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# Perceived Recurrence Risk and Health Behavior Change Among Breast Cancer Survivors

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# PERCEIVED RECURRENCE RISK AND HEALTH BEHAVIOR CHANGE AMONG BREAST CANCER SURVIVORS

A Thesis Presented

by

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## DEDICATION

To my father, as you are greatly missed each and every day.

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**ABSTRACT**

**PERCEIVED RECURRENCE RISK AND HEALTH BEHAVIOR CHANGE AMONG BREAST CANCER SURVIVORS**

**MAY 2013**

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Over one third of breast cancer survivors report "fear of recurrence" as the primary concern after diagnosis and treatment. Behavior changes such as exercise and weight loss post cancer may reduce recurrence risk. How perceived recurrence risk affects behavior change is unknown. We evaluated this association in the Breast Cancer Survivorship Study, a cross-sectional study of 301 breast cancer survivors. Data on perceived recurrence risk (local and distant) and health behavior change (alcohol, exercise, nutrition, smoking, sun exposure, supplement use, weight) were assessed by mailed questionnaire. Multivariable logistic regressions were used to evaluate associations between perceived recurrence risk and health behavior change, and multinomial logistic regression to assess direction of change. 47.6% of women perceived their local recurrence risk <10%, while 36.3% perceived distant between 10-30%. Participants mean age was 60 years and had predominantly early stage cancer. Over 90% of women reported making a behavior change. Significant associations were found between higher perceived recurrence risk and behavior changes of nutrition (OR 3.1, 95% CI 1.6-6.3) and sun exposure (OR 2.5, 95% CI 1.2-5.0). Exploratory direction of change analyses found women with higher perceived recurrence risk were more likely to make positive changes in nutrition (OR 4.0, 95% CI 1.9-8.2) and sun exposure (OR 2.5, 95% CI 1.2-5.2). Overall, we found trends that women are likely to make specific behavior changes as their perceived recurrence risk increases. Findings provide a baseline for future research to identify survivors more likely to make behavior changes that affect their long term health.

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# CHAPTER 1

# INTRODUCTION

There are more than 2.9 million breast cancer survivors in the United States (1). Survival rates have been steadily increasing due to improvements in both treatment and early detection, with 5 year survival for localized disease of 98.6% across all races (2). Women diagnosed with stage 0-III breast cancer treated with surgery plus adjuvant or neoadjuvant therapy have a local recurrence risk of 6-13% (3-6). Whereas, women treated with breast conserving therapy have a distant recurrence risk of approximately 24% (7). In fact, one study shows that 39% of breast cancer survivors name "fear of recurrence" as their primary concern (8). Additionally, 45% of women reported their local recurrence risk of invasive breast cancer to be likely, and 39% of women reported their distant recurrence risk to be likely (9). Breast cancer survivors are also at an increased risk for developing secondary tumors, cardiovascular disease, osteoporosis, and diabetes (10) .

Making lifestyle behavior changes post cancer diagnosis and treatment may reduce the likelihood of these outcomes. In particular, behavior changes such as maintaining a healthy weight (11), being physically active (11), increasing fruit and vegetable consumption (11) and controlling alcohol intake (12) post cancer diagnosis and treatment has been linked to a reduction in breast cancer recurrence risk. Lifestyle behaviors after cancer diagnosis and treatment have been associated with breast cancer recurrence and survival rates; however the direction of effect remains controversial. Higher body mass index, increased total fat intake, and increased alcohol consumption have been reported to increase recurrence risk (13, 14). In contrast, increased fiber intake and exercise, increased soy, and increased fruit and vegetable consumption (13-15) have been reported to either decrease recurrence risk or to have no impact.

The American Cancer Society recommends breast cancer patients focus on maintaining a healthy weight through physical activity and a diet high in fruits and vegetables and low in

saturated fat (2). One study of cancer survivors reported 86% of cancer survivors make at least one behavior change following diagnosis (16). Among them, 75% reported at least one positive behavior change and 38.5% reported making a negative change post diagnosis (16). Other survivorship literature has cited approximately 40-50% of cancer survivors report positive changes in their diet (17), 15-26% report increased physical activity (6, 16), 51% reduced fat intake and 44% increased fiber intake since diagnosis (10). Other common changes include regular health checkups, taking vitamins and/or supplements, and increasing sun protective behaviors (18). Literature has also found 9.6% of adults continued to smoke after a cancer diagnosis and 30.1% exercised less (10). Positive behavior change is associated with younger age, higher education, longer time since diagnosis, more comorbidities, increased vitality, fear of recurrence, and spiritual well-being. Negative behavior change has been associated with younger age, being non- Hispanic African American, being widowed, divorced or separated, and decreased physical and emotional health (18). Overall, one study has shown that 14% of cancer survivors made no health behavior changes after cancer diagnosis (16).

Perceived severity of disease or fear of recurrence is often a catalyst for health behavior change among breast cancer survivors (6, 18, 19). Psychosocial theories such as the Social Cognitive Theory (20), Parallel Processing Model (21), Behavior Motivation Hypothesis (22), and other cognitive (23) and emotional constructs (24) have all been cited as possible explanations as to why risk perceptions play an important role in behavior change.

Only two studies have assessed the relationship between perceived recurrence risk and health behavior change in breast cancer survivors (6, 19). Burris et. al found that women with a higher perceived recurrence risk were less likely to limit their food intake to maintain or lose weight ($r=-0.16$, p-value $<0.05$) compared to women who perceived themselves to have a lower recurrence risk, but overall, risk perception was largely unrelated to behavior (6). O'Neill similarly found that recurrence risk perception was unrelated to behavior change (BMI- OR 1.00, 95% CI: 0.98-1.01; fruit and vegetable consumption- OR 0.99, 95% CI: 0.97-1.01; and physical

activity- OR 1.00, 95% CI: 0.99-1.02) (19). Current literature has only focused on perceived local recurrence risk and has limited control for covariates, warranting further research.

Given the importance of behavior change following breast cancer diagnosis and treatment in relation to risk of recurrence or development of other chronic diseases, it is important to study characteristics that lead to behavior change. Therefore, we investigated the relationship between perceived recurrence risk and health behavior change among breast cancer survivors using data from the Breast Cancer Survivorship Study, a cross-sectional study, based at Baystate Medical Center in Springfield, Massachusetts. We hypothesized that breast cancer survivors with a higher perceived recurrence risk would be more likely to report changes to their health behaviors.

# CHAPTER 2

# METHODS

## A. Study Population

In 2008, the Breast Cancer Survivorship Study identified breast cancer survivors through the Baystate Medical Center Tumor Registry. Eligible patients were diagnosed between 1997-2007 and subsequently treated by the principal investigators (Drs. Makari-Judson, Mertens, and Katz). Additional eligibility included: 1) women >18 years of age, 2) diagnosis of stage I, II, or III breast cancer, 3) 12 months or greater since diagnosis, and 4) no distant relapse. Eligible patients received a letter from their physician inviting them to participate in the study. Study exclusion criteria were: 1) male breast cancer, 2) non-English, non-Spanish speaking patients, and 3) patients unable to complete the questionnaire due to dementia or disability.

A total of 1022 eligible women were mailed a consent form and questionnaire. The first 301 completed questionnaires returned were included in the study. The questionnaire collected data on sociodemographic factors, smoking, alcohol use, family history of breast cancer, personal breast cancer history, perceived recurrence risk, and changes in health behavior. Women were excluded from analysis if they did not provide information about their perceived recurrence risk or behavior changes (n=34), leaving a final population for analysis of 267.

## B. Data Collection

Perceived recurrence risk of breast cancer was measured by a self-administered questionnaire. In some cases, the questionnaire was administered over the phone. Women were asked, “Thinking back to the day you completed your treatment, estimate your risk of having a breast cancer recurrence at the site of surgery”, and “Thinking back to the day you completed your treatment, estimate what you believed to be your risk of recurrence of cancer outside the

breast over 10 years from completing therapy". Participants were asked to choose from the following options: 0-10%, 10-30%, 30-60%, or >60%.

Health behavior change also was assessed through the self-administered questionnaire. Participants were asked to check if they had made a change post-diagnosis or post-treatment in any of the following behaviors: alcohol, exercise, nutrition, smoking, sun exposure, use of supplements, and weight. Participants reporting a behavior change were asked to describe the change in a free text entry.

Data for covariates were gathered through self-report via the questionnaire and medical record abstraction. Covariates gathered by questionnaire included: age, race, socioeconomic status, educational level, family history of breast cancer in 1$^{st}$ degree relatives, alcohol consumption, smoking history, and years since diagnosis. Covariates collected from the medical record data included: stage of breast cancer, lymph node involvement, surgical treatment, chemotherapy treatment, hormonal treatment, radiation treatment, estrogen receptor (ER) status, progesterone receptor (PR) status, and actual distant recurrence risk from the *Adjuvant! Online* calculation (25).

## C. Statistical Analysis

Both local and distant perceived recurrence risk were collapsed into three categories (<10%, 10-30%, and >30%) due to the low number of women who perceived their recurrence risk to be greater than 60%.

Each behavior change was assessed separately and classified as either "yes" or "no" in regards to the presence of a change. A variable denoting any behavior change was created and defined as making at least 1 change among any of the behaviors. Participants noting a behavior change and who provided information about the type of change were further classified as either having made a positive change or a negative change. A response was classified as a positive change if it met one of the following requirements: decrease in alcohol consumption, increase in

exercise, increased consumption of fruits and vegetables, whole grains, and fiber, or decreased amount consumed, decrease or cessation of smoking, spending less time in the sun or wearing more sun protection, began taking a multivitamin, vitamin D, calcium, vitamin E, or vitamin C, or decrease in body weight. A response was classified as a negative behavior change if it met one of the following requirements: increase in alcohol consumption; decrease in exercise; increase in red meat or fat consumption, eating less fruits and vegetables, whole grains, and fiber or increased amount consumed; increased smoking; increased sun exposure; taking supplements that did not include at least one of the supplements classified as positive; or an increase in body weight. Variables denoting any positive change or any negative change were also created and defined as making at least 1 positive or at least 1 negative change, respectively.

Some participants indicated a behavior change but did not provide enough information for further classification. Additionally, some participants indicated fluctuations in their behaviors over time (e.g. loss then gain of weight); in these cases we used the initial change to classify the direction of change.

Data were analyzed using STATA 12.1. We calculated summary statistics for all variables and compared the distribution between levels of each of the aforementioned outcome variables. T-tests, chi square, or Fisher's exact tests were used for continuous and categorical variables, respectively.

We used logistic regression to calculate adjusted odds ratios and 95% confidence intervals between local and distant perceived recurrence risk and health behavior change. We used multinomial logistic regression to investigate the direction of behavior change while controlling for confounders.

Potential confounders were chosen based on knowledge of a relationship with perceived recurrence risk and health behavior change and are shown in Table 1. We fit a univariable logistic regression model for each potential covariate. Any covariate with a p-value $<0.25$ from the likelihood ratio test was fit into an initial multivariable model, and assessed via likelihood ratio

tests to determine whether or not a variable was needed in the model. Changes in the estimates of other coefficients were considered, and if it was greater than 10%, the variable was kept in the model. Two sided P values $\leq 0.10$ were considered statistically significant.

To assess if behavior changes varied by length of time since diagnosis, results were stratified on time since diagnosis. To assess concordance of recurrence risk, we compared women's distant perceived recurrence risk to their *Adjuvant! Online* score and grouped them as accurate, overestimated, or underestimated. Frequencies, adjusted odds ratios, and 95% confidence intervals were calculated in the same manner as described above.

# CHAPTER 3

# RESULTS

The average age in this sample was 59.7 years with over 90% self-identifying as Caucasian (Table 1). The majority of the women in this sample attended college, consumed alcohol rarely, and was never or past smokers. Nearly 60% of women who reported smoking at their breast cancer diagnosis made a positive change to their smoking behavior. Over 70% of the sample had no previous family history of breast cancer, 47% of women were diagnosed with stage 1 cancer, and more than 62% of women were greater than 5 years past the initial diagnosis.

Approximately two-thirds (66.3%) of women did not have lymph node involvement, 64.4% received a lumpectomy, 79.4% received hormonal treatment, 77.9% received radiation treatment, 79.8% were ER positive, and 70% were PR positive. Nearly half (47.6%) of the women reported their perceived local recurrence risk to be between 10% and 30%. More than half (53.2%) of women had *Adjuvant! Online* risk scores calculated between 10% and 30%, while only 36.3% of women perceived their distant recurrence risk to be between 10% and 30% (Table 1). Women who were excluded from analysis due to missing information on perceived recurrence risk or health behaviors, were significantly older, more likely to have a lower socioeconomic status, to be diagnosed with Stage I breast cancer, have no lymph node involvement, not receive chemotherapy treatment, and more likely to perceive their local and distant recurrence risk to be <10% (Table 2).

Over 90% of the population reported making a behavior change. Over 77% reported making at least one positive change, while 42.7% reported making at least one negative change. Weight was the most common change reported, with 59.2% of women reporting such a change. More than half of the population reported changes in exercise (54.7%), nutrition (52.4%), and supplement use (51.3%). Forty three percent of women reported a change in sun exposure. The least commonly reported changes were for the behaviors of alcohol (16.5%) and smoking

(12.0%). The most common positive behavior changes were reported for nutrition (43.5%), sun exposure (37.1%), supplement use (36.0%), and exercise (33.7%). The most common negative behavior change was reported for weight (33.0%). (Table 3)

Women who made any behavior change tended to be older, have a family history of breast cancer, receive hormonal treatment, and were less than 5 years from their diagnosis compared to women who did not make any behavior change. Women who made no positive changes were significantly more likely to report their perceived recurrence risk to be lower as compared to women who made >1 positive change (Table 4).

For most behaviors, there was a positive, though not always statistically significant, association between women's perceived recurrence risk and making a behavior change (Tables 5 & 6). We compared women with the highest perceived recurrence risk (>30%) to those with the lowest perceived recurrence risk (<10%). In adjusted analyses, local perceived recurrence risk was significantly associated with change in nutrition (OR 3.1 95% CI: 1.6-6.3) and marginally significantly associated with a change in sun exposure (OR 1.8 95% CI; 0.9-3.6). Distant perceived recurrence risk also was positively associated with a change in sun exposure (OR 2.5 95% CI: 1.2-5.0), and marginally significantly associated with nutrition (OR 1.8 95% CI: 1.0-3.4) and making any negative change (OR 1.9 95% CI: 1.0-3.5). Additionally, local perceived recurrence risk was positively associated with making at least one positive behavior change (OR 3.4 95% CI: 1.3-9.4).

We repeated the analyses with stratification by the number of years since diagnosis at the time of questionnaire completion (Tables 7 & 8). Nearly half (47.2%) of women were between 5 and 10 years since diagnosis, 15.4% were greater than 10 years since diagnosis, and 37.1% of women were less than 5 years since diagnosis. All statistically significant results were found for women who reported being between 5 and 10 years since diagnosis.

We examined perceived recurrence risk and direction of behavior change in exploratory analyses (Tables 9 & 10). Local perceived recurrence risk was positively associated with a

positive change in nutrition (OR 4.0 95% CI: 1.9, 8.2) and exercise (OR 1.9 95% CI: .9-3.9) in adjusted analyses. Likewise, distant perceived recurrence risk also was positively associated with nutrition (OR 2.0 95% CI: 1.0-3.9) and sun exposure (2.5 95% CI: 1.2-5.2) in adjusted analyses.

Concordance of behavior change was assessed and 37% of women accurately perceived their recurrence risk, while 39.4% overestimated and 23.5% underestimated (Table 11). We compared women who overestimated and underestimated their recurrence risk to those women who perceived it accurately. Although not statistically significant, women who overestimated their distant recurrence risk tended to be more likely to report having made behavior changes as compared to women who were accurate in reporting their distant recurrence risk (Table 12). Additionally, women who underestimated their recurrence risk, tended to be less likely to make behavior changes, and marginally significantly less likely to make a change in sun exposure (OR 0.5 95% CI; 0.2-1.0) as compared to women who were accurate in reporting their recurrence risk. Additionally, women who overestimated their distant recurrence risk tended to be more likely to report positive changes to their health behaviors as compared to women who accurately perceived their distant recurrence risk (Table 13).

# CHAPTER 4

# DISCUSSION

In this study of early stage breast cancer survivors, we found that women with higher perceived recurrence risk were more likely to make behavior changes. Significant results were observed for changes in nutrition and sun exposure and indicate that higher perceived recurrence risk was associated with improved nutrition and reduced sun exposure.

Previous literature has found that perceived recurrence risk was largely unrelated to behavior (6, 19). Burris and colleagues observed fourteen potential recurrence risk reduction behaviors and found two (limit food intake to maintain current weight or lose weight and see a mental health professional) to be significantly associated with perceived recurrence risk. A more recent study published found similar results to Burris claiming adherence to healthy behavior is unrelated to perceived recurrence risk (19). Variations in study results are likely due to the differences in the way exposure and outcome information was obtained. Burris and colleagues used Likert scale questions to create a 2-point composite score which gathered perceived recurrence risk information while O'Neill and colleagues asked women their perception on a 0-100% scale. Burris assessed behavior change by asking the women if they performed the behaviors in the past month or not, while O'Neill targeted behavioral questions to assess adherence to health behavior recommendations. Additionally, this topic has been sparsely studied. One study has examined this relationship in colorectal cancer survivors (26) and another in head, neck, and lung cancer survivors (27) and found that greater risk perceptions are associated with positive behavior changes. Our data agree with the latter studies, suggesting the presence of an association between perceived recurrence risk and health behavior change.

Current survivorship literature states that maintaining a healthy BMI (11), increasing physical activity (11), and eating a low fat diet (28) will decrease cancer recurrence risk. Additional literature on the relationship of increasing fruit and vegetable intake suggests a modest benefit, if

any at all (11, 13-15). In our study, women were significantly more likely to make a positive behavior change in regards to nutrition and sun exposure. Interestingly, these behaviors have not been proven to reduce recurrence risk. Positive change in weight or exercise was less common and generally unrelated to perceived recurrence risk, despite evidence that such behavior change may decrease recurrence risk. Only 54.6% of the population made a change in exercise. This finding was surprising to us, as the clinicians treating the survivors recommend an increase in exercise at the diagnostic appointment. It is possible that it is easier for breast cancer survivors to make an adjustment to their nutrition than it is to start an exercise routine. Additionally, breast cancer treatment effects can include fatigue and weight gain, making a positive change to exercise and weight even more challenging.

Strengths of this study include the use of a standardized questionnaire, the collection of a wide variety of confounders, and the use of medical record data for treatment and disease information. Furthermore, all of the survivors were treated within the same medical practice so they likely received similar medical care and advice after diagnosis and treatment.

A limitation of this study is the assessment of the behavior change inquiry on the questionnaire. Women were asked to define whether or not they made a behavior change, but minimal quantitative information about the change was gathered. For example, a 5 pound weight gain was classified the same as a 50 pound weight gain. Among breast cancer survivors, it is common for chemotherapy to cause uncontrollable weight gain, so it is important to note that we could not distinguish between weight changes resulting from behavior changes from those to treatment regimen.

Data on direction of behavior change were limited as some women failed to describe their behavior change and others did not give information useful in classifying the direction of their change. Further, some behaviors had a greater chance of being classified as either a positive or negative change. For example, in terms of nutrition, a positive behavior change was classified as either eating less quantity, eating a lower fat diet, eating more fruits, vegetables, or fiber, or

eating less red meat. Similarly, a positive behavior change for sun exposure was classified as any action that would reduce sun exposure such as: using more sunscreen, less exposure to the sun, or covering up more when in the sun. A positive behavior change for smoking, however, was either reducing the amount of cigarettes smoked, or quitting smoking completely. Additionally, associations between other behaviors may not have been seen due to small sample size and resulting low statistical power.

Women in this study were told their personalized recurrence risk percentage at initial diagnosis by their clinician. This given risk percentage may have had an effect on the perceived recurrence risk they reported on the questionnaire, even though women were prompted to think back to the day they completed treatment when they responded. We believe this misclassification to occur at random and would attenuate the study results. In a separate analysis, in this sample, women reported their perceived recurrence risk to be consistently higher than *Adjuvant! Online* estimates ($p<0.0001$) (29). *Adjuvant! Online* is a tool used by clinicians to help determine a patients' risk of an adverse cancer outcome (recurrence or mortality) by entering specific information about the woman such as age, tumor size, nodal involvement, histological grade, etc (25).

As mentioned previously, the majority of women in this study were between five and ten years since diagnosis. The small size of the other groups could have led to no significant associations with behavior changes to be seen. Additionally, the length of time since diagnosis may have caused women to report their current perceived recurrence risk rather than thinking back to the day treatment was completed. Reported behavior changes may also have been affected by the length of time since diagnosis, as women may have reported changes that have occurred over time, rather than as a result of their breast cancer diagnosis. This also could have led to misclassification and have attenuated the study results.

Lastly, as this was a cross-sectional study, temporality cannot be established. We cannot definitively state whether an increased perception of recurrence risk lead to behavior change, or if the reverse is true.

In conclusion, we found that women with higher perceived recurrence risk were more likely to make behavior changes, especially in improving nutrition and reducing sun exposure. Making drastic lifestyle changes to exercise, alcohol consumption, and smoking can be difficult after a breast cancer diagnosis as compared to modifying diet or sun exposure. Weight management and increasing exercise are the strongest predictors for lowering breast cancer recurrence risk, and our results present that even the women with the highest perceived recurrence risk could not make these behavior changes. This may be due to the fact that treatments for breast cancer can cause involuntary weight changes and fatigue leading to an increased difficulty of making positive behavior changes to weight or exercise, in conjunction with the general difficulty surrounding a person making positive changes to their weight and exercise routine. The "teachable moment" after a cancer diagnosis is vital to the transition into becoming a cancer survivor, and these results may help clinicians understand what motivates women to make health behavior changes after a breast cancer diagnosis and target them for interventions. Further, we discovered that women with a higher perceived recurrence risk were more likely to be making positive behavior changes. Findings from this study are exploratory and contribute to the limited literature on this topic. Future research should include gathering quantitative information about behavior changes and establishing temporality.

**Table 1. Distribution of covariates according to behavior change (n=267): Breast Cancer Survivorship Study, 2008 (continued on next page)**

| | Total | | Any Behavior Change | | No Behavior Change | | P-Value |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | 0.04 |
| Age (years) | 59.65 | 9.6 | 59.96 | 9.5 | 55.12 | 9.7 | |
| | N | % | N | % | N | % | |
| Race | | | | | | | 0.32 |
| Non-White | 18 | 6.7 | 16 | 6.4 | 2 | 11.8 | |
| White | 249 | 93.3 | 234 | 93.6 | 15 | 88.2 | |
| Socioeconomic status | | | | | | | 0.93 |
| <$25,000/year | 43 | 16.1 | 41 | 16.4 | 2 | 11.8 | |
| 25,000-50,000/year | 64 | 24.0 | 60 | 24.0 | 4 | 23.5 | |
| 50,000-100,000/year | 87 | 32.6 | 80 | 32.0 | 7 | 41.2 | |
| >100,000/year | 58 | 21.7 | 54 | 21.6 | 4 | 23.5 | |
| Missing | 15 | 5.6 | 15 | 6.0 | 0 | 0.0 | |
| Educational Level | | | | | | | 0.70 |
| High School or less | 87 | 32.6 | 83 | 33.2 | 4 | 23.5 | |
| College | 100 | 37.5 | 93 | 37.2 | 7 | 41.2 | |
| Post Graduate | 80 | 30.0 | 74 | 29.6 | 6 | 35.3 | |
| Family History of Breast Cancer (1st deg relative) | | | | | | | 0.09 |
| None | 189 | 70.8 | 173 | 69.2 | 16 | 94.1 | |
| One or more | 77 | 28.8 | 76 | 30.4 | 1 | 5.9 | |
| Missing | 1 | 0.4 | 1 | 0.4 | 0 | 0.0 | |
| Alcohol Consumption | | | | | | | 0.87 |
| None | 49 | 18.4 | 47 | 18.8 | 2 | 11.8 | |
| Rare | 158 | 59.2 | 147 | 58.8 | 11 | 64.7 | |
| >1 Drink/day | 56 | 21.0 | 52 | 20.8 | 4 | 23.5 | |
| Missing | 4 | 1.5 | 4 | 1.6 | 0 | 0.0 | |
| Smoking History | | | | | | | 0.59 |
| Current Smoker | 14 | 5.2 | 13 | 5.2 | 1 | 5.9 | |
| Past Smoker | 135 | 50.6 | 124 | 49.6 | 11 | 64.7 | |
| Never Smoked | 114 | 42.7 | 109 | 43.6 | 5 | 29.4 | |
| Missing | 4 | 1.5 | 4 | 1.6 | 0 | 0.0 | |
| Stage of cancer | | | | | | | 1.00 |
| Stage I | 126 | 47.2 | 118 | 47.2 | 8 | 47.1 | |
| Stage II | 115 | 43.1 | 107 | 42.8 | 8 | 47.1 | |
| Stage III | 24 | 9.0 | 23 | 9.2 | 1 | 5.9 | |
| Missing | 2 | 0.8 | 2 | 0.8 | 0 | 0.0 | |
| Years Since Diagnosis | | | | | | | 0.07 |
| <5 years | 99 | 37.1 | 97 | 38.8 | 2 | 11.8 | |
| 5-10 years | 126 | 47.2 | 116 | 46.4 | 10 | 58.8 | |
| >10 years | 41 | 15.4 | 36 | 14.4 | 5 | 29.4 | |
| Missing | 1 | 0.4 | 1 | 0.4 | 0 | 0.0 | |
| Lymph Node Involvement | | | | | | | 0.75 |
| No | 177 | 66.3 | 164 | 65.6 | 13 | 76.5 | |
| Yes | 83 | 31.1 | 79 | 31.6 | 4 | 23.5 | |
| Missing | 7 | 2.6 | 7 | 2.8 | 0 | 0.0 | |
| Surgical Treatment | | | | | | | 0.61 |
| Lumpectomy | 172 | 64.4 | 162 | 64.8 | 10 | 58.8 | |
| Mastectomy | 95 | 35.6 | 88 | 35.2 | 7 | 41.2 | |
| Chemotherapy | | | | | | | 0.81 |
| No | 108 | 40.5 | 102 | 40.8 | 6 | 35.3 | |
| Yes | 158 | 59.2 | 147 | 58.8 | 11 | 64.7 | |
| Missing | 1 | 0.4 | 1 | 0.4 | 0 | 0.0 | |
| Hormonal Treatment | | | | | | | 0.07 |
| No | 52 | 19.5 | 45 | 18.0 | 7 | 41.2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Yes | 212 | 79.4 | 202 | 80.8 | 10 | 58.8 | |
| Missing | 3 | 1.1 | 3 | 1.2 | 0 | 0.0 | |
| Radiation Treatment | | | | | | | 0.45 |
| No | 57 | 21.4 | 52 | 20.8 | 5 | 29.5 | |
| Yes | 208 | 77.9 | 196 | 78.4 | 12 | 70.6 | |
| Missing | 2 | 0.8 | 2 | 0.8 | 0 | 0.0 | |
| ER Status | | | | | | | 0.17 |
| Negative | 48 | 18.0 | 42 | 16.8 | 6 | 35.3 | |
| Positive | 213 | 79.8 | 202 | 80.8 | 11 | 64.7 | |
| Missing | 6 | 2.3 | 6 | 2.4 | 0 | 0.0 | |
| PR Status | | | | | | | 0.50 |
| Negative | 68 | 25.5 | 62 | 24.8 | 6 | 35.3 | |
| Positive | 187 | 70.0 | 176 | 70.4 | 11 | 64.7 | |
| Missing | 12 | 4.5 | 12 | 4.8 | 0 | 0.0 | |
| Local Perceived Recurrence Risk | | | | | | | 0.31 |
| 0-10% | 127 | 47.6 | 118 | 47.2 | 9 | 52.9 | |
| 10-30% | 86 | 32.2 | 79 | 31.6 | 7 | 41.2 | |
| >30% | 54 | 20.2 | 53 | 21.2 | 1 | 5.9 | |
| Distant Perceived Recurrence Risk | | | | | | | 0.40 |
| 0-10% | 89 | 33.3 | 81 | 32.4 | 8 | 47.1 | |
| 10-30% | 97 | 36.3 | 91 | 36.4 | 6 | 35.3 | |
| >30% | 81 | 30.3 | 78 | 31.2 | 3 | 17.7 | |
| Adjuvant! Online Risk Score | | | | | | | 0.39 |
| 0-10% | 95 | 35.6 | 92 | 36.8 | 3 | 17.7 | |
| 10-30% | 142 | 53.2 | 130 | 52.0 | 12 | 70.6 | |
| >30% | 27 | 10.1 | 25 | 10.0 | 2 | 11.8 | |
| Missing | 3 | 1.1 | 3 | 1.2 | 0 | 0.0 | |

**Table 2. Descriptive statistics for missing women (n=34): Breast Cancer Survivorship Study, 2008 (continued on next page)**

| | Mean | SD | P-Value |
|---|---|---|---|
| Age (years) | 67.48 | 11.3 | 0.00 |
| | N | % | |
| Race | | | 0.59 |
| Non-White | 2 | 5.9 | |
| White | 26 | 76.5 | |
| Missing | 6 | 17.7 | |
| Socioeconomic status | | | 0.02 |
| <$25,000/year | 9 | 26.5 | |
| 25,000-50,000/year | 4 | 11.8 | |
| 50,000-100,000/year | 5 | 14.7 | |
| >100,000/year | 1 | 2.9 | |
| Missing | 15 | 44.1 | |
| Educational Level | | | 0.16 |
| High School or less | 13 | 38.2 | |
| College | 6 | 17.7 | |
| Post Graduate | 5 | 14.7 | |
| Missing | 10 | 29.4 | |
| Family History of Breast Cancer (1st deg relative) | | | |
| None | 18 | 52.9 | 0.56 |
| One or more | 7 | 20.6 | |
| Missing | 9 | 26.5 | |
| Alcohol Consumption | | | 0.14 |
| None | 8 | 23.5 | |
| Rare | 10 | 29.4 | |
| >1 Drink/day | 6 | 17.7 | |
| Missing | 10 | 29.4 | |
| Smoking History | | | 0.32 |
| Current Smoker | 2 | 5.9 | |
| Past Smoker | 9 | 26.5 | |
| Never Smoked | 13 | 38.2 | |
| Missing | 10 | 29.4 | |
| Stage of cancer | | | 0.01 |
| Stage I | 24 | 70.6 | |
| Stage II | 9 | 26.5 | |
| Stage III | 0 | 0.0 | |
| Missing | 1 | 2.9 | |
| Years Since Diagnosis | | | 0.85 |
| <5 years | 8 | 23.5 | |
| 5-10 years | 13 | 38.2 | |
| >10 years | 4 | 11.8 | |
| Missing | 9 | 26.5 | |
| Lymph Node Involvement | | | 0.10 |
| No | 26 | 76.5 | |
| Yes | 5 | 14.7 | |
| Missing | 3 | 8.8 | |
| Surgical Treatment | | | 0.70 |
| Lumpectomy | 23 | 67.7 | |
| Mastectomy | 10 | 29.4 | |
| Missing | 1 | 2.9 | |
| Chemotherapy | | | 0.00 |
| No | 23 | 67.7 | |
| Yes | 9 | 26.5 | |
| Missing | 2 | 5.9 | |

| | | | |
|---|---|---|---|
| Hormonal Treatment | | | 0.16 |
| No | 6 | 17.7 | |
| Yes | 26 | 76.5 | |
| Missing | 2 | 5.9 | |
| Radiation Treatment | | | 0.34 |
| No | 8 | 23.5 | |
| Yes | 25 | 73.5 | |
| Missing | 1 | 2.9 | |
| ER Status | | | 0.06 |
| Negative | 3 | 8.8 | |
| Positive | 28 | 82.4 | |
| Missing | 3 | 8.8 | |
| PR Status | | | 0.22 |
| Negative | 8 | 23.5 | |
| Positive | 22 | 64.7 | |
| Missing | 4 | 11.8 | |
| Local Perceived Recurrence Risk | | | 0.00 |
| 0-10% | 15 | 44.1 | |
| 10-30% | 4 | 11.8 | |
| >30% | 1 | 2.9 | |
| Missing | 14 | 41.2 | |
| Distant Perceived Recurrence Risk | | | 0.04 |
| 0-10% | 12 | 35.3 | |
| 10-30% | 3 | 8.8 | |
| >30% | 4 | 11.8 | |
| Missing | 15 | 44.1 | |
| Adjuvant! Online Risk Score | | | 0.01 |
| 0-10% | 11 | 32.4 | |
| 10-30% | 20 | 58.8 | |
| >30% | 0 | 0.0 | |
| Missing | 3 | 8.8 | |

**Table 3. Distribution of behavior change among participants (n=267): Breast Cancer Survivorship Study, 2008**

| | N | % |
|---|---|---|
| Alcohol | | |
| No Change | 223 | 83.5 |
| Change | | |
| Positive | 33 | 12.4 |
| Negative | 8 | 3.0 |
| Unclassifiable | 3 | 1.1 |
| Exercise | | |
| No Change | 121 | 45.3 |
| Change | | |
| Positive | 90 | 33.7 |
| Negative | 47 | 17.6 |
| Unclassifiable | 9 | 3.4 |
| Nutrition | | |
| No Change | 127 | 47.6 |
| Change | | |
| Positive | 116 | 43.5 |
| Negative | 10 | 3.8 |
| Unclassifiable | 14 | 5.2 |
| Smoking | | |
| No Change | 235 | 88.0 |
| Change | | |
| Positive | 24 | 9.0 |
| Negative | 4 | 1.5 |
| Unclassifiable | 4 | 1.5 |
| Sun Exposure | | |
| No Change | 152 | 56.9 |
| Change | | |
| Positive | 99 | 37.1 |
| Negative | 8 | 8.0 |
| Unclassifiable | 8 | 8.0 |
| Supplement Use | | |
| No Change | 130 | 48.7 |
| Change | | |
| Positive | 96 | 36.0 |
| Negative | 18 | 6.7 |
| Unclassifiable | 23 | 8.6 |
| Weight | | |
| No Change | 109 | 40.8 |
| Change | | |
| Positive | 53 | 19.9 |
| Negative | 88 | 33.0 |
| Unclassifiable | 17 | 6.4 |
| Any Change | | |
| No | 17 | 6.4 |
| Only Positive | 117 | 43.8 |
| Only Negative | 25 | 9.4 |
| Both Positive and Negative | 89 | 33.3 |
| Unclassifiable | 19 | 7.1 |
| Any Positive Change | | |
| At least 1 | 206 | 77.2 |
| No | 61 | 22.9 |
| Any Negative Change | | |
| At least 1 | 114 | 42.7 |
| No | 153 | 57.3 |

**Table 4. Descriptive statistics for those women who made no positive changes (n=61): Breast Cancer Survivorship Study, 2008 (continued on next page)**

| | Mean | SD | P-Value |
|---|---|---|---|
| Age (years) | 59.79 | 10.8 | 0.95 |
| | N | % | |
| Race | | | 0.28 |
| Non-White | 7 | 11.5 | |
| White | 54 | 88.5 | |
| Socioeconomic status | | | 0.62 |
| <$25,000/year | 13 | 21.3 | |
| 25,000-50,000/year | 14 | 23.0 | |
| 50,000-100,000/year | 15 | 24.6 | |
| >100,000/year | 14 | 23.0 | |
| Missing | 5 | 8.2 | |
| Educational Level | | | 0.88 |
| High School or less | 21 | 34.4 | |
| College | 24 | 39.3 | |
| Post Graduate | 16 | 26.2 | |
| Family History of Breast Cancer (1st deg relative) | | | 0.40 |
| None | 48 | 78.7 | |
| One or more | 13 | 21.3 | |
| Missing | 0 | 0.0 | |
| Alcohol Consumption | | | 0.77 |
| None | 8 | 13.1 | |
| Rare | 38 | 62.3 | |
| >1 Drink/day | 14 | 23.0 | |
| Missing | 1 | 1.6 | |
| Smoking History | | | 0.62 |
| Current Smoker | 4 | 6.6 | |
| Past Smoker | 28 | 45.9 | |
| Never Smoked | 27 | 44.3 | |
| Missing | 2 | 3.3 | |
| Stage of cancer | | | 0.50 |
| Stage I | 31 | 50.8 | |
| Stage II | 28 | 45.9 | |
| Stage III | 2 | 3.3 | |
| Missing | 0 | 0.0 | |
| Years Since Diagnosis | | | 0.83 |
| <5 years | 20 | 32.8 | |
| 5-10 years | 31 | 50.8 | |
| >10 years | 10 | 16.4 | |
| Missing | 0 | 0.0 | |
| Lymph Node Involvement | | | 0.73 |
| No | 44 | 72.1 | |
| Yes | 16 | 26.2 | |
| Missing | 1 | 1.6 | |
| Surgical Treatment | | | 0.46 |
| Lumpectomy | 43 | 70.5 | |
| Mastectomy | 18 | 29.5 | |
| Chemotherapy | | | 0.82 |
| No | 23 | 37.7 | |
| Yes | 38 | 62.3 | |
| Missing | 0 | 0.0 | |
| Hormonal Treatment | | | 0.62 |
| No | 15 | 24.6 | |
| Yes | 46 | 75.4 | |
| Missing | 0 | 0.0 | |

| | | | |
|---|---|---|---|
| Radiation Treatment | | | 0.62 |
| No | 12 | 19.7 | |
| Yes | 48 | 78.7 | |
| Missing | 1 | 0.0 | |
| ER Status | | | 0.59 |
| Negative | 13 | 21.3 | |
| Positive | 48 | 78.7 | |
| Missing | 0 | 0.0 | |
| PR Status | | | 0.72 |
| Negative | 16 | 26.2 | |
| Positive | 44 | 72.1 | |
| Missing | 1 | 1.6 | |
| Local Perceived Recurrence Risk | | | 0.08 |
| 0-10% | 33 | 54.1 | |
| 10-30% | 23 | 37.7 | |
| >30% | 5 | 8.2 | |
| Distant Perceived Recurrence Risk | | | 0.43 |
| 0-10% | 25 | 41.0 | |
| 10-30% | 22 | 36.1 | |
| >30% | 14 | 23.0 | |
| Adjuvant! Online Risk Score | | | 0.88 |
| 0-10% | 19 | 31.2 | |
| 10-30% | 35 | 57.4 | |
| >30% | 7 | 11.5 | |
| Missing | 0 | 0.0 | |

**Table 5. Frequencies and odds ratios of behavior change by local perceived recurrence risk: Breast Cancer Survivorship Study, 2008**

| | <10% | 10-30% | >30% | P-Trend |
|---|---|---|---|---|
| Any Change | | | | |
| No | 9 | 7 | 1 | |
| Yes | 118 | 79 | 53 | |
| Unadjusted | 1.0 | .9 (.3, 2.4) | 4.0 (.5, 32.7) | |
| Adjusted[a] | 1.0 | .9(.3, 2.5) | 3.6 (.4, 29.4) | 0.35 |
| Alcohol | | | | |
| No | 103 | 74 | 46 | |
| Yes | 24 | 12 | 8 | |
| Unadjusted | 1.0 | 0.7 (.3, 1.5) | 0.8 (.3, 1.8) | |
| Adjusted[b] | 1.0 | 0.6 (.3, 1.4) | 0.8 (.3, 2.2) | 0.52 |
| Exercise | | | | |
| No | 60 | 40 | 21 | |
| Yes | 67 | 46 | 33 | |
| Unadjusted | 1.0 | 1.0 (.6, 1.8) | 1.4 (.7, 2.7) | |
| Adjusted[c] | 1.0 | 1.0 (.6, 1.8) | 1.4 (.7, 2.7) | 0.39 |
| Nutrition | | | | |
| No | 73 | 37 | 17 | |
| Yes | 54 | 49 | 37 | |
| Unadjusted | 1.0 | 1.8 (1.0, 3.1) | 2.9 (1.5, 5.8) | |
| Adjusted[d] | 1.0 | 1.9 (1.0, 3.3) | 3.1 (1.6, 6.3) | 0.00 |
| Smoking | | | | |
| No | 114 | 74 | 47 | |
| Yes | 13 | 12 | 7 | |
| Unadjusted | 1.0 | 1.4 (.6, 3.3) | 1.3 (.5, 3.5) | |
| Adjusted[e] | 1.0 | 1.8 (.6, 5.1) | 2.6 (.8, 8.7) | 0.11 |
| Sun Exposure | | | | |
| No | 77 | 51 | 24 | |
| Yes | 50 | 35 | 30 | |
| Unadjusted | 1.0 | 1.1 (.6, 1.9) | 1.9 (1.0, 3.7) | |
| Adjusted[f] | 1.0 | 0.9 (.5, 1.6) | 1.8 ( 0.9, 3.6) | 0.22 |
| Supplement Use | | | | |
| No | 66 | 39 | 25 | |
| Yes | 61 | 47 | 29 | |
| Unadjusted | 1.0 | 1.3 (.8, 2.3) | 1.3 (.7, 2.4) | |
| Adjusted[g] | 1.0 | 1.2 (.6, 2.1) | 1.4 (.7, 2.9) | 0.46 |
| Weight | | | | |
| No | 56 | 35 | 18 | |
| Yes | 71 | 51 | 36 | |
| Unadjusted | 1.0 | 1.2 (.7, 2.0) | 1.6 (.8, 3.1) | |
| Adjusted[h] | 1.0 | 1.1 (.6, 2.0) | 1.4 (.7, 2.7) | 0.45 |
| Any Positive Change | | | | |
| No | 33 | 23 | 5 | |
| Yes | 94 | 63 | 49 | |
| Unadjusted | 1.0 | 1.0 (.5, 1.8) | 3.4 (1.3, 9.4) | 0.04 |
| Any Negative Change | | | | |
| No | 75 | 46 | 32 | |
| Yes | 52 | 40 | 22 | |
| Unadjusted | 1.0 | 1.3 (.7, 2.2) | 1.0 (.5, 1.9) | |
| Adjusted[i] | 1.0 | 1.3(.7, 2.2) | 1.0 (.5, 2.0) | 0.82 |

a) adjusted for family history of cancer (1st degree) and surgical treatment
b) adjusted for smoking status, income, alcohol use, and age
c) adjusted for age
d) adjusted for age and alcohol use
e) adjusted for age, smoking status, and race
f) adjusted for stage of cancer, radiation treatment, and chemotherapy treament
g) adjusted for education, years since diagnosis, and lymph node involvement
h) adjusted for alcohol use, years since diagnosis, and chemotherapy treatment
i) adjusted for stage of cancer and chemotherapy treatment

**Table 6. Frequencies and odds ratios of behavior change by distant perceived recurrence risk: Breast Cancer Survivorship Study, 2008**

| | <10% | 10-30% | >30% | P-Trend |
|---|---|---|---|---|
| Any Change | | | | |
| No | 8 | 6 | 3 | |
| Yes | 81 | 91 | 78 | |
| Unadjusted | 1.0 | 1.5 (.5, 4.5) | 2.6 (.7, 10.0) | |
| Adjusted[a] | 1.0 | 1.8 (.6, 5.4) | 2.7 (.7, 10.6) | 0.15 |
| Alcohol | | | | |
| No | 76 | 81 | 66 | |
| Yes | 13 | 16 | 15 | |
| Unadjusted | 1.0 | 1.2 (.5, 2.6) | 1.3 (.6, 3.0) | |
| Adjusted[b] | 1.0 | 1.0 (.4, 2.4) | 1.1 (.5, 2.8) | 0.67 |
| Exercise | | | | |
| No | 45 | 44 | 32 | |
| Yes | 44 | 53 | 49 | |
| Unadjusted | 1.0 | 1.2 (.7, 2.2) | 1.6 (.9, 2.9) | |
| Adjusted[c] | 1.0 | 1.2 (.6, 2.1) | 1.5 (.8, 2.8) | 0.20 |
| Nutrition | | | | |
| No | 47 | 49 | 31 | |
| Yes | 42 | 48 | 50 | |
| Unadjusted | 1.0 | 1.1 (.6, 2.0) | 1.8 (1.0, 3.3) | |
| Adjusted[d] | 1.0 | 1.0 (.6, 1.8) | 1.8 (1.0, 3.4) | 0.08 |
| Smoking | | | | |
| No | 81 | 84 | 70 | |
| Yes | 8 | 13 | 11 | |
| Unadjusted | 1.0 | 1.6 (.6, 4.0) | 1.6 (.6, 4.2) | |
| Adjusted[e] | 1.0 | 1.8 (.5, 6.8) | 2.3 (.6, 8.5) | 0.24 |
| Sun Exposure | | | | |
| No | 60 | 54 | 38 | |
| Yes | 29 | 43 | 43 | |
| Unadjusted | 1.0 | 1.7 (.9, 3.0) | 2.3 (1.3, 4.4) | |
| Adjusted[f] | 1.0 | 2.1 (1.1, 4.1) | 2.5 (1.2, 5.0) | 0.01 |
| Supplement Use | | | | |
| No | 47 | 48 | 35 | |
| Yes | 42 | 49 | 46 | |
| Unadjusted | 1.0 | 1.1 (.6, 2.0) | 1.5 (.8, 2.7) | |
| Adjusted[g] | 1.0 | 0.9 (.5, 1.6) | 1.3 (.7, 2.5) | 0.60 |
| Weight | | | | |
| No | 43 | 41 | 25 | |
| Yes | 46 | 56 | 56 | |
| Unadjusted | 1.0 | 1.3 (.7, 2.3) | 2.1 (1.1, 3.9) | |
| Adjusted[h] | 1.0 | 1.1 (.6, 2.1) | 1.6 (.8, 3.2) | 0.14 |
| Any Positive Change | | | | |
| No | 25 | 22 | 14 | |
| Yes | 64 | 75 | 67 | |
| Unadjusted | 1.0 | 1.3 (.7, 2.6) | 1.9 (.9, 3.9) | 0.04 |
| Any Negative Change | | | | |
| No | 57 | 57 | 39 | |
| Yes | 32 | 40 | 42 | |
| Unadjusted | 1.0 | 1.3 (.7, 2.3) | 1.9 (1.0, 3.6) | |
| Adjusted[i] | 1.0 | 1.2 (.6, 2.1) | 1.9 (1.0, 3.5) | 0.06 |

a) adjusted for family history of cancer (1st degree) and surgical treatment
b) adjusted for smoking status, alcohol use, and age
c) adjusted for age
d) adjusted for age and alcohol use
e) adjusted for race, alcohol use, smoking status, lymph node involvement, and pr status
f) adjusted for family history, stage of cancer, chemotherapy treament, radiation treatment, and pr status
g) adjusted for education, years since diagnosis, and lymph node involvement
h) adjusted for alcohol use, years since diagnosis, and chemotherapy treatment
i) adjusted for chemotherapy treatment and radiation treatment

**Table 7. Odds ratios of behavior change by local perceived recurrence risk stratified by years since diagnosis: Breast Cancer Survivorship Study, 2008**

| | <5 years | | | 5-10 years | | | >10 years | | |
|---|---|---|---|---|---|---|---|---|---|
| | <10% | 10-30% | >30% | <10% | 10-30% | >30% | <10% | 10-30% | >30% |
| Any Change | | | | | | | | | |
| No | 0 | 2 | 0 | 5 | 5 | 0 | 4 | 0 | 1 |
| Yes | 46 | 29 | 22 | 53 | 43 | 20 | 19 | 7 | 10 |
| Unadjusted | 1.0 | 1.0 | 1.0 | 1.0 | .8 (.2, 3.0) | 1.0 | 1.0 | 1.0 | 2.1 (.2, 21.5) |
| Adjusted[a] | 1.0 | 1.0 | 1.0 | 1.0 | .7 (.2, 2.8) | 1.0 | 1.0 | 1.0 | 2.1 (.2, 22.0) |
| Alcohol | | | | | | | | | |
| No | 35 | 29 | 17 | 47 | 39 | 17 | 21 | 6 | 11 |
| Yes | 11 | 2 | 5 | 11 | 9 | 3 | 2 | 1 | 0 |
| Unadjusted | 1.0 | .2 (.1, 1.1) | .9 (.3, 3.1) | 1.0 | .99 (.37, 2.6) | .75 (.19, 3.0) | 1.0 | 1.8 (.1, 22.8) | 1.0 |
| Adjusted[b] | 1.0 | .3 (.1, 1.5) | 1.0 (.2, 3.9) | 1.0 | .89 (.30, 2.6) | 1.1 (.25, 4.7) | 1.0 | 7.2 (.1, 654.1) | 1.0 |
| Exercise | | | | | | | | | |
| No | 20 | 15 | 9 | 31 | 21 | 8 | 9 | 4 | 4 |
| Yes | 26 | 16 | 13 | 27 | 27 | 12 | 14 | 3 | 7 |
| Unadjusted | 1.0 | .8 (.3, 2.1) | 1.1 (.4, 3.1) | 1.0 | 1.5 (.7, 3.2) | 1.7 (.6, 4.8) | 1.0 | .5 (.1, 2.7) | 1.1 (.3, 50) |
| Adjusted[c] | 1.0 | .9 (.4, 2.4) | 1.1 (.4, 3.1) | 1.0 | 1.5 (.7, 3.2) | 1.7 (.6, 4.9) | 1.0 | .5 (.1, 2.8) | 1.0 (.2, 4.7) |
| Nutrition | | | | | | | | | |
| No | 23 | 13 | 10 | 37 | 20 | 3 | 13 | 4 | 4 |
| Yes | 23 | 18 | 12 | 21 | 28 | 17 | 10 | 3 | 7 |
| Unadjusted | 1.0 | 1.4 (.6, 3.5) | 1.2 (.4, 3.3) | 1.0 | 2.5 (1.1, 5.4) | 10.0 (2.6, 38.1) | 1.0 | 1.0 (.2, 5.4) | 2.3 (.5, 10.0) |
| Adjusted[d] | 1.0 | 1.7 (.6, 4.7) | 1.1 (.4, 3.3) | 1.0 | 2.6 (1.2, 6.0) | 15.5 (3.2, 75.0) | 1.0 | 1.1 (.2, 6.8) | 1.8 (.4, 8.8) |
| Smoking | | | | | | | | | |
| No | 42 | 29 | 19 | 52 | 40 | 18 | 20 | 5 | 9 |
| Yes | 4 | 2 | 3 | 6 | 8 | 2 | 3 | 2 | 2 |
| Unadjusted | 1.0 | .7 (.1, 4.2) | 1.7 (.3, 8.2) | 1.0 | 1.7 (.6, 5.4) | 1.0 (.2, 5.2) | 1.00 | 2.7 (.3, 20.5) | 1.5 (.2, 10.5) |
| Adjusted[e] | 1.0 | 1.2 (.1, 14.5) | 4.3 (.4, 49.4) | 1.0 | 2.1 (.5, 8.6) | 2.2 (.3, 14.8) | 1.00 | 1.8 (.2, 20.9) | 2.4 (.2, 36.2) |
| Sun Exposure | | | | | | | | | |
| No | 25 | 18 | 13 | 34 | 28 | 5 | 18 | 5 | 5 |
| Yes | 21 | 13 | 9 | 24 | 20 | 15 | 5 | 2 | 6 |
| Unadjusted | 1.0 | .9 (.3, 2.2) | .8 (.3, 2.3) | 1.0 | 1.0 (.5, 2.2) | 4.3 (1.4, 13.3) | 1.0 | 1.4 (.2, 9.8) | 4.3 (.9, 20.3) |
| Adjusted[f] | 1.0 | .7 (.3, 1.9) | .9 (.3, 2.8) | 1.0 | .8 (.3, 1.8) | 3.4 (1.0, 11.4) | 1.0 | 1.5 (.2, 12.7) | 2.3 (.3, 16.0) |
| Supplement Use | | | | | | | | | |
| No | 17 | 8 | 7 | 34 | 26 | 9 | 15 | 5 | 9 |
| Yes | 29 | 23 | 15 | 24 | 22 | 11 | 8 | 2 | 2 |
| Unadjusted | 1.0 | 1.7 (.6, 4.6) | 1.3 (.4, 3.7) | 1.0 | 1.2 (.6, 2.6) | 1.7 (.6, 4.8) | 1.0 | .8 (.1, 4.8) | .4 (.1, 2.4) |
| Adjusted[g] | 1.0 | 1.6 (.6, 4.5) | 1.4 (.5, 4.1) | 1.0 | 1.0 (.4, 2.12 | 1.3 (.4, 3.9) | 1.0 | 1.1 (.1, 8.2) | .7 (.1, 5.08) |
| Weight | | | | | | | | | |
| No | 19 | 11 | 8 | 24 | 21 | 3 | 13 | 3 | 7 |
| Yes | 27 | 20 | 14 | 34 | 27 | 17 | 10 | 4 | 4 |
| Unadjusted | 1.0 | 1.3 (.5, 3.3) | 1.2 (.4, 3.5) | 1.0 | .9 (.4, 2.0) | 4.0 (1.1, 15.2) | 1.0 | 1.7 (.3, 9.6) | .7 (.2, 3.3) |
| Adjusted[h] | 1.0 | 1.3 (.5, 3.3) | 1.1 (.4, 3.1) | 1.0 | .8 (.3, 1.7) | 3.2 (.8, 12.3) | 1.0 | 2.0 (.3, 12.4) | .5 (.1, 2.7) |
| Any Positive Change | | | | | | | | | |
| No | 8 | 8 | 4 | 17 | 14 | 0 | 8 | 1 | 1 |
| Yes | 38 | 23 | 18 | 41 | 34 | 20 | 15 | 6 | 10 |
| Unadjusted | 1.0 | .6 (.2, 1.8) | 1.0 (.3, 3.6) | 1.0 | 1.0 (.4, 2.3) | 1.0 | 1.0 | 3.2 (.3, 31.4) | 5.3 (.6, 49.5) |
| Any Negative Change | | | | | | | | | |
| No | 23 | 21 | 11 | 36 | 22 | 12 | 16 | 3 | 8 |
| Yes | 23 | 10 | 11 | 22 | 26 | 8 | 7 | 4 | 3 |
| Unadjusted | 1.0 | .5 (.2, 1.2) | 1.0 (.4, 2.8) | 1.0 | 1.9 (.9, 4.2) | 1.1 (.4, 3.1) | 1.0 | 3.1 (.5, 17.4) | .9 (.2, 4.2) |
| Adjusted[i] | 1.0 | .5 (.2, 1.2) | .8 (.3, 2.3) | 1.0 | 1.8 (.8, 3.9) | .9 (.3, 2.6) | 1.0 | 3.7 (.6, 23.2) | 1.2 (.2, 6.9) |

**Table 8. Odds ratios of behavior change by distant perceived recurrence risk stratified by years since diagnosis: Breast Cancer Survivorship Study, 2008**

| | <5 years | | | 5-10 years | | | >10 years | | |
|---|---|---|---|---|---|---|---|---|---|
| | <10% | 10-30% | >30% | <10% | 10-30% | >30% | <10% | 10-30% | >30% |
| Any Change | | | | | | | | | |
| No | 0 | 1 | 1 | 5 | 3 | 2 | 3 | 2 | 0 |
| Yes | 26 | 37 | 34 | 38 | 45 | 33 | 17 | 9 | 10 |
| Unadjusted | 1.0 | 1.1 (.1, 18.1) | 1.0 | 1.0 | 2.0 (.4, 8.8) | 2.2 (.4, 11.9) | 1.0 | .8 (.1, 5.7) | 1.0 |
| Adjusted[a] | 1.0 | 1.1 (.1, 19.9) | 1.0 | 1.0 | 2.3 (.5, 10.6) | 1.8 (.3, 10.6) | 1.0 | .9 ( .1, 6.6) | 1.0 |
| Alcohol | | | | | | | | | |
| No | 23 | 31 | 27 | 35 | 40 | 28 | 18 | 10 | 10 |
| Yes | 3 | 7 | 8 | 8 | 8 | 7 | 2 | 1 | 0 |
| Unadjusted | 1.0 | 1.7 (.4, 7.4) | 2.3 (.5, 9.6) | 1.0 | .9 (.3, 2.6) | 1.1 (.4, 3.4) | 1.0 | .9 (.1, 11.2) | 1.0 |
| Adjusted[b] | 1.0 | 1.6 (.3, 8.2) | 2.2 (.5, 11.1) | 1.0 | 1.1 (.3, 3.4) | 1.2 (.3, 4.0) | 1.0 | 1.1 (0.0, 44.1) | 1.0 |
| Exercise | | | | | | | | | |
| No | 12 | 15 | 17 | 26 | 22 | 12 | 7 | 7 | 3 |
| Yes | 14 | 23 | 18 | 17 | 26 | 23 | 13 | 4 | 7 |
| Unadjusted | 1.0 | 1.3 (.5, 3.6) | .9 (.3, 2.5) | 1.0 | 1.8 (.8, 4.2) | 2.9 (1.2, 7.4) | 1.0 | .3 (.1, 1.4) | 1.3 (.2, 6.5) |
| Adjusted[c] | 1.0 | 1.3 (.4, 3.7) | .9 (.3, 2.7) | 1.0 | 1.8 (.8, 4.1) | 2.9 (1.1, 7.4) | 1.0 | .3 (.1, 1.4) | 1.1 (.2, 5.9) |
| Nutrition | | | | | | | | | |
| No | 11 | 16 | 19 | 24 | 25 | 11 | 12 | 8 | 1 |
| Yes | 15 | 22 | 16 | 19 | 23 | 24 | 8 | 3 | 9 |
| Unadjusted | 1.0 | 1.0 (.4, 2.8) | .6 (.2, 1.7) | 1.0 | 1.2 (.5, 2.7) | 2.8 (1.1, 7.0) | 1.0 | .6 (.1, 2.8) | 13.5 (1.4, 128.3) |
| Adjusted[d] | 1.0 | 1.0 (.4, 3.0) | .7 (.2, 1.9) | 1.0 | 1.0 (.4, 2.5) | 2.8 (1.1, 7.5) | 1.0 | .4 (.1, 2.4) | 13.4 (1.2, 145.2) |
| Smoking | | | | | | | | | |
| No | 24 | 35 | 31 | 39 | 41 | 30 | 18 | 8 | 8 |
| Yes | 2 | 3 | 4 | 4 | 7 | 5 | 2 | 3 | 2 |
| Unadjusted | 1.0 | 1.0 (.2, 6.6) | 1.6 (.3, 9.2) | 1.0 | 1.7 (.5, 6.1) | 1.6 (.4, 6.6) | 1.0 | 3.4 (.5, 24.3) | 2.3 (.3, 18.9) |
| Adjusted[e] | 1.0 | .6 (.1, 4.9) | 1.8 (.3, 11.1) | 1.0 | 1.6 (.4, 6.7) | 1.5 (.3, 6.7) | 1.0 | 5.1 (.1, 262.6) | 13.5 (.1, 1971.4) |
| Sun Exposure | | | | | | | | | |
| No | 16 | 21 | 19 | 29 | 25 | 13 | 15 | 8 | 5 |
| Yes | 10 | 17 | 16 | 14 | 23 | 22 | 5 | 3 | 5 |
| Unadjusted | 1.0 | 1.3 (.5, 3.6) | 1.4 (.5, 3.8) | 1.0 | 1.9 (.8, 4.5) | 3.5 (1.4, 8.9) | 1.0 | 1.1 (.2, 6.0) | 3.0 (.6, 14.9) |
| Adjusted[f] | 1.0 | 1.8 (.6, 5.7) | 1.9 (.6, 6.2) | 1.0 | 2.2 (.9, 5.5) | 3.4 (1.2, 9.7) | 1.0 | 2.8 (.3, 24.1) | 2.6 (.2, 27.6) |
| Supplement Use | | | | | | | | | |
| No | 10 | 10 | 12 | 23 | 29 | 17 | 14 | 9 | 6 |
| Yes | 15 | 28 | 23 | 20 | 19 | 18 | 6 | 2 | 4 |
| Unadjusted | 1.0 | 1.8 (.6, 5.1) | 1.2 (.4, 3.4) | 1.0 | .8 (.3, 1.7) | 1.2 (.5, 3.0) | 1.0 | .5 (.1, 3.2) | 1.6 (.3, 7.6) |
| Adjusted[g] | 1.0 | 1.7 (.6, 5.1) | 1.3 (.4, 3.8) | 1.0 | .7 (.3, 1.6) | 1.0 (.4, 2.5) | 1.0 | .2 (0.0, 2.1) | 2.9 (.4, 20.8) |
| Weight | | | | | | | | | |
| No | 11 | 14 | 13 | 22 | 19 | 7 | 10 | 8 | 5 |
| Yes | 15 | 24 | 22 | 21 | 29 | 28 | 10 | 3 | 5 |
| Unadjusted | 1.0 | 1.3 (.5, 3.5) | 1.2 (.4, 3.5) | 1.0 | 1.6 (.7, 3.7) | 4.2 (1.5, 11.6) | 1.0 | .4 (.1, 1.8) | 1.0 (.2, 4.6) |
| Adjusted[h] | 1.0 | 1.1 (.4, 3.2) | 1.1 (.4, 3.2) | 1.0 | 1.5 (.6, 3.5) | 3.4 (1.2, 9.8) | 1.0 | .5 (.1, 2.6) | .8 (.2, 4.2) |
| Any Positive Change | | | | | | | | | |
| No | 5 | 5 | 10 | 14 | 13 | 4 | 6 | 4 | 0 |
| Yes | 21 | 33 | 25 | 29 | 35 | 31 | 14 | 7 | 10 |
| Unadjusted | 1.0 | 1.6 (.4, 6.1) | .6 (.2, 2.0) | 1.0 | 1.3 (.5, 3.2) | 3.7 (1.1, 12.7) | 1.0 | .8 (.2, 3.6) | 1.0 |
| Any Negative Change | | | | | | | | | |
| No | 15 | 23 | 17 | 29 | 25 | 16 | 13 | 9 | 5 |
| Yes | 11 | 15 | 18 | 14 | 23 | 19 | 7 | 2 | 5 |
| Unadjusted | 1.0 | .9 (.3, 2.5) | 1.4 (.5, 2.5) | 1.0 | 1.9 (.8, 4.5) | 2.5 (1.0, 6.2) | 1.0 | .4 (.1, 2.5) | 1.9 (.4, 8.7) |
| Adjusted[i] | 1.00 | .7 (.3, 2.1) | 1.2 (.4, 3.5) | 1.0 | 1.7 (.7, 4.1) | 2.1 (.8, 5.4) | 1.0 | .4 (.1, 2.9) | 2.9 (.5, 15.9) |

**Table 9. Multinomial Regression for direction of Behavior Change, Local Perceived Recurrence Risk: Breast Cancer Survivorship Study, 2008**

| | N | No Change | N | Negative Change | | Adjusted | | P-Trend | N | Positive Change | | Adjusted | | P-Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OR | | OR | 95% CI | OR | 95% CI | | | OR | 95% CI | OR | 95% CI | |
| Alcohol | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 103 | 1.0 | 4 | 1.0 | | | | | 17 | 1.0 | | | | |
| 10-30% Recurrence Risk | 74 | 1.0 | 3 | 1.0 | (.23, 4.8) | 1.1 | (.2, 5.2) | | 9 | 0.7 | (.3, 1.7) | 0.6 | (.3, 1.6) | |
| >30% Recurrence Risk | 46 | 1.0 | 1 | 0.6 | (.06, 5.2) | 0.5 | (.04, 5.2) | 0.63 | 7 | 0.9 | (.4, 2.4) | 1.0 | (.4, 2.7) | 0.80 |
| Exercise | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 60 | 1.0 | 22 | 1.0 | | | | | 37 | 1.0 | | | | |
| 10-30% Recurrence Risk | 40 | 1.0 | 17 | 1.2 | (.6, 2.5) | 1.2 | (.5, 2.4) | | 28 | 1.1 | (.6, 2.1) | 1.1 | (.6, 2.1) | |
| >30% Recurrence Risk | 21 | 1.0 | 8 | 1.0 | (.4, 2.7) | 1.0 | (.4, 2.6) | 0.90 | 25 | 1.9 | (1.0, 3.9) | 1.9 | (.9, 3.9) | 0.10 |
| Nutrition | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 73 | 1.0 | 4 | 1.0 | | | | | 41 | 1.0 | | | | |
| 10-30% Recurrence Risk | 37 | 1.0 | 4 | 2.0 | (.5, 8.3 | 2.2 | (.5, 9.6) | | 40 | 1.9 | (1.1, 3.5) | 2.1 | (1.1, 3.8) | |
| >30% Recurrence Risk | 17 | 1.0 | 2 | 2.2 | (.4, 12.7) | 2.4 | (.4, 14.2) | 0.26 | 35 | 3.7 | (1.9, 7.4) | 4.0 | (1.9, 8.2) | 0.00 |
| Smoking | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 114 | 1.0 | 1 | 1.0 | | | | | 9 | 1.0 | | | | |
| 10-30% Recurrence Risk | 74 | 1.0 | 1 | 1.5 | (.1, 25.0) | 3.6 | (.1, 91.8) | | 10 | 1.7 | (.7, 4.4) | 2.1 | (.7, 6.3) | |
| >30% Recurrence Risk | 47 | 1.0 | 2 | 4.9 | (.4, 54.8) | 21.4 | (.7, 654.1) | 0.08 | 5 | 1.4 | (.4, 4.2) | 2.6 | (.7, 9.6) | 0.13 |
| Sun Exposure | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 77 | 1.0 | 5 | 1.0 | | | | | 42 | 1.0 | | | | |
| 10-30% Recurrence Risk | 51 | 1.0 | 1 | 0.3 | (.03, 2.7) | 0.2 | (.03, 2.1) | | 31 | 1.1 | (.6, 2.0) | 0.9 | (.5, 1.7) | |
| >30% Recurrence Risk | 24 | 1.0 | 2 | 1.3 | (.2, 7.0) | 1.1 | (.2, 6.6) | 0.80 | 26 | 2.0 | (1.0 3.9) | 1.7 | (.8, 3.6) | 0.20 |
| Supplement Use | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 66 | 1.0 | 12 | 1.0 | | | | | 40 | 1.0 | | | | |
| 10-30% Recurrence Risk | 39 | 1.0 | 5 | 0.7 | (.2, 2.2) | 0.6 | (.2, 1.8) | | 35 | 1.5 | (.8, 2.7) | 1.3 | (.7, 2.6) | |
| >30% Recurrence Risk | 25 | 1.0 | 1 | 0.2 | (.03, 1.8) | 0.2 | (.02, 1.7) | 0.09 | 21 | 1.4 | (.7, 2.8) | 1.5 | (.7, 3.2) | 0.29 |
| Weight | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 56 | 1.0 | 37 | 1.0 | | | | | 25 | 1.0 | | | | |
| 10-30% Recurrence Risk | 35 | 1.0 | 33 | 1.4 | (.8, 2.7) | 1.3 | (.7, 2.5) | | 14 | 0.9 | (.4, 2.0) | 0.9 | (.4, 1.9) | |
| >30% Recurrence Risk | 18 | 1.0 | 18 | 1.5 | (.7, 3.3) | 1.2 | (.6, 2.8) | 0.52 | 14 | 1.7 | (.8, 4.1) | 1.6 | (.7, 3.7) | 0.42 |

a) adjusted for smoking status, income, alcohol use, and age
b) adjusted for age
c) adjusted for age and alcohol use
d) adjusted for age, smoking status, and race
e) adjusted for stage of cancer, radiation treatment, and chemotherapy treatment
f) adjusted for education, years since diagnosis, and lymph node involvement
g) adjusted for alcohol use, years since diagnosis, and chemotherapy treatment

**Table 10. Multinomial Regression for direction of Behavior Change, Distant Perceived Recurrence Risk: Breast Cancer Survivorship Study, 2008**

| | N | No Change | N | Negative Change | | Adjusted | | P-Trend | N | Positive Change | | Adjusted | | P-Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OR | | OR | 95% CI | OR | 95% CI | | | OR | 95% CI | OR | 95% CI | |
| Alcohol[a] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 76 | 1.0 | 1 | 1.0 | | | | | 10 | 1.0 | | | | |
| 10-30% Recurrence Risk | 81 | 1.0 | 2 | 1.9 | (.2, 21.1) | 1.8 | (.2, 21.2) | | 13 | 1.2 | (.5, 3.0) | 1.09 | (.4, 2.7) | |
| >30% Recurrence Risk | 66 | 1.0 | 5 | 5.8 | (.7, 50.5) | 5.4 | (.6, 50.6) | 0.10 | 10 | 1.2 | (.5, 2.9) | 0.96 | (.4, 2.6) | 0.95 |
| Exercise[b] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 45 | 1.0 | 12 | 1.0 | | | | | 26 | 1.0 | | | | |
| 10-30% Recurrence Risk | 44 | 1.0 | 19 | 1.6 | (.7, 3.7) | 1.5 | (.6, 3.5) | | 31 | 1.2 | (.6, 2.4) | 1.16 | (.6, 2.3) | |
| >30% Recurrence Risk | 32 | 1.0 | 16 | 1.9 | (.8, 4.5) | 1.8 | (.7, 4.3) | 0.21 | 33 | 1.8 | (.9, 3.5) | 1.72 | (.9, 3.4) | 0.12 |
| Nutrition[c] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 47 | 1.0 | 0 | 1.0 | | | | | 33 | 1.0 | | | | |
| 10-30% Recurrence Risk | 49 | 1.0 | 5 | 277824.0 | | 3361584.0 | | | 40 | 1.2 | (.6, 2.1) | 1.10 | (.6, 2.1) | |
| >30% Recurrence Risk | 31 | 1.0 | 5 | 439140.0 | | 5872987.0 | | *0.03* | 43 | 2.0 | (1.0, 3.8) | 2.02 | (1.0, 3.9) | 0.05 |
| Smoking[d] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 81 | 1.0 | 1 | 1.0 | | | | | 6 | 1.0 | | | | |
| 10-30% Recurrence Risk | 84 | 1.0 | 1 | 1.0 | (.1, 15.7) | 1.6 | (.1, 37.2) | | 9 | 1.5 | (.5, 4.3) | 1.39 | (.3, 5.7) | |
| >30% Recurrence Risk | 70 | 1.0 | 2 | 2.3 | (.2, 26.1) | 1.1 | (0.0, 33.3) | 0.94 | 9 | 1.7 | (.6, 5.1) | 2.20 | (.5, 8.9) | 0.26 |
| Sun Exposure[e] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 60 | 1.0 | 0 | 1.0 | | | | | 27 | 1.0 | | | | |
| 10-30% Recurrence Risk | 54 | 1.0 | 6 | 5107638.0 | | 1.01 E07 | | | 34 | 1.4 | (.7, 2.6) | 1.90 | (.9, 3.8) | |
| >30% Recurrence Risk | 38 | 1.0 | 2 | 2418342.0 | | 882898.8 | | 0.35 | 38 | 2.2 | (1.2, 4.2) | 2.52 | (1.2, 5.2) | 0.01 |
| Supplement Use[f] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 47 | 1.0 | 6 | 1.0 | | | | | 28 | 1.0 | | | | |
| 10-30% Recurrence Risk | 48 | 1.0 | 6 | 1.0 | (.3, 3.3) | 0.7 | (.2, 2.4) | | 37 | 1.3 | (.7, 2.4) | 0.99 | (.5, 2.0) | |
| >30% Recurrence Risk | 35 | 1.0 | 6 | 1.3 | (.4, 4.6) | 0.9 | (.3, 3.4) | 0.92 | 31 | 1.5 | (.8, 2.9) | 1.18 | (.6, 2.5) | 0.67 |
| Weight[g] | | | | | | | | | | | | | | |
| 0-10% Recurrence Risk | 43 | 1.0 | 25 | 1.0 | | | | | 16 | 1.0 | | | | |
| 10-30% Recurrence Risk | 41 | 1.0 | 31 | 1.3 | (.7, 2.6) | 1.1 | (.5, 2.2) | | 19 | 1.3 | (.6, 2.8) | 1.13 | (.5, 2.5) | |
| >30% Recurrence Risk | 25 | 1.0 | 32 | 2.2 | (1.1, 4.5) | 1.6 | (.8, 3.5) | 0.22 | 18 | 1.9 | (.8, 4.5) | 1.64 | (.7, 3.9) | 0.28 |

a) adjusted for smoking status, alcohol use, and age
b) adjusted for age
c) adjusted for age and alcohol use
d) adjusted for race, alcohol use, smoking status, lymph node involvement, and pr status
e) adjusted for family history, stage of cancer, chemotherapy treatment, radiation treatment, and pr status
f) adjusted for education, years since diagnosis, and lymph node involvement
g) adjusted for alcohol use, years since diagnosis, and chemotherapy treatment

**Table 11. Concordance of distant perceived recurrence risk (n=267), Breast Cancer Survivorship Study, 2008**

| | N | % |
|---|---|---|
| Accurate | 98 | 37.1 |
| Overestimated | 104 | 39.4 |
| Underestimated | 62 | 23.5 |

**Table 12. Frequency and odds ratios of behavior change by concordance: Breast Cancer Survivorship Study, 2008**

| | Accurate | Overestimate | Underestimate |
|---|---|---|---|
| Any Change | | | |
| No | 5 | 4 | 8 |
| Yes | 93 | 100 | 54 |
| Unadjusted | 1.0 | 1.3 (.4, 5.2) | .4 (.1, 1.2) |
| Adjusted[a] | 1.0 | 1.5 (.4, 5.6) | .4 (.1, 1.4) |
| Alcohol | | | |
| No | 85 | 81 | 54 |
| Yes | 13 | 23 | 8 |
| Unadjusted | 1.0 | 1.9 (.9, 3.9) | 1.0 (.4, 2.5) |
| Adjusted[b] | 1.0 | 1.9 (.8, 4.2) | 1.2 (.4, 3.2) |
| Exercise | | | |
| No | 46 | 44 | 30 |
| Yes | 52 | 60 | 32 |
| Unadjusted | 1.0 | 1.2 (.7, 2.1) | .9 (.5, 1.8) |
| Adjusted[c] | 1.0 | 1.2 (.7, 2.1) | 1.0 (.5, 2.0) |
| Nutrition | | | |
| No | 46 | 48 | 32 |
| Yes | 52 | 56 | 30 |
| Unadjusted | 1.0 | 1.0 (.6, 1.8) | .8 (.4, 1.6) |
| Adjusted[d] | 1.0 | 1.0 (.6, 1.8) | .8 (.4, 1.6) |
| Smoking | | | |
| No | 86 | 91 | 55 |
| Yes | 12 | 13 | 7 |
| Unadjusted | 1.0 | 1.0 (.4, 2.4) | .9 (.3, 2.5) |
| Adjusted[e] | 1.0 | 1.0 (.3, 2.9) | .8 (.2, 3.0) |
| Sun Exposure | | | |
| No | 55 | 55 | 41 |
| Yes | 43 | 49 | 21 |
| Unadjusted | 1.0 | 1.1 (.7, 2.0) | .7 (.3, 1.3) |
| Adjusted[f] | 1.0 | 1.4 (.8, 2.5) | .5 (.2, 1.0) |
| Supplement Use | | | |
| No | 50 | 46 | 32 |
| Yes | 48 | 58 | 30 |
| Unadjusted | 1.0 | 1.3 (.8, 2.3) | 1.0 (.5, 1.8) |
| Adjusted[g] | 1.0 | 1.1 (.6, 2.0) | 1.1 (.5, 2.2) |
| Weight | | | |
| No | 40 | 38 | 30 |
| Yes | 58 | 66 | 32 |
| Unadjusted | 1.0 | 1.2 (.7, 2.1) | .7 (.4, 1.4) |
| Adjusted[h] | 1.0 | 1.1 (.6, 2.0) | .7 (.4, 1.5) |
| Any Positive Change | | | |
| No | 22 | 19 | 20 |
| Yes | 76 | 85 | 42 |
| Unadjusted | 1.0 | 1.3 (.7, 2.6) | .6 (3, 1.2) |
| Any Negative Change | | | |
| No | 52 | 59 | 40 |
| Yes | 46 | 45 | 22 |
| Unadjusted | 1.0 | .9 (.5, 1.5) | .6 (.3, 1.2) |
| Adjusted[i] | 1.0 | .9 (.5, 1.6) | .6 (.3, 1.1) |

a) adjusted for family history of cancer (1st degree) and surgical treatment
b) adjusted for smoking status, income, alcohol use, and age
c) adjusted for age
d) adjusted for age and alcohol use
e) adjusted for age, smoking status, and race
f) adjusted for stage of cancer and chemotherapy treatment
g) adjusted for education, years since diagnosis, and lymph node involvement
h) adjusted for alcohol use, years since diagnosis, and chemotherapy treatment
i) adjusted for stage of cancer and chemotherapy treatment

**Table 13. Multinomial Regression for direction of Behavior Change, concordance: Breast Cancer Survivorship Study, 2008**

| | N | No Change | N | Negative Change | | Adjusted | | N | Positive Change | | Adjusted | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OR | | OR | 95% CI | OR | 95% CI | | OR | 95% CI | OR | 95% CI |
| Alcohol[a] | | | | | | | | | | | | |
| Accurate | 85 | 1.0 | 1 | 1.0 | | 1.0 | | 10 | 1.0 | | 1.0 | |
| Overestimate | 81 | 1.0 | 6 | 6.3 | (.7, 53.4) | 5.9 | (.7, 52.2) | 17 | 1.8 | (.8, 4.1) | 1.7 | (.7, 4.0) |
| Underestimate | 54 | 1.0 | 1 | 1.6 | (.1, 25.7) | 1.5 | (.1, 25.3) | 6 | 0.9 | (.3, 2.7) | 1.0 | (.3, 3.0) |
| Exercise[b] | | | | | | | | | | | | |
| Accurate | 46 | 1.0 | 17 | 1.0 | | 1.0 | | 32 | 1.0 | | 1.0 | |
| Overestimate | 44 | 1.0 | 17 | 1.0 | (.5, 2.3) | 1.1 | (.5, 2.3) | 42 | 1.4 | (.7, 2.5) | 1.4 | (.7, 2.6) |
| Underestimate | 30 | 1.0 | 12 | 1.1 | (.5, 2.6) | 1.2 | (.5, 2.9) | 15 | 0.7 | (.3, 1.5) | 0.8 | (.4, 1.7) |
| Nutrition[c] | | | | | | | | | | | | |
| Accurate | 46 | 1.0 | 6 | 1.0 | | 1.0 | | 42 | 1.0 | | 1.0 | |
| Overestimate | 48 | 1.0 | 4 | 0.6 | (.2, 2.4) | 0.6 | (.2, 2.3) | 50 | 1.1 | (.6, 2.0) | 1.1 | (.6, 2.0) |
| Underestimate | 32 | 1.0 | 0 | 2.20 E07 | | 3.58 E07 | | 22 | 0.8 | (.4, 1.5) | 0.7 | (.4, 1.5) |
| Smoking[d] | | | | | | | | | | | | |
| Accurate | 86 | 1.0 | 1 | 1.0 | | 1.0 | | 8 | 1.0 | | 1.0 | |
| Overestimate | 91 | 1.0 | 2 | 1.9 | (.2, 21.2) | 0.5 | (.02, 12.1) | 11 | 1.3 | (.5, 3.4) | 1.2 | (.4, 4.2) |
| Underestimate | 55 | 1.0 | 1 | 1.6 | (.1, 25.5) | 2.1 | (.1, 63.1) | 5 | 1.0 | (.3, 3.1) | 1.0 | (.2, 4.4) |
| Sun Exposure[e] | | | | | | | | | | | | |
| Accurate | 55 | 1.0 | 4 | 1.0 | | 1.0 | | 36 | 1.0 | | 1.0 | |
| Overestimate | 55 | 1.0 | 4 | 1.0 | (.2, 4.2) | 0.9 | (.2, 4.4) | 43 | 1.2 | (.7, 2.1) | 1.5 | (.8, 2.8) |
| Underestimate | 41 | 1.0 | 0 | 7.13 E07 | | 2.75 E07 | | 18 | 0.7 | (.3, 1.3) | 0.5 | (.2, 1.1) |
| Supplement Use[f] | | | | | | | | | | | | |
| Accurate | 50 | 1.0 | 5 | 1.0 | | 1.0 | | 31 | 1.0 | | 1.0 | |
| Overestimate | 46 | 1.0 | 8 | 1.7 | (.5, 5.7) | 1.5 | (.4, 5.2) | 42 | 1.5 | (.8, 2.7) | 1.2 | (.6, 2.4) |
| Underestimate | 32 | 1.0 | 5 | 1.6 | (.4, 5.8) | 2.0 | (.5, 7.7) | 22 | 1.1 | (.5, 2.2) | 1.3 | (.6, 2.9) |
| Weight[g] | | | | | | | | | | | | |
| Accurate | 40 | 1.0 | 36 | 1.0 | | 1.0 | | 18 | 1.0 | | 1.0 | |
| Overestimate | 38 | 1.0 | 35 | 1.0 | (.5, 1.9) | 1.0 | (.5, 1.9) | 24 | 1.4 | (.7, 3.0) | 1.2 | (.6, 2.7) |
| Underestimate | 30 | 1.0 | 17 | 0.6 | (.3, 1.3) | 0.6 | (.3, 1.4) | 10 | 0.7 | (.3, 1.8) | 0.8 | (.3, 1.9) |

a) adjusted for smoking status, income, alcohol use, and age
b) adjusted for age
c) adjusted for age and alcohol use
d) adjusted for age, smoking status, and race
e) adjusted for stage of cancer, radiation treatment, and chemotherapy treatment
f) adjusted for education, years since diagnosis, and lymph node involvement
g) adjusted for alcohol use, years since diagnosis, and chemotherapy treatment

# APPENDICES

## APPENDIX A

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE IN ALCOHOL: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | Change in Alcohol | | No Change in Alcohol | | P-Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 55.8 | 9.1 | 60.4 | 9.5 | 0.00 |
| | N | % | N | % | |
| Race | | | | | 0.19 |
| Non-White | 5 | 11.4 | 13 | 5.8 | |
| White | 39 | 88.6 | 210 | 94.2 | |
| Socioeconomic status | | | | | 0.16 |
| <$25,000/year | 11 | 25.0 | 32 | 14.4 | |
| 25,000-50,000/year | 6 | 13.6 | 58 | 26.0 | |
| 50,000-100,000/year | 14 | 31.8 | 73 | 32.7 | |
| >100,000/year | 12 | 27.3 | 46 | 20.6 | |
| Missing | 1 | 2.3 | 14 | 6.3 | |
| Educational Level | | | | | 0.86 |
| High School or less | 13 | 29.6 | 74 | 33.2 | |
| College | 18 | 40.9 | 82 | 36.8 | |
| Post-graduate | 13 | 29.6 | 67 | 30.0 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.56 |
| None | 29 | 65.9 | 160 | 71.8 | |
| One or more | 15 | 34.1 | 62 | 27.8 | |
| Missing | 0 | 0.0 | 1 | 0.5 | |
| Alcohol Consumption | | | | | 0.02 |
| None | 4 | 9.1 | 45 | 20.2 | |
| Rare | 23 | 52.3 | 135 | 60.5 | |
| >1 Drink/day | 15 | 34.1 | 41 | 18.4 | |
| Missing | 2 | 4.6 | 2 | 0.9 | |
| Smoking History | | | | | 0.33 |
| Current Smoker | 3 | 6.8 | 11 | 4.9 | |
| Past Smoker | 27 | 61.4 | 108 | 48.4 | |
| Never Smoked | 14 | 31.8 | 100 | 44.8 | |
| Missing | 0 | 0.0 | 4 | 1.8 | |
| Stage of cancer | | | | | 0.43 |
| Stage I | 17 | 38.6 | 109 | 48.9 | |
| Stage II | 24 | 54.6 | 91 | 40.8 | |
| Stage III | 3 | 6.8 | 21 | 9.4 | |
| Missing | 0 | 0.0 | 2 | 0.9 | |
| Years Since Diagnosis | | | | | 0.35 |
| <5 years | 18 | 40.9 | 81 | 36.3 | |
| 5-10 years | 23 | 52.3 | 103 | 46.2 | |
| >10 years | 3 | 6.8 | 38 | 17.0 | |
| Missing | 0 | 0.0 | 1 | 0.5 | |
| Lymph Node Involvement | | | | | 0.68 |
| No | 29 | 65.9 | 148 | 66.4 | |
| Yes | 15 | 34.1 | 68 | 30.5 | |
| Missing | 0 | 0.0 | 7 | 3.1 | |
| Surgical Treatment | | | | | 0.73 |
| Lumpectomy | 27 | 61.4 | 145 | 65.0 | |
| Mastectomy | 17 | 38.6 | 78 | 35.0 | |
| Chemotherapy | | | | | |
| No | 12 | 27.3 | 96 | 43.1 | 0.14 |
| Yes | 32 | 72.7 | 126 | 56.5 | |
| Missing | 0 | 0.0 | 1 | 0.5 | |

| | | | | | |
|---|---|---|---|---|---|
| Hormonal Treatment | | | | | 0.91 |
| No | 9 | 20.5 | 43 | 19.3 | |
| Yes | 35 | 79.6 | 177 | 79.4 | |
| Missing | 0 | 0.0 | 3 | 1.4 | |
| Radiation Treatment | | | | | *0.09* |
| Negative | 11 | 25.0 | 57 | 25.6 | |
| Positive | 33 | 75.0 | 154 | 69.1 | |
| Missing | 0 | 0.0 | 12 | 5.4 | |
| ER Status | | | | | 0.87 |
| Negative | 9 | 20.5 | 39 | 17.5 | |
| Positive | 34 | 77.3 | 179 | 80.3 | |
| Missing | 1 | 2.3 | 5 | 2.2 | |
| PR Status | | | | | 0.35 |
| Negative | 11 | 25.0 | 57 | 25.6 | |
| Positive | 33 | 75.0 | 154 | 69.1 | |
| Missing | 0 | 0.0 | 12 | 5.4 | |
| Local Perceived Recurrence Risk | | | | | 0.65 |
| 0-10% | 24 | 54.6 | 103 | 46.2 | |
| 10-30% | 12 | 27.3 | 74 | 33.2 | |
| >30% | 8 | 18.2 | 46 | 20.6 | |
| Distant Perceived Recurrence Risk | | | | | 0.82 |
| 0-10% | 13 | 29.6 | 76 | 34.1 | |
| 10-30% | 16 | 36.4 | 81 | 36.3 | |
| >30% | 15 | 34.1 | 66 | 29.6 | |
| Adjuvant! Online Risk Score | | | | | 0.33 |
| 0-10% | 21 | 47.7 | 74 | 33.2 | |
| 10-30% | 20 | 45.5 | 122 | 54.7 | |
| >30% | 3 | 6.8 | 24 | 10.8 | |
| Missing | 0 | 0.0 | 3 | 1.4 | |

## APPENDIX B

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE IN EXERCISE: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | **Change in Exercise** | | **No Change in Exercise** | | **P-Value** |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 58.4 | 9.2 | 61.2 | 9.8 | 0.01 |
| | N | % | N | % | |
| Race | | | | | 0.34 |
| Non-White | 12 | 8.2 | 6 | 5.0 | |
| White | 134 | 91.8 | 115 | 95.0 | |
| Socioeconomic status | | | | | *0.08* |
| <$25,000/year | 21 | 14.4 | 22 | 18.2 | |
| 25,000-50,000/year | 32 | 21.9 | 32 | 26.5 | |
| 50,000-100,000/year | 43 | 29.5 | 44 | 36.4 | |
| >100,000/year | 41 | 28.1 | 17 | 14.1 | |
| Missing | 9 | 6.2 | 6 | 5.0 | |
| Educational Level | | | | | 0.30 |
| High School or less | 43 | 29.5 | 44 | 36.4 | |
| College | 54 | 37.0 | 46 | 38.0 | |
| Post-graduate | 49 | 33.6 | 31 | 25.6 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.20 |
| None | 98 | 67.1 | 91 | 75.2 | |
| One or more | 47 | 32.2 | 30 | 24.8 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Alcohol Consumption | | | | | 0.94 |
| None | 25 | 17.1 | 24 | 19.8 | |
| Rare | 87 | 59.6 | 71 | 58.7 | |
| >1 Drink/day | 32 | 21.9 | 24 | 19.8 | |
| Missing | 2 | 1.4 | 2 | 1.7 | |
| Smoking History | | | | | 0.75 |
| Current Smoker | 8 | 5.5 | 6 | 5.0 | |
| Past Smoker | 70 | 48.0 | 65 | 53.7 | |
| Never Smoked | 65 | 44.5 | 49 | 40.5 | |
| Missing | 3 | 2.1 | 1 | 0.8 | |
| Stage of cancer | | | | | 0.97 |
| Stage I | 69 | 47.3 | 57 | 47.1 | |
| Stage II | 62 | 42.5 | 53 | 43.8 | |
| Stage III | 14 | 9.6 | 10 | 8.3 | |
| Missing | 1 | 0.7 | 1 | 0.8 | |
| Years Since Diagnosis | | | | | 0.85 |
| <5 years | 55 | 37.7 | 44 | 36.4 | |
| 5-10 years | 66 | 45.2 | 60 | 49.6 | |
| >10 years | 24 | 16.4 | 17 | 14.1 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Lymph Node Involvement | | | | | 0.91 |
| No | 95 | 65.1 | 82 | 67.8 | |
| Yes | 47 | 32.2 | 36 | 29.8 | |
| Missing | 4 | 2.7 | 3 | 2.5 | |
| Surgical Treatment | | | | | 0.80 |
| Lumpectomy | 93 | 63.7 | 79 | 65.3 | |
| Mastectomy | 53 | 36.3 | 42 | 34.7 | |
| Chemotherapy | | | | | 0.95 |
| No | 58 | 39.7 | 50 | 41.3 | |
| Yes | 87 | 59.6 | 71 | 58.7 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |

| | | | | | |
|---|---|---|---|---|---|
| Hormonal Treatment | | | | | 0.95 |
| No | 29 | 19.9 | 23 | 19.0 | |
| Yes | 115 | 78.8 | 97 | 80.2 | |
| Missing | 2 | 1.4 | 1 | 0.8 | |
| Radiation Treatment | | | | | 0.65 |
| Negative | 38 | 26.0 | 30 | 24.8 | |
| Positive | 99 | 67.8 | 88 | 72.7 | |
| Missing | 9 | 6.2 | 3 | 2.5 | |
| ER Status | | | | | 0.39 |
| Negative | 25 | 17.1 | 23 | 19.0 | |
| Positive | 116 | 79.5 | 97 | 80.2 | |
| Missing | 5 | 3.4 | 1 | 0.8 | |
| PR Status | | | | | 0.35 |
| Negative | 38 | 26.0 | 30 | 24.8 | |
| Positive | 99 | 67.8 | 88 | 72.7 | |
| Missing | 9 | 6.2 | 3 | 2.5 | |
| Local Perceived Recurrence Risk | | | | | 0.60 |
| 0-10% | 67 | 45.9 | 60 | 49.6 | |
| 10-30% | 46 | 31.5 | 40 | 33.1 | |
| >30% | 33 | 22.6 | 21 | 17.4 | |
| Distant Perceived Recurrence Risk | | | | | 0.36 |
| 0-10% | 44 | 30.1 | 45 | 37.2 | |
| 10-30% | 53 | 36.3 | 44 | 36.4 | |
| >30% | 49 | 33.6 | 32 | 26.5 | |
| Adjuvant! Online Risk Score | | | | | 0.73 |
| 0-10% | 49 | 33.6 | 46 | 38.0 | |
| 10-30% | 78 | 53.4 | 64 | 52.9 | |
| >30% | 17 | 11.6 | 10 | 8.3 | |
| Missing | 2 | 1.4 | 1 | 0.8 | |

## APPENDIX C

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE NUTRITION: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | Change in Nutrition | | No Change in Nutrition | | P-Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 58.3 | 8.6 | 61.2 | 10.4 | 0.01 |
| | N | % | N | % | |
| Race | | | | | 0.48 |
| Non-White | 11 | 7.9 | 7 | 5.5 | |
| White | 129 | 92.1 | 120 | 94.5 | |
| Socioeconomic status | | | | | 0.78 |
| <$25,000/year | 26 | 18.6 | 17 | 13.4 | |
| 25,000-50,000/year | 31 | 22.1 | 33 | 26.0 | |
| 50,000-100,000/year | 46 | 32.9 | 41 | 32.3 | |
| >100,000/year | 30 | 21.4 | 28 | 22.1 | |
| Missing | 7 | 5.0 | 8 | 6.3 | |
| Educational Level | | | | | 0.55 |
| High School or less | 48 | 34.3 | 39 | 30.7 | |
| College | 48 | 34.3 | 52 | 40.9 | |
| Post-graduate | 44 | 31.4 | 36 | 28.4 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.25 |
| None | 94 | 67.1 | 95 | 74.8 | |
| One or more | 45 | 32.1 | 32 | 25.2 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Alcohol Consumption | | | | | 0.20 |
| None | 30 | 21.4 | 19 | 15.0 | |
| Rare | 85 | 60.7 | 73 | 57.5 | |
| >1 Drink/day | 23 | 16.4 | 33 | 26.0 | |
| Missing | 2 | 1.4 | 2 | 1.6 | |
| Smoking History | | | | | 0.90 |
| Current Smoker | 7 | 5.0 | 7 | 5.5 | |
| Past Smoker | 68 | 48.6 | 67 | 52.8 | |
| Never Smoked | 63 | 45.0 | 51 | 40.2 | |
| Missing | 2 | 1.4 | 2 | 1.6 | |
| Stage of cancer | | | | | 0.56 |
| Stage I | 64 | 45.7 | 62 | 48.8 | |
| Stage II | 63 | 45.0 | 52 | 40.9 | |
| Stage III | 13 | 9.3 | 11 | 8.7 | |
| Missing | 0 | 0.0 | 2 | 1.6 | |
| Years Since Diagnosis | | | | | 0.93 |
| <5 years | 53 | 37.9 | 46 | 36.2 | |
| 5-10 years | 66 | 47.1 | 60 | 47.2 | |
| >10 years | 20 | 14.3 | 21 | 16.5 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Lymph Node Involvement | | | | | 0.80 |
| No | 95 | 67.9 | 82 | 64.6 | |
| Yes | 42 | 30.0 | 41 | 32.3 | |
| Missing | 3 | 2.1 | 4 | 3.2 | |
| Surgical Treatment | | | | | 0.90 |
| Lumpectomy | 91 | 65.0 | 81 | 63.8 | |
| Mastectomy | 49 | 35.0 | 46 | 36.2 | |
| Chemotherapy | | | | | 0.12 |
| No | 50 | 35.7 | 58 | 45.7 | |
| Yes | 89 | 63.6 | 69 | 54.3 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |

| | | | | | |
|---|---|---|---|---|---|
| Hormonal Treatment | | | | | 0.69 |
| No | 29 | 20.7 | 23 | 18.1 | |
| Yes | 110 | 78.6 | 102 | 80.3 | |
| Missing | 1 | 0.7 | 2 | 1.6 | |
| Radiation Treatment | | | | | 0.58 |
| Negative | 38 | 27.1 | 30 | 23.6 | |
| Positive | 96 | 68.6 | 91 | 71.7 | |
| Missing | 6 | 4.3 | 6 | 4.7 | |
| ER Status | | | | | 0.82 |
| Negative | 26 | 18.6 | 22 | 17.3 | |
| Positive | 110 | 78.6 | 103 | 81.1 | |
| Missing | 4 | 2.9 | 2 | 1.6 | |
| PR Status | | | | | 0.81 |
| Negative | 38 | 27.1 | 30 | 23.6 | |
| Positive | 96 | 68.6 | 91 | 71.7 | |
| Missing | 6 | 4.3 | 6 | 4.7 | |
| Local Perceived Recurrence Risk | | | | | 0.00 |
| 0-10% | 54 | 38.6 | 73 | 57.5 | |
| 10-30% | 49 | 35.0 | 37 | 29.1 | |
| >30% | 37 | 26.4 | 17 | 13.4 | |
| Distant Perceived Recurrence Risk | | | | | 0.12 |
| 0-10% | 42 | 30.0 | 47 | 37.0 | |
| 10-30% | 48 | 34.3 | 49 | 38.6 | |
| >30% | 50 | 35.7 | 31 | 24.4 | |
| Adjuvant! Online Risk Score | | | | | 0.32 |
| 0-10% | 43 | 30.7 | 52 | 40.9 | |
| 10-30% | 81 | 57.9 | 61 | 48.0 | |
| >30% | 14 | 10.0 | 13 | 10.2 | |
| Missing | 2 | 1.4 | 1 | 0.8 | |

## APPENDIX D

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE IN SMOKING: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | Change in Smoking | | No Change in Smoking | | P-Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 57.1 | 7.7 | 60.0 | 9.8 | 0.10 |
| | N | % | N | % | |
| Race | | | | | 0.01 |
| Non-White | 6 | 18.8 | 12 | 5.1 | |
| White | 26 | 81.3 | 223 | 94.9 | |
| Socioeconomic status | | | | | 0.11 |
| <$25,000/year | 10 | 31.3 | 33 | 14.0 | |
| 25,000-50,000/year | 4 | 12.5 | 60 | 25.5 | |
| 50,000-100,000/year | 9 | 28.1 | 78 | 33.2 | |
| >100,000/year | 8 | 25.0 | 50 | 21.3 | |
| Missing | 1 | 3.1 | 14 | 6.0 | |
| Educational Level | | | | | 0.61 |
| High School or less | 13 | 40.6 | 74 | 31.5 | |
| College | 11 | 34.4 | 89 | 37.9 | |
| Post-graduate | 8 | 25.0 | 72 | 30.6 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.48 |
| None | 25 | 78.1 | 164 | 69.8 | |
| One or more | 7 | 21.9 | 70 | 29.8 | |
| Missing | 0 | 0.0 | 1 | 0.4 | |
| Alcohol Consumption | | | | | 0.27 |
| None | 3 | 9.4 | 46 | 19.6 | |
| Rare | 19 | 59.4 | 139 | 59.2 | |
| >1 Drink/day | 9 | 28.1 | 47 | 20.0 | |
| Missing | 1 | 3.1 | 3 | 1.3 | |
| Smoking History | | | | | 0.00 |
| Current Smoker | 10 | 31.3 | 4 | 1.7 | |
| Past Smoker | 22 | 68.8 | 113 | 48.1 | |
| Never Smoked | 0 | 0.0 | 114 | 48.5 | |
| Missing | 0 | 0.0 | 4 | 1.7 | |
| Stage of cancer | | | | | 0.07 |
| Stage I | 9 | 28.1 | 117 | 49.8 | |
| Stage II | 18 | 56.3 | 97 | 41.3 | |
| Stage III | 5 | 15.6 | 19 | 8.1 | |
| Missing | 0 | 0.0 | 2 | 0.9 | |
| Years Since Diagnosis | | | | | 0.46 |
| <5 years | 9 | 28.1 | 90 | 38.3 | |
| 5-10 years | 16 | 50.0 | 110 | 46.8 | |
| >10 years | 7 | 21.9 | 34 | 14.5 | |
| Missing | 0 | 0.0 | 1 | 0.4 | |
| Lymph Node Involvement | | | | | 0.02 |
| No | 15 | 46.9 | 162 | 68.9 | |
| Yes | 15 | 46.9 | 68 | 28.9 | |
| Missing | 2 | 6.3 | 5 | 2.1 | |
| Surgical Treatment | | | | | 0.70 |
| Lumpectomy | 22 | 68.8 | 150 | 63.8 | |
| Mastectomy | 10 | 31.3 | 85 | 36.2 | |
| Chemotherapy | | | | | 0.17 |
| No | 8 | 25.0 | 100 | 42.6 | |
| Yes | 24 | 75.0 | 134 | 57.0 | |
| Missing | 0 | 0.0 | 1 | 0.4 | |

| | | | | | |
|---|---|---|---|---|---|
| Hormonal Treatment | | | | | 0.76 |
| No | 5 | 15.6 | 47 | 20.0 | |
| Yes | 27 | 84.8 | 185 | 78.7 | |
| Missing | 0 | 0.0 | 3 | 1.3 | |
| Radiation Treatment | | | | | 1.00 |
| No | 7 | 21.9 | 50 | 21.3 | |
| Yes | 25 | 78.1 | 183 | 77.9 | |
| Missing | 0 | 0.0 | 2 | 0.9 | |
| ER Status | | | | | 0.83 |
| Negative | 5 | 15.6 | 43 | 18.3 | |
| Positive | 26 | 81.3 | 187 | 79.6 | |
| Missing | 1 | 3.1 | 5 | 2.1 | |
| PR Status | | | | | 0.57 |
| Negative | 6 | 18.8 | 62 | 26.4 | |
| Positive | 24 | 75.0 | 163 | 69.4 | |
| Missing | 2 | 6.3 | 10 | 4.3 | |
| Local Perceived Recurrence Risk | | | | | 0.68 |
| 0-10% | 13 | 40.6 | 114 | 48.5 | |
| 10-30% | 12 | 37.5 | 74 | 31.5 | |
| >30% | 7 | 21.9 | 47 | 20.0 | |
| Distant Perceived Recurrence Risk | | | | | 0.58 |
| 0-10% | 8 | 25.0 | 81 | 34.5 | |
| 10-30% | 13 | 40.6 | 84 | 35.7 | |
| >30% | 11 | 34.4 | 70 | 29.8 | |
| Adjuvant! Online Risk Score | | | | | 0.51 |
| 0-10% | 8 | 25.0 | 87 | 37.0 | |
| 10-30% | 21 | 65.6 | 121 | 51.5 | |
| >30% | 3 | 9.4 | 24 | 10.2 | |
| Missing | 0 | 0.0 | 3 | 1.3 | |

## APPENDIX E

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE IN SUN EXPOSURE: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | Change in Sun Exposure | | No Change in Sun Exposure | | P-Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 60.3 | 9.8 | 59.2 | 9.4 | 0.34 |
| | N | % | N | % | |
| Race | | | | | 0.81 |
| Non-White | 7 | 6.1 | 11 | 7.2 | |
| White | 108 | 93.9 | 141 | 92.8 | |
| Socioeconomic status | | | | | 0.57 |
| <$25,000/year | 23 | 20.0 | 20 | 13.2 | |
| 25,000-50,000/year | 24 | 20.9 | 40 | 26.3 | |
| 50,000-100,000/year | 36 | 31.3 | 51 | 33.6 | |
| >100,000/year | 26 | 22.6 | 32 | 21.1 | |
| Missing | 6 | 5.2 | 9 | 5.9 | |
| Educational Level | | | | | 0.10 |
| High School or less | 45 | 39.1 | 42 | 27.6 | |
| College | 36 | 31.3 | 64 | 42.1 | |
| Post-graduate | 34 | 29.6 | 46 | 30.3 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.04 |
| None | 74 | 64.4 | 115 | 75.7 | |
| One or more | 41 | 35.7 | 36 | 23.7 | |
| Missing | 0 | 0.0 | 1 | 0.7 | |
| Alcohol Consumption | | | | | 0.23 |
| None | 24 | 20.9 | 25 | 16.5 | |
| Rare | 69 | 60.0 | 89 | 58.6 | |
| >1 Drink/day | 19 | 16.5 | 37 | 24.3 | |
| Missing | 3 | 2.6 | 1 | 0.7 | |
| Smoking History | | | | | 0.39 |
| Current Smoker | 6 | 5.2 | 8 | 5.3 | |
| Past Smoker | 57 | 49.6 | 78 | 51.3 | |
| Never Smoked | 52 | 45.2 | 62 | 40.8 | |
| Missing | 0 | 0.0 | 4 | 2.6 | |
| Stage of cancer | | | | | 0.00 |
| Stage I | 55 | 47.8 | 71 | 46.7 | |
| Stage II | 41 | 35.7 | 74 | 48.7 | |
| Stage III | 18 | 15.7 | 6 | 4.0 | |
| Missing | 1 | 0.9 | 1 | 0.7 | |
| Years Since Diagnosis | | | | | 0.27 |
| <5 years | 43 | 37.4 | 56 | 36.8 | |
| 5-10 years | 59 | 51.3 | 67 | 44.1 | |
| >10 years | 13 | 11.3 | 28 | 18.4 | |
| Missing | 0 | 0.0 | 1 | 0.7 | |
| Lymph Node Involvement | | | | | 0.76 |
| No | 76 | 66.1 | 101 | 66.5 | |
| Yes | 35 | 30.4 | 48 | 31.6 | |
| Missing | 4 | 3.5 | 3 | 2.0 | |
| Surgical Treatment | | | | | 0.52 |
| Lumpectomy | 77 | 67.0 | 95 | 62.5 | |
| Mastectomy | 38 | 33.0 | 57 | 37.5 | |
| Chemotherapy | | | | | 0.05 |
| No | 54 | 47.0 | 54 | 35.5 | |
| Yes | 60 | 52.2 | 98 | 64.5 | |
| Missing | 1 | 0.9 | 0 | 0.0 | |

| | | | | | |
|---|---|---|---|---|---|
| Hormonal Treatment | | | | | 0.61 |
| No | 24 | 20.9 | 28 | 18.4 | |
| Yes | 89 | 77.4 | 123 | 80.9 | |
| Missing | 2 | 1.7 | 1 | 0.7 | |
| Radiation Treatment | | | | | 0.04 |
| No | 17 | 14.8 | 40 | 26.3 | |
| Yes | 97 | 84.4 | 111 | 73.0 | |
| Missing | 1 | 0.9 | 1 | 0.7 | |
| ER Status | | | | | 0.82 |
| Negative | 22 | 19.1 | 26 | 17.1 | |
| Positive | 90 | 78.3 | 123 | 80.9 | |
| Missing | 3 | 2.6 | 3 | 2.0 | |
| PR Status | | | | | 0.18 |
| Negative | 34 | 29.6 | 34 | 22.4 | |
| Positive | 74 | 64.4 | 113 | 74.3 | |
| Missing | 7 | 6.1 | 5 | 3.3 | |
| Local Perceived Recurrence Risk | | | | | 0.12 |
| 0-10% | 50 | 43.5 | 77 | 50.7 | |
| 10-30% | 35 | 30.4 | 51 | 33.6 | |
| >30% | 30 | 26.1 | 24 | 15.8 | |
| Distant Perceived Recurrence Risk | | | | | 0.03 |
| 0-10% | 29 | 25.2 | 60 | 39.5 | |
| 10-30% | 43 | 37.4 | 54 | 35.5 | |
| >30% | 43 | 37.4 | 38 | 25.0 | |
| Adjuvant! Online Risk Score | | | | | 0.81 |
| 0-10% | 40 | 34.8 | 55 | 36.2 | |
| 10-30% | 60 | 52.2 | 82 | 54.0 | |
| >30% | 13 | 11.3 | 14 | 9.2 | |
| Missing | 2 | 1.7 | 1 | 0.7 | |

## APPENDIX F

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE IN SUPPLEMENT USE: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | Change in Supplement Use | | No Change in Supplement Use | | P-Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 59.7 | 9.1 | 59.6 | 10.1 | 0.99 |
| | N | % | N | % | |
| Race | | | | | 1.00 |
| Non-White | 9 | 6.6 | 9 | 6.9 | |
| White | 128 | 93.4 | 121 | 93.1 | |
| Socioeconomic status | | | | | 0.50 |
| <$25,000/year | 22 | 16.1 | 21 | 16.2 | |
| 25,000-50,000/year | 27 | 19.7 | 37 | 28.5 | |
| 50,000-100,000/year | 46 | 33.6 | 41 | 31.5 | |
| >100,000/year | 33 | 24.1 | 25 | 19.2 | |
| Missing | 9 | 6.6 | 6 | 4.6 | |
| Educational Level | | | | | 0.08 |
| High School or less | 36 | 26.3 | 51 | 39.2 | |
| College | 57 | 41.6 | 43 | 33.1 | |
| Post-graduate | 44 | 32.1 | 36 | 27.7 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.95 |
| None | 96 | 70.1 | 93 | 71.5 | |
| One or more | 40 | 29.2 | 37 | 28.5 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Alcohol Consumption | | | | | 0.96 |
| None | 24 | 17.5 | 25 | 19.2 | |
| Rare | 83 | 60.6 | 75 | 57.7 | |
| >1 Drink/day | 28 | 20.4 | 28 | 21.5 | |
| Missing | 2 | 1.5 | 2 | 1.5 | |
| Smoking History | | | | | 0.43 |
| Current Smoker | 9 | 6.6 | 5 | 3.9 | |
| Past Smoker | 64 | 46.7 | 71 | 54.6 | |
| Never Smoked | 61 | 44.5 | 53 | 40.8 | |
| Missing | 3 | 2.2 | 1 | 0.8 | |
| Stage of cancer | | | | | 0.69 |
| Stage I | 60 | 43.8 | 66 | 50.8 | |
| Stage II | 64 | 46.7 | 51 | 39.2 | |
| Stage III | 12 | 8.8 | 12 | 9.2 | |
| Missing | 1 | 0.7 | 1 | 0.8 | |
| Years Since Diagnosis | | | | | 0.00 |
| <5 years | 67 | 48.9 | 32 | 24.6 | |
| 5-10 years | 57 | 41.6 | 69 | 53.1 | |
| >10 years | 12 | 8.8 | 29 | 22.3 | |
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Lymph Node Involvement | | | | | 0.47 |
| No | 87 | 63.5 | 90 | 69.2 | |
| Yes | 47 | 34.3 | 36 | 27.7 | |
| Missing | 3 | 2.2 | 4 | 3.1 | |
| Surgical Treatment | | | | | 0.70 |
| Lumpectomy | 90 | 65.7 | 82 | 63.1 | |
| Mastectomy | 47 | 34.3 | 48 | 36.9 | |
| Chemotherapy | | | | | 0.45 |
| No | 52 | 38.0 | 56 | 43.1 | |
| Yes | 84 | 61.3 | 74 | 56.9 | |

| | | | | | |
|---|---|---|---|---|---|
| Missing | 1 | 0.7 | 0 | 0.0 | |
| Hormonal Treatment | | | | | 0.17 |
| No | 21 | 15.3 | 31 | 23.9 | |
| Yes | 114 | 83.2 | 98 | 75.4 | |
| Missing | 2 | 1.5 | 1 | 0.8 | |
| Radiation Treatment | | | | | 0.25 |
| No | 26 | 19.0 | 31 | 23.9 | |
| Yes | 109 | 79.6 | 99 | 76.2 | |
| Missing | 2 | 1.5 | 0 | 0.0 | |
| ER Status | | | | | 0.76 |
| Negative | 23 | 16.8 | 25 | 19.2 | |
| Positive | 110 | 80.3 | 103 | 79.2 | |
| Missing | 4 | 2.9 | 2 | 1.5 | |
| PR Status | | | | | 0.59 |
| Negative | 34 | 24.8 | 34 | 26.2 | |
| Positive | 95 | 69.3 | 92 | 70.8 | |
| Missing | 8 | 5.8 | 4 | 3.1 | |
| Local Perceived Recurrence Risk | | | | | 0.60 |
| 0-10% | 61 | 44.5 | 66 | 50.8 | |
| 10-30% | 47 | 34.3 | 39 | 30.0 | |
| >30% | 29 | 21.2 | 25 | 19.2 | |
| Distant Perceived Recurrence Risk | | | | | 0.44 |
| 0-10% | 42 | 30.7 | 47 | 36.2 | |
| 10-30% | 49 | 35.8 | 48 | 36.9 | |
| >30% | 46 | 33.6 | 35 | 26.9 | |
| Adjuvant! Online Risk Score | | | | | 0.95 |
| 0-10% | 50 | 36.5 | 45 | 34.6 | |
| 10-30% | 72 | 52.6 | 70 | 53.9 | |
| >30% | 14 | 10.2 | 13 | 10.0 | |
| Missing | 1 | 0.7 | 2 | 1.5 | |

## APPENDIX G

**DISTRIBUTION OF COVARIATES ACCORDING TO CHANGE IN WEIGHT: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)**

| | Change in Weight | | No Change in Weight | | P-Value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Age (years) | 58.9 | 9.4 | 60.8 | 9.8 | 0.10 |
| | N | % | N | % | |
| Race | | | | | 0.62 |
| Non-White | 12 | 7.6 | 6 | 5.5 | |
| White | 146 | 92.4 | 103 | 94.5 | |
| Socioeconomic status | | | | | 0.69 |
| <$25,000/year | 28 | 17.7 | 15 | 13.8 | |
| 25,000-50,000/year | 37 | 23.4 | 27 | 24.8 | |
| 50,000-100,000/year | 49 | 31.0 | 38 | 34.9 | |
| >100,000/year | 33 | 20.9 | 25 | 22.9 | |
| Missing | 11 | 7.0 | 4 | 3.7 | |
| Educational Level | | | | | 0.30 |
| High School or less | 47 | 29.8 | 40 | 36.7 | |
| College | 67 | 40.5 | 36 | 33.0 | |
| Post-graduate | 47 | 29.8 | 33 | 30.3 | |
| Family History of Breast Cancer (1st deg relative) | | | | | 0.70 |
| None | 109 | 69.0 | 80 | 73.4 | |
| One or more | 48 | 30.4 | 29 | 26.6 | |
| Missing | 1 | 0.6 | 0 | 0.0 | |
| Alcohol Consumption | | | | | 0.09 |
| None | 35 | 22.2 | 14 | 12.8 | |
| Rare | 84 | 53.2 | 74 | 67.9 | |
| >1 Drink/day | 36 | 22.8 | 20 | 18.4 | |
| Missing | 3 | 1.9 | 1 | 0.9 | |
| Smoking History | | | | | 0.93 |
| Current Smoker | 8 | 5.1 | 6 | 5.5 | |
| Past Smoker | 82 | 51.9 | 53 | 48.6 | |
| Never Smoked | 66 | 41.8 | 48 | 44.0 | |
| Missing | 2 | 1.3 | 2 | 1.8 | |
| Stage of cancer | | | | | 0.79 |
| Stage I | 76 | 48.1 | 50 | 45.9 | |
| Stage II | 65 | 41.1 | 50 | 45.9 | |
| Stage III | 16 | 10.1 | 8 | 7.3 | |
| Missing | 1 | 0.6 | 1 | 0.9 | |
| Years Since Diagnosis | | | | | 0.13 |
| <5 years | 61 | 38.6 | 38 | 34.9 | |
| 5-10 years | 78 | 49.4 | 48 | 44.0 | |
| >10 years | 18 | 11.4 | 23 | 21.1 | |
| Missing | 1 | 0.6 | 0 | 0.0 | |
| Lymph Node Involvement | | | | | 0.21 |
| No | 104 | 65.8 | 73 | 67.0 | |
| Yes | 52 | 32.9 | 31 | 28.4 | |
| Missing | 2 | 1.3 | 5 | 4.6 | |
| Surgical Treatment | | | | | 0.24 |
| Lumpectomy | 97 | 61.4 | 75 | 68.8 | |
| Mastectomy | 61 | 38.6 | 34 | 31.2 | |
| Chemotherapy | | | | | 0.04 |
| No | 55 | 34.8 | 53 | 48.6 | |
| Yes | 102 | 64.6 | 56 | 51.4 | |
| Missing | 1 | 0.6 | 0 | 0.0 | |

| | | | | | |
|---|---|---|---|---|---|
| Hormonal Treatment | | | | | 0.89 |
| No | 32 | 20.3 | 20 | 18.4 | |
| Yes | 124 | 78.5 | 88 | 80.7 | |
| Missing | 2 | 1.3 | 1 | 0.9 | |
| Radiation Treatment | | | | | 0.69 |
| No | 33 | 20.9 | 24 | 22.0 | |
| Yes | 123 | 77.9 | 85 | 78.0 | |
| Missing | 2 | 1.3 | 0 | 0.0 | |
| ER Status | | | | | 0.68 |
| Negative | 31 | 19.6 | 17 | 15.6 | |
| Positive | 123 | 77.9 | 90 | 82.6 | |
| Missing | 4 | 2.5 | 2 | 1.8 | |
| PR Status | | | | | 0.51 |
| Negative | 44 | 27.9 | 24 | 22.0 | |
| Positive | 108 | 68.4 | 79 | 72.5 | |
| Missing | 6 | 3.8 | 6 | 5.5 | |
| Local Perceived Recurrence Risk | | | | | 0.40 |
| 0-10% | 71 | 44.9 | 56 | 51.4 | |
| 10-30% | 51 | 32.3 | 35 | 32.1 | |
| >30% | 36 | 22.8 | 18 | 16.5 | |
| Distant Perceived Recurrence Risk | | | | | 0.07 |
| 0-10% | 46 | 29.1 | 43 | 39.5 | |
| 10-30% | 56 | 35.4 | 41 | 37.6 | |
| >30% | 56 | 35.4 | 25 | 22.9 | |
| Adjuvant! Online Risk Score | | | | | 0.92 |
| 0-10% | 55 | 34.8 | 40 | 36.7 | |
| 10-30% | 86 | 54.4 | 56 | 51.4 | |
| >30% | 15 | 9.5 | 12 | 11.0 | |
| Missing | 2 | 1.3 | 1 | 0.9 | |

## APPENDIX H

## DISTRIBUTION OF COVARIATES ACCORDING TO DIRECTION OF BEHAVIOR CHANGE: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)

| | No Behavior Change | | Any Positive Behavior Change | | Any Negative Behavior Change | | P-Value |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | |
| Age (years) | 55.1 | 9.7 | 59.6 | 9.2 | 58.3 | 8.9 | 0.01 |
| | N | % | N | % | N | % | |
| Race | | | | | | | 0.38 |
| Non-White | 2 | 11.8 | 11 | 5.3 | 8 | 7.0 | |
| White | 15 | 88.2 | 195 | 94.7 | 106 | 93.0 | |
| Socioeconomic status | | | | | | | 0.92 |
| <$25,000/year | 2 | 11.8 | 30 | 14.6 | 19 | 16.7 | |
| 25,000-50,000/year | 4 | 23.5 | 50 | 24.3 | 27 | 23.7 | |
| 50,000-100,000/year | 7 | 41.2 | 72 | 35.0 | 33 | 29.0 | |
| >100,000/year | 4 | 23.5 | 44 | 21.4 | 26 | 22.8 | |
| Missing | 0 | 0.0 | 10 | 4.9 | 9 | 7.9 | |
| Educational Level | | | | | | | 0.97 |
| High School or less | 4 | 23.5 | 66 | 32.0 | 37 | 32.5 | |
| College | 7 | 41.2 | 76 | 36.9 | 43 | 37.7 | |
| Post-graduate | 6 | 35.3 | 64 | 31.1 | 34 | 29.8 | |
| Family History of Breast Cancer (1st deg relative) | | | | | | | 0.13 |
| None | 16 | 94.1 | 141 | 68.5 | 76 | 66.7 | |
| One or more | 1 | 5.9 | 64 | 31.1 | 37 | 32.5 | |
| Missing | 0 | 0.0 | 1 | 0.5 | 1 | 0.9 | |
| Alcohol Consumption | | | | | | | 0.97 |
| None | 2 | 11.8 | 41 | 19.9 | 20 | 17.5 | |
| Rare | 11 | 64.7 | 120 | 58.3 | 66 | 57.9 | |
| >1 Drink/day | 4 | 23.5 | 42 | 20.4 | 26 | 22.8 | |
| Missing | 0 | 0.0 | 3 | 1.5 | 2 | 1.8 | |
| Smoking History | | | | | | | 0.88 |
| Current Smoker | 1 | 5.9 | 10 | 4.9 | 6 | 5.3 | |
| Past Smoker | 11 | 64.7 | 107 | 51.9 | 58 | 50.9 | |
| Never Smoked | 5 | 29.4 | 87 | 42.2 | 48 | 42.1 | |
| Missing | 0 | 0.0 | 2 | 1.0 | 2 | 1.8 | |
| Stage of cancer | | | | | | | 0.97 |
| Stage I | 8 | 47.1 | 95 | 46.1 | 53 | 46.5 | |
| Stage II | 8 | 47.1 | 87 | 42.2 | 45 | 39.5 | |
| Stage III | 1 | 5.9 | 22 | 10.7 | 15 | 13.2 | |
| Missing | 0 | 0.0 | 2 | 1.0 | 1 | 0.9 | |
| Years Since Diagnosis | | | | | | | 0.19 |
| <5 years | 2 | 11.8 | 79 | 38.4 | 44 | 38.6 | |
| 5-10 years | 10 | 58.8 | 95 | 46.1 | 56 | 49.1 | |
| >10 years | 5 | 29.4 | 31 | 15.1 | 14 | 12.3 | |
| Missing | 0 | 0.0 | 1 | 0.5 | 0 | 0.0 | |
| Lymph Node Involvement | | | | | | | 0.88 |
| No | 13 | 76.5 | 133 | 64.6 | 74 | 64.9 | |
| Yes | 4 | 23.5 | 67 | 32.5 | 38 | 33.3 | |
| Missing | 0 | 0.0 | 6 | 2.9 | 2 | 1.8 | |
| Surgical Treatment | | | | | | | 0.94 |
| Lumpectomy | 10 | 58.8 | 129 | 62.6 | 72 | 63.2 | |
| Mastectomy | 7 | 41.2 | 77 | 37.4 | 42 | 36.8 | |
| Chemotherapy | | | | | | | 0.40 |
| No | 6 | 35.3 | 85 | 41.3 | 37 | 32.5 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Yes | 11 | 64.7 | 120 | 58.3 | 77 | 67.5 | |
| Missing | 0 | 0.0 | 1 | 0.5 | 0 | 0.0 | |
| Hormonal Treatment | | | | | | | 0.21 |
| No | 7 | 41.2 | 37 | 18.0 | 25 | 21.9 | |
| Yes | 10 | 58.8 | 166 | 80.6 | 88 | 77.2 | |
| Missing | 0 | 0.0 | 3 | 1.5 | 1 | 0.9 | |
| Radiation Treatment | | | | | | | 0.56 |
| No | 5 | 29.5 | 45 | 21.8 | 20 | 17.5 | |
| Yes | 12 | 70.6 | 160 | 77.7 | 93 | 81.6 | |
| Missing | 0 | 0.0 | 1 | 0.5 | 1 | 0.9 | |
| ER Status | | | | | | | 0.38 |
| Negative | 6 | 35.3 | 35 | 17.0 | 25 | 21.9 | |
| Positive | 11 | 64.7 | 165 | 80.1 | 86 | 75.4 | |
| Missing | 0 | 0.0 | 6 | 2.9 | 3 | 2.6 | |
| PR Status | | | | | | | 0.68 |
| Negative | 6 | 35.3 | 52 | 25.2 | 36 | 31.6 | |
| Positive | 11 | 64.7 | 143 | 69.4 | 73 | 64.0 | |
| Missing | 0 | 0.0 | 11 | 5.3 | 5 | 4.4 | |
| Adjuvant! Online Risk Score | | | | | | | 0.74 |
| 0-10% | 3 | 17.7 | 76 | 36.9 | 40 | 35.1 | |
| 10-30% | 12 | 70.6 | 107 | 51.9 | 60 | 52.6 | |
| >30% | 2 | 11.8 | 20 | 9.7 | 13 | 11.4 | |
| Missing | 0 | 0.0 | 3 | 1.5 | 1 | 0.9 | |

## APPENDIX I

## DISTRIBUTION OF COVARIATES ACCORDING TO PERCEIVED LOCAL RECURRENCE RISK: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)

| | 0-10% | | 10-30% | | >30% | | P-Value |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | |
| Age (years) | 60.0 | 10.2 | 59.5 | 9.1 | 59.2 | 8.9 | 0.98 |
| | N | % | N | % | N | % | |
| Race | | | | | | | 0.63 |
| Non-White | 9 | 7.1 | 7 | 8.1 | 2 | 3.7 | |
| White | 118 | 92.9 | 79 | 91.9 | 52 | 96.3 | |
| Socioeconomic status | | | | | | | 0.57 |
| <$25,000/year | 23 | 18.1 | 11 | 12.8 | 9 | 16.7 | |
| 25,000-50,000/year | 30 | 23.6 | 16 | 18.6 | 18 | 33.3 | |
| 50,000-100,000/year | 42 | 33.1 | 31 | 36.1 | 14 | 25.9 | |
| >100,000/year | 24 | 18.9 | 23 | 26.7 | 11 | 20.4 | |
| Missing | 8 | 6.3 | 5 | 5.8 | 2 | 3.7 | |
| Educational Level | | | | | | | 0.04 |
| High School or less | 39 | 30.7 | 22 | 25.6 | 26 | 48.2 | |
| College | 54 | 42.5 | 31 | 36.1 | 15 | 27.8 | |
| Post-graduate | 34 | 26.8 | 33 | 38.4 | 13 | 24.1 | |
| Family History of Breast Cancer (1st deg relative) | | | | | | | 0.25 |
| None | 91 | 71.7 | 65 | 75.6 | 33 | 61.1 | |
| One or more | 35 | 27.6 | 21 | 24.4 | 21 | 38.9 | |
| Missing | 1 | 0.8 | 0 | 0.0 | 0 | 0.0 | |
| Alcohol Consumption | | | | | | | 0.39 |
| None | 28 | 22.1 | 10 | 11.6 | 11 | 20.4 | |
| Rare | 73 | 57.5 | 52 | 60.5 | 33 | 61.1 | |
| >1 Drink/day | 25 | 19.7 | 22 | 25.6 | 9 | 16.7 | |
| Missing | 1 | 0.8 | 2 | 2.3 | 1 | 1.9 | |
| Smoking History | | | | | | | 0.61 |
| Current Smoker | 8 | 6.3 | 5 | 5.8 | 1 | 1.9 | |
| Past Smoker | 63 | 49.6 | 47 | 54.7 | 25 | 46.3 | |
| Never Smoked | 54 | 42.5 | 32 | 37.2 | 28 | 51.9 | |
| Missing | 2 | 1.6 | 2 | 2.3 | 0 | 0.0 | |
| Stage of cancer | | | | | | | 0.48 |
| Stage I | 66 | 52.0 | 39 | 45.4 | 21 | 38.9 | |
| Stage II | 51 | 40.2 | 37 | 43.0 | 27 | 50.0 | |
| Stage III | 9 | 7.1 | 10 | 11.6 | 5 | 9.3 | |
| Missing | 1 | 0.8 | 0 | 0.0 | 1 | 1.9 | |
| Years Since Diagnosis | | | | | | | 0.07 |
| <5 years | 46 | 36.2 | 31 | 36.1 | 22 | 40.7 | |
| 5-10 years | 58 | 45.7 | 48 | 55.8 | 20 | 37.0 | |
| >10 years | 23 | 18.1 | 7 | 8.1 | 11 | 20.4 | |
| Missing | 0 | 0.0 | 0 | 0.0 | 1 | 1.9 | |
| Lymph Node Involvement | | | | | | | 0.07 |
| No | 93 | 73.2 | 54 | 62.8 | 30 | 55.6 | |
| Yes | 31 | 24.4 | 31 | 36.1 | 21 | 38.9 | |
| Missing | 3 | 2.4 | 1 | 1.2 | 3 | 5.6 | |
| Surgical Treatment | | | | | | | 0.08 |
| Lumpectomy | 74 | 58.3 | 63 | 73.3 | 35 | 64.8 | |
| Mastectomy | 53 | 41.7 | 23 | 26.7 | 19 | 35.2 | |
| Chemotherapy | | | | | | | 0.20 |
| No | 56 | 44.1 | 35 | 40.7 | 17 | 31.5 | |
| Yes | 71 | 55.9 | 51 | 59.3 | 36 | 66.7 | |
| Missing | 0 | 0.0 | 0 | 0.0 | 1 | 1.9 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hormonal Treatment | | | | | | | 0.03 |
| No | 29 | 22.8 | 9 | 10.5 | 14 | 25.9 | |
| Yes | 95 | 74.8 | 77 | 89.5 | 40 | 74.1 | |
| Missing | 3 | 2.4 | 0 | 0.0 | 0 | 0.0 | |
| Radiation Treatment | | | | | | | 0.00 |
| No | 40 | 31.5 | 8 | 9.3 | 9 | 16.7 | |
| Yes | 86 | 67.7 | 78 | 90.7 | 44 | 81.5 | |
| Missing | 1 | 0.8 | 0 | 0.0 | 1 | 1.9 | |
| ER Status | | | | | | | 0.15 |
| Negative | 27 | 21.3 | 9 | 10.5 | 12 | 22.2 | |
| Positive | 96 | 75.6 | 76 | 88.4 | 41 | 75.9 | |
| Missing | 4 | 3.2 | 1 | 1.2 | 1 | 1.9 | |
| PR Status | | | | | | | 0.17 |
| Negative | 33 | 26.0 | 18 | 20.9 | 17 | 31.5 | |
| Positive | 89 | 70.1 | 66 | 76.7 | 32 | 59.3 | |
| Missing | 5 | 3.9 | 2 | 2.3 | 5 | 9.3 | |
| Adjuvant! Online Risk Score | | | | | | | 0.23 |
| 0-10% | 50 | 39.4 | 32 | 37.2 | 13 | 24.1 | |
| 10-30% | 63 | 49.6 | 47 | 54.7 | 32 | 59.3 | |
| >30% | 13 | 10.2 | 7 | 8.1 | 7 | 13.0 | |
| Missing | 1 | 0.8 | 0 | 0.0 | 2 | 3.7 | |

## APPENDIX J

## DISTRIBUTION OF COVARIATES ACCORDING TO PERCEIVED DISTANT RECURRENCE RISK: BREAST CANCER SURVIVORSHIP STUDY, 2008 (CONTINUED ON NEXT PAGE)

| | 0-10% | | 10-30% | | >30% | | P-Value |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | |
| Age (years) | 61.0 | 10.1 | 58.7 | 9.3 | 59.3 | 9.3 | 0.99 |
| | N | % | N | % | N | % | |
| Race | | | | | | | 0.62 |
| Non-White | 8 | 9.0 | 5 | 5.2 | 5 | 6.2 | |
| White | 81 | 91.0 | 92 | 94.9 | 76 | 93.8 | |
| Socioeconomic status | | | | | | | 0.82 |
| <$25,000/year | 14 | 15.7 | 16 | 16.5 | 13 | 16.1 | |
| 25,000-50,000/year | 23 | 25.8 | 19 | 19.6 | 22 | 27.2 | |
| 50,000-100,000/year | 30 | 33.7 | 36 | 37.1 | 21 | 25.9 | |
| >100,000/year | 17 | 19.1 | 22 | 22.7 | 19 | 23.5 | |
| Missing | 5 | 5.6 | 4 | 4.1 | 6 | 7.4 | |
| Educational Level | | | | | | | 0.25 |
| High School or less | 27 | 30.3 | 26 | 26.8 | 34 | 42.0 | |
| College | 33 | 37.1 | 42 | 43.3 | 25 | 30.9 | |
| Post-graduate | 29 | 32.6 | 29 | 29.9 | 22 | 27.2 | |
| Family History of Breast Cancer (1st deg relative) | | | | | | | *0.06* |
| None | 60 | 67.4 | 77 | 79.4 | 52 | 64.2 | |
| One or more | 28 | 31.5 | 20 | 20.6 | 29 | 35.8 | |
| Missing | 1 | 1.1 | 0 | 0.0 | 0 | 0.0 | |
| Alcohol Consumption | | | | | | | 0.87 |
| None | 19 | 21.4 | 15 | 15.5 | 15 | 18.5 | |
| Rare | 51 | 57.3 | 62 | 63.9 | 45 | 55.6 | |
| >1 Drink/day | 18 | 20.2 | 19 | 19.6 | 19 | 23.5 | |
| Missing | 1 | 1.1 | 1 | 1.0 | 2 | 2.5 | |
| Smoking History | | | | | | | 0.85 |
| Current Smoker | 6 | 6.7 | 4 | 4.1 | 4 | 4.9 | |
| Past Smoker | 40 | 44.9 | 54 | 55.7 | 41 | 50.6 | |
| Never Smoked | 41 | 46.1 | 38 | 39.2 | 35 | 43.2 | |
| Missing | 2 | 2.3 | 1 | 1.0 | 1 | 1.2 | |
| Stage of cancer | | | | | | | 0.20 |
| Stage I | 48 | 53.9 | 44 | 45.4 | 34 | 42.0 | |
| Stage II | 34 | 38.2 | 45 | 46.4 | 36 | 44.4 | |
| Stage III | 5 | 5.6 | 8 | 8.3 | 11 | 13.6 | |
| Missing | 2 | 2.3 | 0 | 0.0 | 0 | 0.0 | |
| Years Since Diagnosis | | | | | | | 0.13 |
| <5 years | 26 | 29.2 | 38 | 39.2 | 35 | 43.2 | |
| 5-10 years | 43 | 48.3 | 48 | 49.5 | 35 | 43.2 | |
| >10 years | 20 | 22.5 | 11 | 11.3 | 10 | 12.4 | |
| Missing | 0 | 0.0 | 0 | 0.0 | 1 | 1.2 | |
| Lymph Node Involvement | | | | | | | 0.32 |
| No | 65 | 73.0 | 64 | 66.0 | 48 | 59.3 | |
| Yes | 21 | 23.6 | 31 | 32.0 | 31 | 38.3 | |
| Missing | 3 | 3.4 | 2 | 2.1 | 2 | 2.5 | |
| Surgical Treatment | | | | | | | 0.15 |
| Lumpectomy | 61 | 68.5 | 66 | 68.0 | 45 | 55.6 | |
| Mastectomy | 28 | 31.5 | 31 | 32.0 | 36 | 44.4 | |
| Chemotherapy | | | | | | | *0.06* |
| No | 45 | 50.6 | 36 | 37.1 | 27 | 33.3 | |
| Yes | 44 | 49.4 | 61 | 62.9 | 53 | 65.4 | |
| Missing | 0 | 0.0 | 0 | 0.0 | 1 | 1.2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hormonal Treatment | | | | | | | 0.51 |
| No | 18 | 20.2 | 16 | 16.5 | 18 | 22.2 | |
| Yes | 69 | 77.5 | 81 | 83.5 | 62 | 76.5 | |
| Missing | 2 | 2.3 | 0 | 0.0 | 1 | 1.2 | |
| Radiation Treatment | | | | | | | 0.74 |
| No | 21 | 23.6 | 18 | 18.6 | 18 | 22.2 | |
| Yes | 67 | 75.3 | 79 | 81.4 | 62 | 76.5 | |
| Missing | 1 | 1.2 | 0 | 0.0 | 1 | 1.2 | |
| ER Status | | | | | | | 0.57 |
| Negative | 18 | 20.2 | 14 | 14.4 | 16 | 19.8 | |
| Positive | 69 | 77.5 | 82 | 84.5 | 62 | 76.5 | |
| Missing | 2 | 2.3 | 1 | 1.0 | 3 | 3.7 | |
| PR Status | | | | | | | 0.16 |
| Negative | 23 | 25.8 | 19 | 19.6 | 26 | 32.1 | |
| Positive | 63 | 70.8 | 75 | 77.3 | 49 | 60.5 | |
| Missing | 3 | 3.4 | 3 | 3.1 | 6 | 7.4 | |
| Adjuvant! Online Risk Score | | | | | | | 0.72 |
| 0-10% | 35 | 39.3 | 35 | 36.1 | 25 | 30.9 | |
| 10-30% | 45 | 50.6 | 53 | 54.6 | 44 | 54.3 | |
| >30% | 8 | 9.0 | 9 | 9.3 | 10 | 12.4 | |
| Missing | 1 | 1.1 | 0 | 0.0 | 2 | 2.5 | |

## REFERENCES


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