-34.9, 35 kg/m²), smoking status (never smoked, former smoker, current smoker), alcohol use (never used, former user, current user below recommended limit [26], current user above recommended limit), physical activity (none, insufficiently active, sufficiently active), sunscreen use (always/most of the time, sometimes or rarely, never), adequate fruit/vegetable intake (no or <4.5 cups/day, yes or 4.5 cups/day), colorectal cancer screening (within past 5, 6-10, and >10 years), breast cancer screening (mammogram within past 2, 3-5, and >5 years), and cervical cancer screening (Pap-smear within past 2, 3-5, and >5 years).

We used multivariate logistic regression to analyze the association of healthy behaviors with cancer status by race while controlling for age, marital status, employment, education, and insurance. Cancer survivors were compared to respondents without cancer (reference group) separately within each racial/ethnic group. For each of the healthy behavior risk factors, the category representing the healthy behavior was used as the reference. To retain observations with missing data on covariates in the logistic regression analysis, we created an "Unknown" category for each of these variables with missing data. Differences in associations of healthy behaviors with survivorship status across racial groups were tested by including an interaction term in the full model. Statistical significance was assessed at 0.05 level in all analyses.

Results

Characteristics of breast cancer survivors (weighted N=2,427,075) and respondents without cancer (weighted N=57,978,043) by their race and cancer survivorship status are presented in Table 1.

Among Caucasian women, cancer survivors were more likely to have regular breast cancer screening, and were less likely to be current smokers (Table 2). We did not find any statistically significant differences in healthy behaviors between African American breast cancer survivors and African American women without cancer. However, African American breast cancer survivors appeared to be more obese, less likely to be physically active and to have regular mammograms or Pap smear, though these differences were not statistically significant. Hispanic breast cancer survivors were more likely to have healthier weight, to consume alcohol above the recommended limit, and to have regular mammograms and screening for colorectal cancer and were less likely to use sunscreen regularly, but these differences did not reach statistical significance.

When comparing only cancer survivors across their race/ethnicity, significant differences in healthy behaviors were found in alcohol use, physical activity, and sunscreen use (Figure 2). African American and Hispanic breast cancer survivors were less likely to adhere to healthy behaviors as compared to their Caucasian counterparts. When comparison by race/ethnicity was limited to respondents without cancer, statistically significant differences were found for all healthy behaviors except adequate fruit/vegetable consumption (Figure 3).

In multivariate logistic regression analysis, associations of healthy behaviors with breast cancer survivorship status were similar in Caucasian, African American and Hispanic women for all behaviors except healthy weight (p for interaction 0.01) (Table 3).

Discussion

This study examined racial disparities in healthy behaviors among 2,427,075 breast cancer survivors and 57,978,043 respondents without cancer using data from 2005 National Health Interview Survey. Our findings suggest that associations of BMI with survivorship status differ by race. The distribution patterns for the examined healthy behaviors among cancer survivors and women without cancer in Caucasian, African American and Hispanic women suggest potential areas for tailored health education to address the needs of specific populations. However, most of the differences are suggestive and do not differ by race.

Our findings for healthy weight and physical activity are consistent with previous reports [30, 31]. Irwin et al. have found that African American women were less likely to have normal weight and to meet recommended levels of physical activity than either Caucasian or Hispanic women [30]. According to the Behavioral Risk Factor Surveillance System, more African American women reported being obese as compared to other races, regardless of their breast cancer status [31]. Our findings suggest that while current heavy alcohol use appears to be a concern among Hispanic breast cancer survivors as compared to their cancer-free counterparts, Caucasian women seem to be more likely to have ever used alcohol in their lifetime, regardless of their cancer survivorship status. Caucasian women

also appear to be more likely to use sunscreen as compared to African American or Hispanic women, regardless of breast cancer history. However, inadequate fruit/vegetable intake remains a concern regardless of breast cancer status or race.

We find that a greater proportion of Hispanic women with a history of breast cancer adhere to recommended screening practices as compared to either Hispanic women without cancer or Caucasian and African American women. These findings are inconsistent with previously reported lower rates of screening among Hispanic women [32] and could be the result of the small number of breast cancer survivors included in this survey.

Compared to the prevalence of current smoking in all breast cancer survivors in an earlier NHIS analysis (14.1%) [33], the proportion of current smokers in our study was lower in Caucasian and Hispanic women, but was similar among African American survivors (14.8%). Proportion of breast cancer survivors engaging in moderate or vigorous physical activity in all three groups was higher than in the previous report (19.8%). The proportion of survivors with risky alcohol consumption levels in Caucasian and Hispanic survivors was similar to the overall prevalence in 2000 (4.7%); African American survivors had lower prevalence of heavy drinking. On the other hand, the adequate intake of fruits and vegetables was much lower in our study across all races as compared to previous reports (42.2%) and the proportion of survivors who never used sunscreen increased substantially since 2000 (3.6%) [33].

Comparison of our findings with earlier reports suggests that while some of the healthy behaviors have been improving among breast cancer survivors (such as smoking and physical activity), others remained unchanged (alcohol consumption) or became less prevalent over time (sunscreen use, fruit/vegetable consumption). Alcohol consumption among Caucasian women and physical activity among African women remain a concern regardless of women's survivorship status, while sustaining healthy weight appears to be a problem in African American and Hispanic breast cancer survivors. These patterns indicate potential areas for preventive services that could be tailored to address specific needs within each of the racial/ethnic groups.

This analysis uses the data from a large representative sample of the US population with oversampling of minority groups. Nonetheless, our study has a few limitations. The cross-sectional nature of the data does not allow us to establish any temporal relationships and to determine if the behaviors were influenced by the cancer diagnosis, which is likely. Both cancer diagnosis and healthy behaviors are self-reported. Previous studies demonstrated high accuracy of self-reported cancer diagnosis [34-36]. However, some reports suggest that self-reported data can underestimate the number of people with risky behaviors [37, 38]. It was also found that respondents tend to overestimate their screening practices [38-42] and that this overestimation can be more pronounced among African American and Hispanic respondents [40, 43]. This could, in part, explain higher rates of breast and colorectal cancer screening that we found in Hispanic breast cancer survivors and could explain the inconsistency of these results with those from previous studies that did not rely on self-reports. In addition, we did not look separately at the type of colorectal screening (fecal occult blood test [FOBT], sigmoidoscopy, colonoscopy, or barium enema). FOBT may be

more common among non-whites and is a guideline recommended screening modality [44]. Finally, lower screening rates for cervical cancer among breast cancer survivors could be the result of higher total hysterectomy rates among the survivors as part of their cancer treatment. However, this cannot be determined with the current data since the type of hysterectomy is not reported.

Racial disparities in healthy behaviors among breast cancer survivors exist but remain poorly understood. Our findings suggest that certain population groups might benefit from tailored preventive service delivery that would address concerns related to selected healthy behaviors and screening practices among minorities, such as lack of physical activity and breast and cervical cancer screening among African American women and high prevalence of heavy alcohol consumption among Hispanic women.

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Fig. 1.

Women in the analysis: inclusion/exclusion flowchart

Fig. 2.

Distribution of Healthy Behaviors in Breast Cancer Survivors, by Race

Fig. 3.
 Distribution of Healthy Behaviors in Women without Cancer, by Race

Table 1

Estimated (weighted) demographic characteristics of cancer survivors and respondents without cancer, National Health Interview Survey 2005 (estimates percentage and 95% Confidence Intervals)

Healthy Behavior/Screening practice	Caucasian Women			African American Women			Hispanic Women		
	Breast cancer survivors (weighted N=2,148,453)	Respondents with no cancer (weighted N=45,120,664)		Breast cancer survivors (weighted N=150,762)	Respondents with no cancer (weighted N=7,104,744)		Breast cancer survivors (weighted N=127,860)	Respondents with no cancer (weighted N=5,752,635)	
Age									
40-49	10.1 (6.7-14.9) ^a	33.1 (31.7-34.5)		11.8 (4.6-27.2) ^a	39.8 (36.9-42.8)		28.5 (12.3-52.0)	43.6 (40.0-47.1)	
50-59	19.5 (15.5-24.3)	27.9 (26.6-29.3)		23.0 (11.0-42.0)	29.0 (26.5-31.7)		17.2 (6.3-38.9)	29.6 (26.6-32.8)	
60	70.4 (64.7-75.6)	39.0 (37.6-40.4)		65.2 (47.1-79.8)	31.2 (28.5-34.1)		54.3 (28.7-77.9)	26.8 (23.8-30.0)	
Education									
< High School	7.2 (5.1-9.9)	7.2 (6.5-7.9)		15.9 (8.1-28.9)	18.0 (15.9-20.4)		23.5 (10.0-45.8)	27.7 (24.1-31.7)	
High School Graduate or Equivalent	24.3 (20.0-29.3)	25.8 (24.6-27.1)		34.2 (19.5-52.7)	27.3 (24.5-30.1)		18.7 (7.1-40.6)	23.7 (20.7-27.0)	
>Some College or Associate Degree	27.8 (23.0-33.2)	30.4 (29.1-31.6)		33.2 (17.6-53.8)	33.5 (30.7-36.4)		18.7 (7.7-38.9)	30.4 (27.1-33.8)	
>Bachelor's Degree	40.8 (35.4-46.3)	36.7 (35.1-38.2)		16.7 (5.4-41.0)	21.3 (18.7-24.1)		39.2 (15.2-69.9)	18.2 (15.5-21.3)	
Marital status									
Married or Partner	28.7 (52.3-64.3) ^b	65.8 (64.5-67.1)		2.0 (0.3-12.9) ^a	40.3 (37.3-43.5)		55.7 (30.4-78.3)	62.5 (59.5-65.3)	
Other	41.3 (35.7-47.2)	34.2 (33.0-35.5)		98.0 (87.1-99.7)	59.7 (56.6-62.7)		44.3 (21.7-69.6)	37.5 (34.7-40.5)	
Insurance									
Uninsured	2.1 (0.9-4.6) ^a	6.9 (6.2-7.7)		6.2 (2.0-17.3) ^b	16.1 (13.7-18.8)		14.5 (5.1-34.9)	28.0 (24.8-31.3)	
Private insurance ^c	37.9 (32.1-44.1)	58.6 (57.1-60.1)		30.0 (15.9-49.3)	50.2 (46.9-53.5)		21.7 (8.5-45.1)	42.7 (39.1-46.3)	
Medicare	48.8 (43.2-54.5)	25.2 (24.0-26.4)		31.4 (17.2-50.2)	17.9 (15.5-20.6)		37.3 (14.5-67.6)	13.0 (11.1-15.1)	
Other plans ^d	11.2 (8.0-15.6)	9.4 (8.5-10.2)		32.4 (18.6-50.2)	15.8 (13.8-18.1)		26.5 (9.6-55.0)	16.4 (14.0-19.2)	
Employed									
Employed	36.0 (30.4-42.0) ^a	58.7 (57.2-60.1)		28.6 (14.8-48.0) ^a	60.2 (56.8-63.4)		24.1 (11.1-44.6) ^b	56.4 (52.9-59.9)	
Unemployed	64.0 (58.0-69.6)	41.3 (39.9-42.8)		71.4 (52.0-85.2)	39.8 (36.6-43.2)		75.9 (55.4-88.9)	43.6 (40.1-47.1)	

Note: estimated percentages are calculated from non-missing data

^a difference between cancer survivors and respondents without cancer within the race is significant at 0.01 level

^b difference between cancer survivors and respondents without cancer within the race is significant at 0.05 level

c also includes military health insurance
d also includes Medicaid and Medi-gap

Table 2

Estimated (weighted) prevalence of healthy behaviors among breast cancer survivors and respondents without cancer, by Race, National Health Interview Survey 2005 (estimates percentage and 95% Confidence Intervals)

Healthy Behavior/Screening practice	Caucasian Women		African American Women		Hispanic Women	
	Breast cancer survivors (weighted N 2,148,453)	Respondents with no cancer (weighted N=45,120,664)	Breast cancer survivors (weighted N=150,762)	Respondents with no cancer (weighted N=7,104,744)	Breast cancer survivors (weighted N=127,860)	Respondents with no cancer (weighted N=5,752,635)
BMI						
0-24.9	43.9 (37.7-50.2)	44.6 (43.1-46.1)	22.7 (11.0-41.2)	25.1 (22.5-28.0)	48.8 (24.5-73.8)	29.8 (26.5-33.3)
25-29.9	35.7 (30.2-41.5)	30.4 (29.1-31.7)	15.2 (6.7-30.7)	35.1 (32.1-38.3)	31.8 (13.5-58.1)	33.6 (30.5-36.9)
30-34.9	13.0 (9.3-18.0)	15.3 (14.3-16.4)	21.6 (9.2-42.9)	21.1 (18.7-23.8)	16.2 (6.5-35.1)	21.5 (18.4-25.1)
>35	7.4 (4.8-11.2)	9.7 (8.9-10.6)	40.5 (24.2-59.2)	18.7 (16.4-21.2)	3.2 (0.4-20.1)	15.1 (12.8-17.7)
Smoking status						
Never smoked	60.1 (54.2-65.6) ^a	58.0 (56.7-59.2)	57.4 (38.7-74.3)	63.8 (60.6-66.9)	77.2 (54.7-90.5)	77.3 (74.2-80.1)
Former smoker	31.6 (26.4-37.3)	25.2 (24.1-26.3)	27.8 (14.1-47.6)	17.4 (15.2-19.8)	15.1 (5.2-36.4)	11.2 (9.4-13.4)
Current smoker	8.3 (5.8-11.8)	16.9 (15.9-17.9)	14.8 (6.3-30.9)	18.8 (16.7-21.1)	7.7 (2.2-23.9)	11.5 (9.5-13.9)
Alcohol						
Never used	25.6 (20.9-30.9)	25.0 (23.7-26.4)	41.0 (25.4-58.7)	43.4 (40.0-46.9)	48.9 (24.0-74.4)	47.3 (43.6-50.9)
Former user	21.9 (17.9-26.5)	17.0 (15.9-18.1)	28.7 (16.0-46.0)	21.8 (19.3-24.6)	7.0 (1.7-24.3)	14.2 (11.9-16.9)
Current user <7 drinks/week	48.2 (43.0-53.5)	53.0 (51.6-54.5)	29.5 (16.4-47.2)	32.5 (29.6-35.6)	39.6 (15.5-70.0)	37.8 (34.1-41.4)
Current user >7 drinks/week	4.4 (2.4-7.8)	5.0 (4.4-5.6)	0.8 (0.1-5.7)	2.3 (1.5-3.5)	4.5 (1.0-18.5)	0.8 (0.4-1.7)
Physical Activity						
None	46.1 (40.0-52.2)	40.2 (38.6-41.9)	66.6 (46.9-81.8)	60.3 (57.1-63.5)	69.0 (43.3-88.1)	61.8 (58.1-65.3)
Moderate	20.8 (16.5-25.9)	21.5 (20.3-22.8)	23.8 (11.2-43.6)	18.6 (16.3-21.1)	5.1 (1.2-18.9)	16.9 (14.7-19.4)
Active	33.1 (27.9-38.8)	28.3 (36.8-39.8)	9.6 (3.4-24.4)	21.1 (18.7-23.8)	25.8 (5.6-56.3)	21.4 (18.7-24.2)
Sunscreen use						
Always/most of the time	50.5 (44.0-57.0)	45.7 (44.1-47.2)	9.9 (2.5-31.8)	12.9 (10.7-15.5)	18.4 (6.5-42.5)	31.0 (27.9-34.2)
Sometimes/ rarely	25.7 (20.3-31.9)	28.9 (27.5-30.3)	17.3 (6.5-38.8)	18.0 (15.1-21.4)	15.6 (6.3-33.9)	19.8 (16.8-23.3)
Never	23.8 (18.6-30.1)	25.4 (24.2-26.8)	72.8 (50.6-87.4)	69.0 (65.1-72.7)	66.0 (40.5-84.7)	49.2 (45.6-52.8)
Adequate fruit/vegetable intake ^c						
Yes (4.5 cups/day)	5.0 (3.0-8.1)	5.9 (5.3-6.6)	5.9 (0.8-31.8)	4.8 (3.4-6.6)	5.2 (1.1-20.5)	5.2 (3.9-6.9)

Healthy Behavior/Screening practice	Caucasian Women			African American Women		Hispanic Women
	Breast cancer survivors (weighted N 2,148,453)	Respondents with no cancer (weighted N=45,120,664)	Breast cancer survivors (weighted N=150,762)	Respondents with no cancer (weighted N=7,104,744)	Breast cancer survivors (weighted N=127,860)	Respondents with no cancer (weighted N=5,752,635)
Colorectal cancer screening	No (<4.5 cups/day)	95.0 (91.9-97.0)	94.1 (93.4-94.7)	94.1 (68.2-99.2)	94.8 (79.5-98.9)	94.8 (93.1-96.1)
	within past 5 years	61.4 (48.5-72.8)	61.3 (58.0-64.1)	76.8 (47.8-92.3)	73.6 (64.7-80.9)	73.0 (64.4-80.1)
	within past 6-10	27.8 (18.6-39.5)	24.5 (21.9-27.2)	20.3 (6.1-49.9)	17.5 (11.2-26.2)	11.5 (6.5-19.4)
	within > 10 years	10.8 (5.3-20.8)	14.4 (12.4-16.7)	3.0 (0.4-19.4)	9.0 (4.7-16.4)	15.5 (10.2-22.9)
Breast cancer screening (mammogram)	within past 2 years	51.5 (38.6-64.1) ^b	36.9 (34.3-39.5)	37.2 (16.9-63.4)	49.0 (43.1-54.9)	45.3 (38.3-52.6)
	within past 3-5	17.7 (10.1-29.1)	36.1 (33.4-38.9)	16.3 (4.0-48.1)	32.4 (27.2-38.2)	23.1 (3.5-71.3)
	within >5 years	30.9 (20.4-43.8)	27.0 (24.6-29.5)	46.5 (18.9-76.3)	18.6 (14.7-23.4)	14.0 (3.1-45.3)
Cervical cancer screening (pap-smear)	within past 2 years	27.6 (19.9-36.9) ^b	27.1 (25.0-29.2)	17.3 (2.5-62.3)	37.4 (32.1-42.9)	30.5 (6.9-72.4)
	within past 3-5	18.1 (12.1-26.3)	31.2 (29.2-33.3)	28.2 (9.3-60.1)	30.2 (25.9-34.9)	61.2 (18.6-91.6)
	within >5 years	54.3 (44.8-63.5)	41.7 (39.5-44.0)	54.6 (24.7-81.6)	32.5 (27.4-37.9)	8.3 (1.3-37.8)

Note: estimated percentages are calculated from non-missing data

^a difference between cancer survivors and respondents without cancer within the race is significant at 0.0001 level

^b difference between cancer survivors and respondents without cancer within the race is significant at 0.05 level

^c According to 2005 Dietary Guidelines for Americans

Table 3

Multivariate odds ratios for health behaviors and screening practices comparing breast cancer survivors to respondents without cancer, by Race, National Health Interview Survey 2005 (Odds Ratio and 95% Confidence intervals)^a

Healthy Behavior/Screening practice	Caucasian	African American	Hispanic	p-values for interaction of race with healthy behaviors
BMI				
0-24.9	1.0	1.0	1.0	0.01
25-29.9	1.2 (0.9-1.6)	0.4 (0.1-1.4)	0.6 (0.2-2.2)	
30-34.9	1.0 (0.7-1.6)	1.3 (0.4-4.3)	0.5 (0.1-1.6)	
>35	1.1 (0.7-1.8)	2.0 (1.0-8.4)	0.1 (0.0-1.3)	
Smoking status				
Never smoked	1.0	1.0	1.0	0.89
Former smoker	1.2 (0.9-1.6)	1.4 (0.6-3.5)	1.3 (0.3-4.6)	
Current smoker	0.8 (0.5-1.2)	1.0 (0.4-2.7)	0.8 (0.2-3.4)	
Alcohol				
Never used	1.0	1.0	1.0	0.12
Former user	1.3 (0.9-1.9)	1.2 (0.5-2.7)	0.5 (0.1-2.2)	
Current user <7 drinks/week	1.3 (1.0-1.7)	1.4 (0.6-3.3)	1.2 (0.4-4.1)	
Current user >7 drinks/week	1.2 (0.6-2.4)	0.6 (0.1-5.9)	8.3 (1.3-51.7)	
Physical Activity				
None	1.0 (0.8-1.4)	1.5 (0.4-5.4)	1.0 (0.2-5.1)	0.37
Moderate	1.0 (0.8-1.5)	2.5 (0.7-9.1)	0.2 (0.0-1.7)	
Active	1.0	1.0	1.0	
Sunscreen use				
Always/most of the time	1.0	1.0	1.0	0.40
Sometimes or rarely	0.8 (0.6-1.1)	1.3 (0.3-6.5)	1.7 (0.4-7.1)	
Never	0.6 (0.4-0.9)	1.0 (0.2-4.2)	2.0 (0.4-9.2)	
Multivitamin use				
None	0.6 (0.5-0.9)	0.4 (0.2-0.8)	2.0 (0.6-7.2)	0.02
1-6 times per week	1.6 (0.9-3.0)	0.5 (0.1-2.3)	0.3 (0.0-2.7)	
Daily	1.0	1.0	1.0	
Adequate fruit/vegetable intake				
No (<4.5 cups/day)	1.1 (0.6-1.9)	0.6 (0.1-4.0)	0.8 (0.2-3.6)	0.70
Yes (≥ 4.5 cups/day)	1.0	1.0	1.0	
Colorectal cancer screening				
within past 5 years	1.0	1.0	Non estimable	0.95
within past 6-10	1.1 (0.6-1.9)	1.4 (0.3-7.5)		
within >10 years	0.9 (0.4-2.0)	0.4 (0.0-4.2)		
Breast cancer screening (mammogram)				
within past 2 years	1.0	1.0	1.0	0.47
within past 3-5	0.4 (0.2-0.8)	0.6 (0.1-3.1)	0.4 (0.0-5.5)	

Healthy Behavior/Screening practice	Caucasian	African American	Hispanic	p-values for interaction of race with healthy behaviors
within >5 years	0.7 (0.4-1.2)	6.8 (1.4-33.4)	0.4 (0.1-3.1)	
Cervical cancer screening (pap-smear)				
within past 2 years	1.0	1.0	1.0	0.19
within past 3-5	0.5 (0.6-0.9)	1.8 (0.2-20.4)	2.2 (0.5-10.5)	
within >5 years	0.8 (0.5-1.2)	2.6 (0.3-24.9)	0.3 (0.0-1.8)	

^a Adjusted for age, employment status, marital status, education, and insurance