

Original article

Age- and treatment-related associations with health behavior change among breast cancer survivors[☆]

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ABSTRACT

Objective: The aim of this study was to identify demographic and treatment-related factors associated with health-promoting behavior changes after a breast cancer diagnosis. Changes in health behaviors were also evaluated according to weight, exercise, diet and alcohol consumption patterns before breast cancer diagnosis.

Materials and methods: We examined self-reported behavior changes among 1415 women diagnosed with breast cancer in the NIEHS Sister Study cohort. Women reported changes in exercising, eating healthy foods, maintaining a healthy body weight, drinking alcohol, smoking, getting enough sleep, spending time with family and friends, and participating in breast cancer awareness events.

Results: On average, women were 3.7 years from their breast cancer diagnosis. Overall, 20–36% reported positive changes in exercise, eating healthy foods, maintaining a healthy weight, or alcohol consumption. However, 17% exercised less. With each 5-year increase in diagnosis age, women were 11–16% less likely to report positive change in each of these behaviors (OR = 0.84–0.89; $p < 0.05$), except alcohol consumption (OR = 0.97; CI: 0.81, 1.17). Women who underwent chemotherapy were more likely to report eating more healthy foods (OR = 1.47; 95% CI 1.16–1.86), drinking less alcohol (OR = 2.01; 95% CI: 1.01, 4.06), and sleeping enough (OR = 1.41; 95% CI: 1.04, 1.91). The majority of women (50–84%) reported no change in exercise, eating healthy foods, efforts to maintain a healthy weight, alcohol consumption, sleep patterns, or time spent with family or friends.

Conclusions: Many women reported no change in cancer survivorship guideline-supported behaviors after diagnosis. Positive changes were more common among younger women or those who underwent chemotherapy.

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1. Introduction

The number of breast cancer survivors in the United States

population has increased, reaching almost 3 million women in 2012 [1]. Health concerns among breast cancer survivors include not only the risk of breast cancer recurrence, but also a potentially increased risk of other cancers and other chronic comorbid conditions [2]. Some evidence suggests that maintaining or adopting a healthy diet and being physically active after diagnosis may improve breast cancer prognosis [3,4], while also reducing all-cause mortality [5,6] and improving quality of life [7,8]. Thus breast cancer survivors represent an important target population for efforts to promote healthy behaviors that contribute to long-term health and survival.

[☆] The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Organizations such as the National Comprehensive Cancer Network (NCCN) [9] and the American Cancer Society (ACS) [10], have published recommendations for cancer survivors regarding maintaining a healthy body weight, engaging in regular physical activity, consuming a healthy diet, minimizing alcohol intake, and avoiding tobacco products. Some have suggested that a cancer diagnosis itself may serve as a stimulus for survivors to make the behavioral changes supported by such guidelines [2], a notion supported by several studies among cancer survivors [11–15]. However, existing studies of health behaviors after a breast cancer diagnosis are most often conducted within samples of women who are recruited and enrolled after diagnosis. Therefore, there has been limited opportunity to address whether lifestyle recommendations were already being met at the time of diagnosis, and whether behavior patterns before diagnosis drive those reported after. Other considerations include proximity to the active treatment period and type(s) of therapy received. Chemotherapy, for example, has been reported to negatively affect cardiorespiratory fitness [16] and weight maintenance [17].

Identifying factors associated with behavior change among breast cancer survivors can help to target interventions toward women who find it more difficult to make positive changes after diagnosis. We assessed behavior change after breast cancer diagnosis in a sample of 1415 women enrolled in the National Institute of Environmental Health Science (NIEHS) Sister Study cohort who had prospectively-provided information on lifestyle characteristics before diagnosis.

2. Materials and methods

The Sister Study Survivorship Survey was initiated by the Centers for Disease Control and Prevention (CDC) and the NIEHS in 2012 to examine several priority public health topics among breast cancer survivors, including health behaviors. Survey respondents included in this analysis were women with a prior breast cancer diagnosis (ductal carcinoma *in situ* or invasive breast cancer) who were enrolled in the Sister Study, a cohort of initially breast cancer-free women whose sister had been diagnosed with breast cancer. Sister Study participants were enrolled in 2003–2009 and were eligible to receive the Survivorship Survey if they were diagnosed with breast cancer before October 9, 2012 (Fig. 1). After medical record review, 40 women were identified as having a breast cancer diagnosis that preceded completion of Sister study cohort enrollment activities, and were retained in analyses as prevalent breast cancers. Descriptions of the Sister Study design and inclusion criteria, can be found elsewhere [18–20]. This survey was approved by the Institutional Review Board of the NIEHS/NIH as an amendment to the protocol for the Sister Study.

2.1. Survey measures

Survey questions relevant to this analysis pertained to NCCN and ACS guideline-recommended behaviors (exercise, healthy eating, alcohol intake, tobacco use, and maintaining a healthy body weight) [9,10] and other behaviors related to general health and well-being. Participants were asked “How often do you do each of the following compared to before you were diagnosed with breast cancer?” Listed behaviors used in these analyses included: exercise, eat healthy foods, drink alcoholic beverages, smoke cigarettes or use tobacco products, make efforts to maintain a healthy body weight, participate in run or walk breast cancer awareness events, spend time with family and friends, and get enough sleep. Answer choices included “More often,” “About as often,” “Less often,” “Didn't do before and don't do now,” and “Don't know.” A similar response format has been used in a previous study of behavior

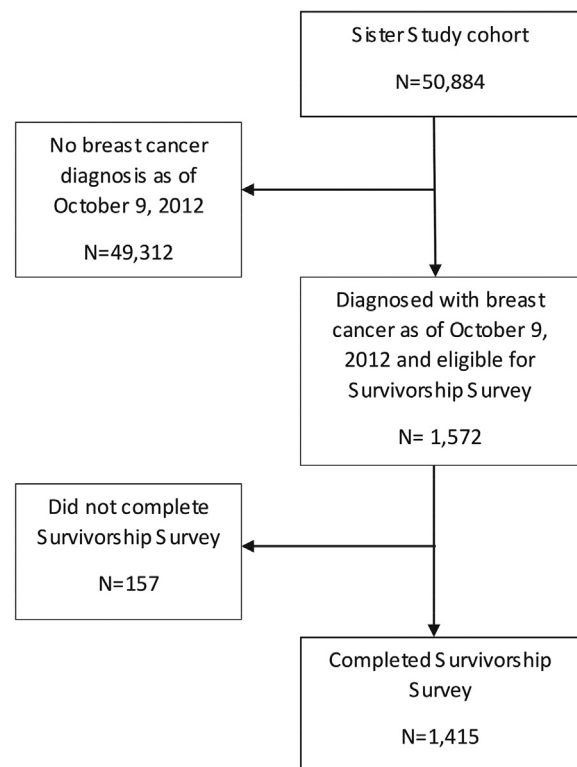


Fig. 1. Flow diagram of Sister Study participants who completed the Survivorship Survey.

changes among cancer survivors [12].

Breast cancer and treatment-related characteristics (stage, chemotherapy, endocrine therapy, trastuzumab, surgery and radiation) were abstracted from medical records. If missing from medical records, these characteristics were ascertained from self-reported measures on the Breast Cancer Follow-Up Questionnaire, a questionnaire completed by Sister Study participants approximately six months after diagnosis of incident breast cancer. Demographic characteristics (age at diagnosis, race/ethnicity) were taken from Sister Study enrollment questionnaires completed prior to breast cancer diagnosis. Information on pre-diagnosis behaviors, including exercise, fruit and vegetable consumption (as an indicator of an overall healthy diet), alcohol consumption, and smoking habits, were also taken from enrollment questionnaires. Exercise was determined based on reported activity during the 12 months prior to Sister Study enrollment. Participants reported the number of hours per week spent engaging in various activities; weekly energy expenditures were then calculated using the assigned metabolic equivalent (MET) values for each activity as listed in established guidelines [21]. Fruit and vegetable consumption was ascertained using the Block 98 food frequency questionnaire (FFQ) [22], and refers to average daily intake in the previous 12 months. Participants also self-reported current smoking and weekly alcohol consumption. Pre-diagnosis body mass index (BMI) was calculated using height and weight measured by trained personnel during home visits at Sister Study enrollment.

2.2. Statistical analysis

Frequencies and percentages were used to describe demographic and breast cancer/treatment characteristics and responses to the eight survey questions among all participants. For each of the eight behaviors, the proportion who responded “Don't

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