



Published in final edited form as:

J Acad Nutr Diet. 2014 June ; 114(6): 932–937. doi:10.1016/j.jand.2013.08.015.

Usual Dietary Intake Among Female Breast Cancer Survivors is Not Significantly Different From Women With No Cancer History: Results of the National Health and Nutrition Examination Survey, 2003–2006

Brandy-Joe Milliron, PhD [Postdoctoral Fellow, Cancer Control and Survivorship],

Division of Public Health Sciences, Department of Social Sciences and Health Policy, Wake Forest School of Medicine, Medical Center Blvd., Winston-Salem, NC, 27157, Phone: (336) 716-6970; Fax: (336) 716-7554, bmilliro@wakehealth.edu; brandyjoe@gmail.com

Mara Z. Vitolins, DrPH, MPH, RD [Vice Chair and Professor], and

Division of Public Health Sciences, Department of Epidemiology and Prevention, Wake Forest School of Medicine, Medical Center Blvd., Winston-Salem, NC, 27157 Phone: (336) 716-2886; Fax: (336) 716-5425; mvitolin@wakehealth.edu

Janet A. Tooze, PhD, MPH [Professor]

Division of Public Health Sciences, Department of Biostatistical Sciences, Wake Forest School of Medicine, Medical Center Blvd., Winston-Salem, NC, 27157 Phone: (336) 716-1063; Fax: (336) 716-6427; jtooze@wakehealth.edu

Abstract

Dietary intake is a modifiable behavior that may reduce the risk of recurrence and death among breast cancer survivors. Cancer survivors are encouraged to consume a diet rich in fruit, vegetables, and whole grains; and limit red meat, processed meat, and alcohol intake. Using the National Health and Nutrition Examination Survey (2003–2006), this study examined whether breast cancer survivors and women with no history of cancer differed in the distribution of usual intake of foods included in the dietary recommendations for preventing cancer and recurrences. Participants completed one or two 24 hour dietary recalls. The food groups included in this analysis were whole fruit, total vegetables, dark green and orange vegetables, whole grains, red meat, processed meat, alcohol, and calories from solid fat, alcohol and added sugar. The National Cancer Institute Method was used to estimate the distribution of usual intake and to compare breast cancer survivors (n=102) to non-cancer respondents (n=2,684). Using age and cancer survivor as covariates, subgroup estimates of usual intake were constructed. No significant group differences were found, except that survivors reported a greater intake of whole grains. Over 90% of both groups did not meet recommendations for fruits, vegetables, and whole grains; 75.4% and

© 2013 The Authors. Published by Elsevier Inc. on behalf of Academy of Nutrition and Dietetics. All rights reserved.

Correspondence to: Brandy-Joe Milliron.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

70.2% consumed less than the red meat recommendation; and less than 10% of either group met the recommendation for percent calories from solid fat, alcohol and added sugar. The diet of breast cancer survivors was not significantly different from women with no history of cancer.

Keywords

Breast cancer; cancer survivorship; dietary intake; dietary assessment

INTRODUCTION

Breast cancer is the most common cancer among women and the second most common cause of cancer-related death.¹ However, advances in early detection and treatment have increased five-year survival rates among individuals diagnosed with Stage I, Stage II or Stage III breast cancer to 88%, 74–81% and 49–67%, respectively. There are approximately 2.5 million breast cancer survivors in the US, and as that number increases, research is needed to prevent recurrence, second malignancy and mortality in this group, and to manage morbidity associated with breast cancer and its treatment.^{1–3}

An extensive body of literature has provided strong evidence of statistically significant, positive correlations between body weight and either recurrence or survival.^{4–6} Recently, several evidence-based approaches have been identified to reduce body weight and improve lifestyle among breast cancer survivors.⁷ For example, improving dietary quality and quantity of foods eaten are modifiable behaviors that may be targeted to support healing, recovery and survivorship. Specific approaches included increasing the consumption of fruit, vegetables, whole grains and nuts; consuming seafood twice per week; avoiding trans fats and highly processed foods; reducing portion sizes; and minimizing the consumption of sugar-sweetened beverages.⁷

During active cancer treatment, the overall goals of nutritional care for survivors are to prevent or resolve nutrient deficiencies, achieve or maintain a healthy weight, preserve lean body mass, minimize nutrition-related side effects, and maximize quality of life.⁸ After treatment, the American Cancer Society Guidelines on nutrition and physical activity encourage survivors to achieve or maintain a healthy weight, engage in regular physical activity (reduce inactivity, exercise at least 150 minutes/week, strength training at least two days/week), and consume a diet rich in fruit, vegetables, and whole grains.⁹ Cancer survivors are also encouraged to limit red meat and alcohol intake; and avoid consumption of processed meat.^{8,9} In addition to red meat, there is convincing evidence that consumption of processed meat is a risk factor for certain types cancer.⁹ Processed meat refers to meats preserved by the addition of preservatives (such as nitrites), or by smoking, curing, or salting; and meat that is altered from its natural form to enhance its digestibility, taste, or color.^{10,11}

Using the National Health and Nutrition Examination Survey (2003–2006), the objective of this study was to examine whether breast cancer survivors and women with no history of cancer differed in the distribution of usual intake of foods included in the dietary recommendations for preventing cancer and recurrences. These differences were also

examined in the context of adherence to the United States Department of Agriculture (USDA) Food Pattern recommendations.¹² Estimating usual intake, or long-term averages, of foods consumed by a population to assess compliance with dietary recommendations can be challenging as most individuals vary their intake daily and self-reported dietary intake measures are prone to measurement error. Therefore, distributions of foods, food groups, and solid fat, alcohol, and added sugar (SoFAAS) consumed were estimated by using a statistical method for usual dietary intake developed by the National Cancer Institute (NCI), which accounts for within-person variation of dietary intake.^{13,14}

METHODS

Data Source and Sample

The NHANES is a population-based survey designed to collect information on the health and nutrition of children and adults in the US. Data from the combined 2003–2004 and 2005–2006 surveys are reported in this study. The NHANES surveys a representative sample of the civilian, non-institutionalized population. Sampling methods are described in detail at the National Center for Health Statistics website (<http://www.cdc.gov/nchs/nhanes.htm>). Briefly, all participants complete an in-person household interview. Following the household interview, all participants are asked to complete a health examination where a 24-hour dietary recall is administered. Participants who attend the health examination are also asked to complete a second 24-hour dietary recall by phone 3 to 10 days later.

Data from female NHANES (2003–2006) respondents was included in the analysis if they met the following criteria: reported a history of breast cancer or never had a cancer diagnosis; were the same age or older than the youngest breast cancer survivor (34 years); completed at least one 24-hour dietary recall; had reliable dietary recall data (participants with complete individual foods list data); were not pregnant or breast feeding at the time of the survey and examination; and had measured height, weight, BMI and waist circumference data. Female respondents who reported a history of other cancer(s) or who reported a history of breast cancer and other cancer(s) were excluded from the analysis because other types of cancer may impact dietary intake. A total of 2,786 female NHANES participants met the inclusion and exclusion criteria and were included in the analysis. From this group, 102 identified themselves as breast cancer survivors. This study was deemed exempt under federal regulation 45 CFR §46.101(b) (www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html).

Measurement

Dietary intake data—The NHANES utilizes two 24-hour recalls to assess dietary intake. Using the USDA’s Automated Multiple-Pass Method, the first dietary assessment was interviewer-administered. Quantities of foods and beverages reported were translated into the number of equivalents for the MyPyramid major groups and corresponding subgroups.¹⁵ There are seven major MyPyramid components and a total of 32 groups and subgroups in the USDA’s MyPyramid Equivalents Database (MPED), version 2.0. Mixed dishes are disaggregated to the appropriate MyPyramid food groups using recipes. For example, a

broccoli salad with apples, nuts and an oil-based salad dressing is first disaggregated into their basic components: vegetables, fruits, nuts and oil.

The food groups used for this analysis were: whole fruit [cup equivalents (eq.)], total vegetables (cup eq.), dark green and orange vegetables (cup eq.), whole grains (ounce eq.), red meat (ounce eq.), processed meat (ounce eq.), alcohol (% kcal), and the Healthy Eating Index-2005 component score representing calories from solid fat, alcohol and added sugar intake (SoFAAS).¹⁶ The red meat category includes beef, pork, veal, lamb, and game, and excludes lean organ meats and processed meats. The red meat category does not include frankfurters, sausage, or luncheon meats. The processed meat category includes frankfurters, sausage, and luncheon meats (made from meat or poultry). Further information about the MPED can be obtained elsewhere.^{12,15}

Anthropometric measures—Body measurements were taken by trained NHANES health technicians at the health examination and included height, weight, and waist circumference. Body mass index (BMI) was calculated and participants were classified as “underweight” (BMI <18.5 kg/m²), “healthy weight” (BMI 18.5–24.9 kg/m²), “overweight” (BMI 25.0–29.9 kg/m²), or “obese” (BMI ≥30.0 kg/m²).

Cancer status, health behaviors and sociodemographic characteristics—To classify participants as breast cancer survivors or non-cancer respondents, items from the Medical Conditions Questionnaire were used, including: “Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?;” and “What kind of cancer was it?” Respondents that only reported a breast cancer diagnosis were classified as breast cancer survivors, and respondents that reported “no” or “don’t know” (n=10) to ever being told that they had cancer were classified as non-cancer respondents. The time since breast cancer diagnosis was calculated by subtracting the age at diagnosis from the current age reported in the Demographics Questionnaire. Self-reported variables obtained from the Demographics Questionnaire included race/ethnicity, marital status, education level, and family poverty income ratio.

Statistical Analysis

All statistical analyses were performed using Statistical Analysis Software (SAS), version 9.2 (2010, SAS Institute Inc., Cary, NC). SAS survey procedures were used to account for the complex survey structure of NHANES to estimate means, standard deviations, frequencies, and to compare groups. A t-test was used to compare age between groups. Linear and logistic regression that accounted for the complex survey structure were used to compare demographic and anthropometric data adjusted for age. The NCI Method was used to estimate the distribution of usual intake of episodically-consumed foods (whole fruit, dark green/orange vegetables, whole grains, red meat, processed meat, and percent of energy from alcohol) and ubiquitously consumed foods and nutrients (energy, total vegetables, SoFAAS). The usual intake of breast cancer survivors and non-cancer respondents was then compared. Using a two-part model, the NCI Method is able to accommodate the large number of non-consumption days that occur with foods by separating the probability of consumption from the consumption-day amount.^{13,14} Energy intake was not significantly

different between the two groups and therefore was not adjusted for further modeling (except for foods that are expressed in densities including SoFAAS and percent of energy from alcohol).^{13,14} Age and cancer survivor (yes/no) were included as covariates in the modeling, and subgroup estimates for each group were constructed.^{13,14} In additional analyses of the survivor group, the NCI Method was used to model time since breast cancer diagnosis on usual intake of the food groups adjusted for age. The NCI method (with balanced repeated replication for standard errors) was also used to estimate the proportion of women below the recommended levels of intake and to compare the groups using t-tests.^{13,14}

RESULTS AND DISCUSSION

The sociodemographic and anthropometric characteristics of breast cancer survivors (n=102) and non-cancer participants (n=2,684) are displayed in Table 1. Breast cancer survivors were significantly older than those with no history of cancer (64.5 years vs. 53.3 years), were predominantly non-Hispanic white, and married. After adjusting for age, approximately 25% of both groups were at least college graduates and there were no group differences in mean values for family poverty income ratio (approximately 3; range 0–5) or BMI (approximately 28 kg/m²). For breast cancer survivors, the average time from diagnosis was 10.1 years (SD=9.4).

The means and distribution of usual intake of episodically-consumed foods (whole fruit, dark green/orange vegetables, whole grains, red meat, processed meat, and calories from energy from alcohol) and ubiquitously-consumed foods and nutrients (energy, total vegetables and SoFAAS) was similar between breast cancer survivors and non-cancer participants, adjusted for age (Table 2). However, among respondents who reported consuming whole grains, breast cancer survivors consumed significantly more ounce equivalents of whole grains when compared to non-cancer participants (age-adjusted means, $p<0.05$); however, there was no significant difference in the proportion of women meeting recommendations for whole grains by group. There were no significant group differences for the means and distributions of intake or the proportion below a cut-off for the other dietary variables included in this analysis: whole fruit, vegetables, dark green/orange vegetables, red meat, processed meat, calories from SoFAAS.

Table 2 also displays the USDA Food Pattern recommendations and the percent (SE) of breast cancer survivors and non-cancer participants who reported intakes below the recommendations.¹² For whole fruit, vegetables, dark green/orange vegetables, and whole grains, over 90% of both survivors and non-cancer participants did not meet recommendations. For red meat intake, 75.4% of breast cancer survivors and 70.2% of non-cancer participants reported less than recommended intake (1.8 ounce equivalents). The guidelines for processed meat intake and calories from SoFAAS are to limit intake. For processed meat intake, 64.6% and 54.9% of cancer survivors and non-cancer participants consumed an average of less than 0.5 ounce equivalents. Only 7.5% and 5.4% of cancer survivors and non-cancer participants reported an average of less than 20% of total energy from calories attributed to SoFAAS, which corresponds to the maximum score on both the

HEI 2005 and 2010.¹⁶ Approximately two-thirds of the participants (66% of cancer survivors and 64% of non-cancer participants) reported <1% of total energy from alcohol.

Among breast cancer survivors, time since breast cancer diagnosis was not significantly associated with intake distribution for any of the food groups except the amount of processed meat consumed. Women who had been diagnosed more recently consumed fewer servings of processed meats on average ($p=0.0087$).

In summary, this is the first study that reports usual dietary intake of foods and nutrients among female breast cancer survivors compared to women with no history of cancer in the US between 2003–2006 using a nationally-representative sample. These findings suggest that female breast cancer survivors consume a diet similar to the general population of women who have never been diagnosed with cancer. Breast cancer survivors who had been diagnosed more recently consumed fewer servings of processed meats on average. This finding may suggest that women who were more recently diagnosed were advised to avoid processed meats due to recent research that links ingredients in processed meats to certain cancers.^{10,11} Possible mechanisms that link processed meat consumption to cancer include the production of heterocyclic amines from cooking meat at high temperatures and the formation of N-nitroso compounds that are produced by the reaction of nitrite and nitrogen oxides with secondary amines and N-alkylamides.¹⁷ While the evidence supporting processed meat consumption as an independent risk factor for breast cancer is mixed, research examining dietary patterns associated with breast cancer risk suggest a synergistic effect when processed meat is included in dietary patterns characterized by soft drinks, sugars, refined grains, red meat, fat, and salty and fried snacks.^{18,19} However, the 2007 report by the World Cancer Research Fund/American Institute for Cancer Research stresses that cancer survivors should avoid processed meat.⁹

When compared to the national recommendations, our investigation showed that a vast majority of both breast cancer survivors and non-cancer respondents consumed too few servings of fruit, vegetables, and whole grains; and too many SoFAAS. Perhaps these findings are not surprising as the majority of Americans in general are not meeting dietary guidance recommendations.^{20–22} However, these findings have important implications given that breast cancer survivors who are overweight or obese are more likely to have a recurrence and are more likely to die from breast cancer.^{4–6}

Our findings are in line with the findings of Blanchard, Courneya, and Stein, who reported that only 18.2% of breast cancer survivors were meeting the 5-A-Day recommendations to consume five servings of fruits and vegetables each day.²⁴ Participants were from the American Cancer Society's Study of Cancer Survivors-II, a national cross-sectional study. The female breast cancer survivors in their sample had a mean age of 63 years, were primarily white (72%), married (59%), and had surgery for treatment (95%). Similarly, researchers in Portugal reported that the usual intake of most foods and nutrients among both cancer survivors and non-cancer respondents in the EpiPorto study did not meet the national recommendations.²³

Two primary strengths of our study include the use of the NHANES data and the NCI Method. The NHANES data includes a representative sample of the civilian, non-institutionalized US population, and uses the 24-hour dietary recall to assess diet. The NCI Method was used to estimate the distribution of usual intake of episodically- and ubiquitously-consumed foods and nutrients, and to compare usual intake of breast cancer survivors to non-cancer respondents. This method is able to accommodate the large number of non-consumption days that occur with foods by separating the probability of consumption from the consumption-day amount, and to account for measurement error when estimating the proportion of women below recommended levels.^{13,14} However, the small sample size of breast cancer survivors precluded stratified analyses such as by time since diagnosis. In this study, it was not possible to distinguish breast cancer survivors who are still receiving treatment from those who are in full remission. This analysis did not exclude women with other chronic diseases, which might also impact dietary intake. Recall bias is a well known limitation in dietary assessment methods. However, NHANES participants were asked to recall the past day making this bias less likely.

CONCLUSIONS

These findings and previous research suggest that breast cancer survivors are not consuming diets that meet dietary guidelines. As excess body weight is a risk factor for recurrence and second cancers and is associated with higher mortality from breast cancer, breast cancer survivors should be encouraged to consume fruit, vegetables, and whole grains, limit red meat, calories from SoFAAS, and alcohol intake, and avoid consumption of processed meat; maintain a healthy weight; and engage in regular physical activity.^{8,9,25} Dietary counseling during cancer treatment can help guide post-treatment health behaviors and has been associated with improved outcomes.^{26,27} Therefore, it is essential to integrate dietary and lifestyle education into standardized models of care during treatment, transition from treatment to survivorship, and to continue to provide support longer term as healthier dietary behaviors may be lost over time.

Acknowledgments

Funding/Support Disclosure

This work was supported by the Comprehensive Cancer Center of Wake Forest Baptist Health Cancer Control Traineeship NCI/NIH grant R25CA122063 and the Comprehensive Cancer Center of Wake Forest Baptist Health (P30CA121970). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute or the National Institutes of Health.

REFERENCES

1. Breast Cancer Overview. [Accessed April 16th, 2013] American Cancer Society Web site. 2011. <http://www.cancer.org/Cancer/BreastCancer/OverviewGuide/breast-cancer-overview-key-statistics>.
2. Howlader, N.; Noone, AM.; Krapcho, M., et al. [Accessed August 15th, 2012] SEER Cancer Statistics Review, 1975–2009. SEER Web site. http://seer.cancer.gov/csr/1975_2009_pops09/browse_csr.php?section=4&page=sect_04_table.14.html.
3. Centers for Disease Control and Prevention (CDC). Cancer survivors–United States, 2007. MMWR Morb Mortal Wkly Rep. 2011; 60:269–272. [PubMed: 21389929]

4. Denmark-Wahnefried W, Winer EP, Rimer BK. Why women gain weight with adjuvant chemotherapy for breast cancer. *J Clin Oncol.* 1993; 11:1418–1429. [PubMed: 8315439]
5. McTiernan A. Obesity and cancer: the risks, science, and potential management strategies. *Oncology.* 2005; 19:871–881. [PubMed: 16053036]
6. Patterson RE, Cadmus LA, Emond JA, Pierce JP. Physical activity, diet, adiposity and female breast cancer prognosis: A review of the epidemiologic literature. *Maturitas.* 2010; 66:5–15. [PubMed: 20097494]
7. Lajous M, Mozaffarian D, Mozaffarian R, Schrag D, Adami HO. Lifestyle prescriptions for cancer survivors and their communities. *J Intern Med.* 2011; 269(1):88–93. [PubMed: 21158981]
8. Doyle C, Kushi LH, Boyle T, et al. Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed. *CA Cancer J Clin.* 2006; 56:323–353. [PubMed: 17135691]
9. Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, Bandera EV, Hamilton KK, Grant B, McCullough M, Byers T, Gansler T. Nutrition and physical activity guidelines for cancer survivors. *CA Cancer J Clin.* 2012; 62:242–274.
10. Ferguson LR. Meat and Cancer. *Meat Sci.* 2010; 84(2):308–313. [PubMed: 20374790]
11. Bartsch H, Montesano R. Relevance of nitrosamines to human cancer. *Carcinogenesis.* 1984; 5:1381–1393. [PubMed: 6386215]
12. US Department of Agriculture (USDA). [Accessed March 1, 2012] Center for Nutrition Policy and Promotion Web site. <http://www.cnpp.usda.gov/USDAFoodPatterns.htm>.
13. Tooze JA, Midthune D, Dodd KW, et al. A new statistical method for estimating the distribution of usual intake of episodically consumed foods. *J Am Diet Assoc.* 2006; 106(10):1575–1587. [PubMed: 17000190]
14. Tooze JA, Kipnis V, Buckman DW, et al. A mixed-effects model approach for estimating the distribution of usual *intake of nutrients*: the NCI method. *Stat Med.* 2010; 29:2857–2868. [PubMed: 20862656]
15. Bowman, SA.; Friday, FE.; Moshfegh, A. Food Surveys Research Group. Beltsville Human Nutrition Research Center, Agricultural Research Service, U.S. Department of Agriculture: Beltsville, MD; 2008. MyPyramid Equivalents Database, 2.0 for USDA Survey Foods, 2003–2004. [Online] Available at: <http://www.ars.usda.gov/ba/bhnrc/fsrg>. [Accessed April 19, 2013]
16. Guenther PM, Casavale KO, Reedy J, et al. Update of the Healthy Eating Index: HEI-2010. *J Acad Nutr Diet.* 2013; 113(4):569–580. [PubMed: 23415502]
17. Lijinsky W. N-Nitroso compounds in the diet. *Mutat Res.* 1999; 443(1–2):129–138. [PubMed: 10415436]
18. Alexander DD, Morimoto LM, Mink PJ, Cushing CA. A review and meta-analysis of red and processed meat consumption and breast cancer. *Nutr Res Rev.* 2010; 23(2):349–365. [PubMed: 21110906]
19. Karimi Z, Jessri M, Houshiar-Rad A, Mizraei HR, Rashidkhani B. Dietary patterns and breast cancer risk among women. *Pub Health Nutr.* 2013; 7:1–9. [Epub ahead of print].
20. Hiza HA, Casavale KO, Guenther PM, Davis CA. Diet quality of Americans differs by age, sex, race/ethnicity, income, and education level. *J Acad Nutr Diet.* 2013; 113(2):297–306. [PubMed: 23168270]
21. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *J Nutr.* 2010; 140(10):1832–1838. [PubMed: 20702750]
22. Guenther, PM.; Juan, WY.; Lino, M.; Hiza, H.; Fungwe, T.; Lucas, R. Diet quality of low-income and higher income Americans in 2003–04 as measured by the Healthy Eating Index-2005. Center for Nutrition Policy and Promotion, US Department of Agriculture; 2008. Report No 42.
23. Pacheco-Figueiredo L, Artunes L, Bento MJ, Lunet N. Health-related behaviours in the EpiPorto study: cancer survivors versus participants with no cancer history. *Eur J Cancer Prev.* 2011; 20(4): 348–354. [PubMed: 21487296]
24. Blanchard CM, Courneya KS, Stein K. Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *J Clin Oncol.* 2008; 26(13):2198–2204. [PubMed: 18445845]

25. International Agency for Research on Cancer. Weight control and physical activity. IARC handbooks for cancer prevention. Lyon: IARC Press; 2001. p. 2
26. Waard, F de; Ramlau, R.; Mulders, Y.; de Vries, T.; van Waveren, S. A feasibility study on weight reduction in obese postmenopausal breast cancer patients. *Eur J Cancer Prev.* 1993; 2(3):233–238. [PubMed: 8490542]
27. Djuric Z, DiLaura NM, Jenkins I, et al. Combining weight-loss counseling with the weight watchers plan for obese breast cancer survivors. *Obes Res.* 2002; 10(7):657–665. [PubMed: 12105288]

Table 1

National Health and Nutrition Examination Survey (2003–2006) Sociodemographic and Anthropometric Characteristics of Breast Cancer Survivors and Non-Cancer Participants, Age Adjusted

Characteristic	Breast cancer survivors ^a (n=102)	Non-cancer participants ^{a,b} (n=2,684)
Age (years)*	64.5 (1.8)	53.3 (0.5)
Non-Hispanic white	80.8%	74.4%
Married	66.9%	58.6%
College graduate or above	25.8%	24.8%
Poverty Income Ratio ^c	3.0 (0.2)	3.1 (0.1)
BMI (kg/m ²) ^d	27.9 (1.0)	28.9 (0.2)
Overweight (BMI 25 kg/m ²)	28.0%	28.6%
Obese (BMI 30 kg/m ²)	34.4%	36.2%
Waist circumference (cm)	93.0 (2.5)	95.7 (0.5)
Waist circumference >88 cm	56.1%	66.4%

* P<0.0001

^a Non-cancer participants were those who met study inclusion criteria and never had a cancer diagnosis.

^b Data are displayed as age-adjusted mean (SE) or age-adjusted %.

^c Reduced sample size due to missing data: breast=94, non-cancer=2,547.

^d BMI: Body Mass Index.

Table 2

National Health and Nutrition Examination Survey (2003–2006) Usual Dietary Intake Among Female Breast Cancer Survivors and Non-Cancer Participants, Age Adjusted

Dietary Component	Breast cancer survivors (n=102)	Non-cancer participants ^a (n=2,684)	USDA Food Pattern recommended ^{b,c}	Percent (SE)	
				Breast cancer survivors below recommended	Non-cancer participants below recommended ^a
Whole fruit (cup eq.)	0.9 (0.10)	0.7 (0.03)	2.0	92.8 (2.3)	95.7 (0.8)
Vegetables (cup eq.)	1.6 (0.13)	1.6 (0.04)	2.5	91.8 (3.0)	90.7 (1.5)
Dark Green/Orange (cup eq.)	0.26 (0.05)	0.28 (0.02)	1.0 ^c	99.8 (0.4)	99.6 (0.4)
Whole grains (ounce eq.) [*]	1.1 (0.21)	0.7 (0.04)	3.0	96.9 (2.4)	99.1 (0.4)
Red meat (ounce eq.) ^d	1.4 (0.24)	1.5 (0.06)	1.8	75.4 (10.5)	70.2 (3.2)
Processed meat (ounce eq.) ^e	0.5 (0.09)	0.6 (0.03)	Limit intake	64.6 (8.3) ^f	54.9 (3.3) ^f
Solid fat, alcohol, added sugar (% of total energy)	31.3 (1.3)	32.8 (0.4)	Limit intake	7.5 (2.6) ^g	5.4 (0.8) ^g
Alcohol (% of total energy)	2.2 (0.8)	2.3 (0.2)	Limit intake	66.0 (4.6) ^h	64.0 (1.6) ^h

^{*} P<0.05 for consumption day amount (N/S for probability of consumption); there was no significant difference in the proportion of women meeting recommendations for whole grains by group. There were no significant group differences for the means and distributions of intake or the proportion below a cut-off for the other dietary variables.

^a Non-cancer participants were those who met study inclusion criteria and never had a cancer diagnosis.

^b US Department of Agriculture (USDA). Center for Nutrition Policy and Promotion Web site. <http://www.cnpp.usda.gov/USDAFoodPatterns.htm>. Accessed March 1, 2012. This food pattern suggests amounts of food to consume based on a daily 2,000 calorie level.

^c The USDA Food Pattern Recommendations include 1.5 cup equivalents of dark green vegetables per week, and 5.5 cup equivalents of red and orange vegetables per week. The food subgroup "Dark Green/Orange" includes dark green, yellow, and orange vegetables, but not red vegetables.

^d The food subgroup "Red meat" includes beef, pork, veal, lamb, and game, and excludes lean organ meats and processed meats.

^e The food subgroup "Processed meat" includes frankfurters, sausage, and luncheon meats (made from meat or poultry).

^f <0.5 ounce equivalents per day.

^g <20% of energy from Solid fat, alcohol, and added sugar.

^h <1% of energy from alcohol.