Preventive Health Behaviors and Familial Breast Cancer

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Abstract

Aim: **To examine medical and lifestyle preventive behaviors among women with varying levels of familial breast cancer risk.**
Methods: **Using cross-sectional data from the Minnesota Breast Cancer Family Study, a historical cohort of 426 families, we compared medical (mammography adherence, antiestrogen use, and prophylactic surgery) and lifestyle (physical activity, smoking, alcohol, and diet) behaviors across three groups of cancer-free women ages 18 to 95 defined by their family history of breast cancer. Family history was classified as high-risk, moderate-risk, or average to low-risk depending on the number and degree of relationship of family members with breast cancer.**
Results: **After adjusting for age and education, high-risk women were twice as likely to have ever used an antiestrogenic agent (9.0% versus 4.6% among moderate-risk and 4.1% among average to low-risk; $P = 0.002$). Among women ages <40, the high-risk group were more likely to have ever had a mammogram (82% versus 47% among moderate-risk and 35% among average to low-risk; $P < 0.001$). Average to low-risk women were the least likely to be current smokers and high-risk women may consume slightly fewer fruits and vegetables compared with the other groups, but there were no other differences in lifestyle behaviors, including physical activity and alcohol use.**
Conclusions: **Women with strong family histories of breast cancer are more likely to undertake medical but not lifestyle preventive behaviors.** (Cancer Epidemiol Biomarkers Prev 2005;14(10):2340–5)

Introduction

Breast cancer is a major health concern in the United States, with over 210,000 new cases and over 40,000 deaths expected in 2005 (1). There is evidence that health behaviors, such as diet, exercise, and alcohol consumption, can alter the risk of breast cancer (2). It is also clear that a family history of breast (and ovarian) cancer increases the risk of breast cancer; multiple affected relatives and relatives diagnosed at a young age both increase risk substantially (3, 4). In addition, there is evidence that there may be interactions between family history and health behaviors, such as physical activity (5), alcohol (6), and smoking (7).

From a behavioral perspective, it is unknown whether individuals with a family history of breast cancer alter their diet, level of physical activity, or other health behaviors in an effort to reduce their increased risk of disease. Previous studies have shown that most women with a strong family history of breast cancer are aware of their own increase in risk and, indeed, often overestimate this risk (8). However, it is not known whether such individuals actually make lifestyle choices that are different from individuals who have not experienced breast cancer in their family. Although there are published medical management recommendations for women who have very strong breast cancer family histories (including BRCA1 and BRCA2 carriers), these guidelines do not include specific suggestions for lifestyle modification (9, 10). Thus, women are left to find their own information and make their own decisions about such changes. Women from families with familial breast/ovarian cancer often seek information on diet and exercise in the context of personal risk reduction, according to needs assessment studies of these populations (11, 12). Such findings suggest that a subset of individuals with a family history are at least aware of their increased risk and may be motivated to change their behaviors.

In addition to lifestyle behaviors, it is important to consider medical management behaviors, such as screening, chemoprevention, and prophylactic surgery, that may be undertaken by women at varying levels of familial risk. Previous studies have found that women with strong family histories of breast cancer are more likely to be compliant with mammography (13, 14). Chemoprevention with antiestrogenic agents as well as prophylactic surgery are generally recommended only to those with a high enough risk to warrant the potential risks of these interventions (15).

Breast cancer is a leading cause of cancer morbidity and mortality, yet much of the disease burden could potentially be alleviated through screening and preventive health behaviors, such as weight loss (16). This may be particularly true in groups at increased risk of breast cancer due to a family history of the disease. Thus, the objective of this study was to explore the association between family history and preventive health behaviors in a cohort of women at varying levels of familial breast cancer risk.

Materials and Methods

Study Population. Details of the Minnesota Breast Cancer Family Study have been published (17). Briefly, the study was initiated in 1944 with the collection of data from 544 consecutive breast cancer patients (probands) diagnosed at the University of Minnesota. Between 1990 and 1996, the family members of these probands were invited to participate in a follow-up family study. This included both female blood relatives of the original probands (sisters, daughters, nieces, and granddaughters) as well as women who married the corresponding male relatives (''marry-ins'').

Telephone interviews were completed with 94.6% of eligible female relatives and marry-ins over the age of 18

Received 4/12/05; revised 7/11/05; accepted 8/9/05.
Grant support: National Cancer Institute grant P01 CA 82267.
The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore be hereby marked advertisement in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.
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doi:10.1158/1055-9965.EPI-05-0254

years (n = 9,084; ref. 18). Specific topics covered included history of cancer, weight history, marital status, education, occupational class, medical history of conditions associated with reproductive dysfunction, benign or malignant breast disease, mammography utilization, menstrual and pregnancy history, oral contraceptive use, physical activity, lifetime frequency of smoking, and alcohol intake. The mammography items used in the present study were worded as follows: ''Have you ever had a mammogram?'' if the respondent answered affirmatively, they were asked ''How long has it been since your last mammogram?'' with response options of ''In the last 10 months,'' ''11 to 17 months,'' ''18+ months ago,'' or ''don't know/don't remember.'' The breast surgical history item was worded ''Have you had a partial or total mastectomy (surgical removal of a breast)?'' with response options of ''Yes, one breast,'' ''Yes, both breasts,'' ''Lumpectomy,'' or ''No.'' The ovarian surgical history item was worded ''Have your ovaries been surgically removed?'' with response options ''Yes, one,'' ''Yes, both,'' ''Yes, part of one,'' ''Yes, part of both,'' ''Yes, one whole ovary and part of the other one,'' ''No,'' and ''Don't know.'' For deceased relatives in these families and relatives not able to complete a questionnaire on their own (n = 2,903), a surrogate was identified to answer a subset of questions from the interview for living individuals. Approximately 80% of surrogates identified were first-degree relatives.

Following the interview, living participants were mailed a 153-item semiquantitative Food Frequency Questionnaire, adapted from ref. (19), to assess usual dietary intake over the past year. Participants were asked, on average over the past year, how often they had consumed a certain portion size of food. The seven categories of foods included dairy foods, fruits, vegetables, eggs and meats, breads and cereals, and beverages and sweets. There were nine possible responses, ranging from ''never or less than once per month'' to ''six or more times per day'' to define their frequency of consumption of that portion size. Additional questions on food preparation and vitamin supplements were included. The average daily nutrient intake was then calculated by multiplying the frequency of consumption of each food portion by the nutrient content of the specified portions, according to the food composition tables from the Department of Agriculture Handbook 8 (Willett Food Frequency Questionnaire Manual). The average daily intake for vitamins was calculated from both food and supplement intake. For the food frequency component of the study, 3,598 (58%) women returned the mailed questionnaire.

Female relatives who married into the families were also sent a family history questionnaire to assess history of breast, ovarian, and other cancers in first- and second-degree relatives. Of the 2,540 eligible marry-ins, 1,274 (50%) responded to the family history questionnaire.

The original cohort thus consisted of 9,084 subjects in 426 families who completed the first telephone interview. Of those, we excluded 2,903 who required surrogates to complete their questionnaires, and 544 who were diagnosed with incident breast cancer, leaving a total of 5,637 eligible individuals (3,097 blood relatives and 2,540 marry-ins).

In 2001, follow-up questionnaires were mailed to all female blood relatives and spouses of male blood relatives in the 426 pedigrees who completed the first follow-up survey. Nonresponders were contacted by telephone to complete priority questions. Of the 6,194 eligible women from the first follow-up, 604 were deceased (9.8%), 654 were lost to follow-up (10.6%), 1,109 refused (17.9%), and 84 required a next of kin (1.4%) to complete the questionnaire. A total of 3,743 women completed the 2001 questionnaire, giving a response rate of 77.1% of those contacted and competent to complete a survey and an overall participation rate of 60.4% of those who participated in the first follow-up. The 2001 questionnaire ascertained updated cancer information as well as tamoxifen and raloxifene exposure data and authorization for release of mammography records. The tamoxifen/raloxifene items used in the present study were worded as follows: ''Have you ever taken tamoxifen (Nolvadex)?'' and ''Have you ever taken raloxifene (Evista)?'' with response options of ''No, I have never taken,'' ''Yes, currently taking,'' ''Yes, but not currently taking,'' and ''I don't know.'' Of the 5,637 eligible individuals eligible for the current analysis, 3,457 (61%) completed the follow-up.

Definition of Family History Groups. Classification of family history was based on the information provided in the pedigrees from the perspective of the unaffected individual, and considering only the side of the family to which the original breast cancer-affected proband belonged. We defined ''high risk'' as a woman related to at least two individuals with breast cancer, at least one of which is a first-degree relative based on baseline data. ''Moderate risk'' was defined as having either (a) a single first-degree relative with breast cancer and no second-degree relatives or (b) no first-degree relatives with breast cancer but more than one second-degree relative with breast cancer. The group of ''average-risk'' individuals was comprised of marry-ins who completed the family history questionnaire and who reported no family history of breast cancer in first-degree relatives. These criteria are based on epidemiologic data demonstrating that risk of breast cancer increases with an increasing number of affected relatives (20).

Data Analysis. Initial comparisons of lifestyle and medical behavioral factors with family history were made on a univariate level. Data were descriptively summarized using frequencies and percentages for all categorical variables, and means and SDs for all continuous variables. We formally compared the reported behavioral variables among the three family history groups using ANOVA for continuous variables and χ^2 tests for categorical variables.

We also did subsequent comparisons after adjusting for the effects of age at initial questionnaire and education level, as both of these variables are associated with lifestyle and medical behaviors. Formal comparisons among the family history groups were carried out using analysis of covariance methods for continuous variables, ordinary logistic regression analysis for binary variables, and multicategorical nominal (polytomous) logistic regression analysis (21) for categorical variables with three or more levels. We summarized the results from these analyses using least-squares means and corresponding SEs for continuous variables, and adjusted percents for categorical variables. The latter were calculated by back-transforming the odds ratio estimates from the resulting logistic regression models.

Primary multivariate analyses assumed independence across all observations. However, we also considered analyses that account for possible nonindependence of effects, realizing that lifestyle and medical behaviors may be correlated among individuals within the same family (22, 23). This was carried out using repeated measures ANOVA for continuous behaviors, and generalized estimating equation methodology for categorical variables. Family-specific correlations for each outcome were modeled using used a compound symmetry (exchangeable) covariance matrix. All hypothesis tests were two-sided and all analyses were carried out using the SAS software system (SAS Institute, Inc., Cary, NC).

Results

Of the 1,274 marry-ins responding to the family history questionnaire, 1,122 (88%) reported no first-degree relatives with breast cancer, and these 1,122 women comprise the average to low-risk group. Among the 3,097 blood relatives of breast cancer probands, 109 had more than one first-degree

relative with breast cancer, and 437 had one first-degree relative plus more than one second-degree relative with breast cancer, comprising the 546 women in the high-risk group. The moderate-risk group comprises the 194 women reporting only a single first-degree relative with breast cancer plus the 496 women with no first-degree relatives, but more than one second-degree relative with breast cancer, for a total of 690. The remaining 1,861 women reported only a single second-degree relative with breast cancer and were excluded from further analyses. We elected to exclude this group because it is not clear what their appropriate risk designation would be (average to low-risk or moderate-risk); a single second-degree relative may confer only a slight increase in risk and from a behavioral perspective, it is not known how women with a very weak family history perceive their own risk of breast cancer.

Of these 2,358 eligible subjects, 1,554 (66%) responded to the second follow-up questionnaire. However, not all subjects responded to the tamoxifen and raloxifene questions (the number of subjects with eligible tamoxifen and raloxifene data are 1,347 and 1,335, respectively). There were 1,876 women who responded to the food frequency questionnaire, of whom 131 were excluded from dietary analyses because either they left 30 or more items blank on the food frequency questionnaire or they reported total daily caloric intake of <600 or >5,000 kcal. Thus, 1,745 women have valid diet data. For women with fewer than 30 missing items, a frequency of ''never or less than once a month'' was imputed for each missing item.

The women in the high-risk group were significantly older than the other two groups: high-risk women had a mean age of 64.1 versus 57.4 in the moderate-risk and 55.6 in the average to low-risk women ($P < 0.001$). The high-risk group also had lower levels of education with 9.7% having a college degree versus 17.0% and 16.7% in the moderate-risk and average to low-risk groups, respectively ($P < 0.001$). After adjusting for age, the difference in education diminished, but persisted ($P = 0.05$). Thus, all comparisons of health behaviors were adjusted for both age and education.

Table 1 shows the age- and education-adjusted comparisons for various lifestyle behaviors. There were no differences between groups with regard to physical activity, alcohol intake, or vitamin supplement use. However, women in the average to low-risk group were less likely to be current smokers than both the high-risk and moderate-risk groups ($P < 0.001$). After adjusting for age and education, the average to low-risk group had slightly fewer pack-years of cigarette smoking than the other groups (least squares means: 8.3 pack-years in average to low-risk versus 10.8 in high-risk and 12.1 in moderate-risk; $P = <0.001$). Table 2 summarizes the comparison of dietary patterns across the three groups. There is a slightly suggestive pattern of higher fruit and vegetable consumption in the average to low-risk group by about a half serving per day compared with the other groups.

Medical behavior comparisons are shown in Table 3. Women in the high-risk group were more likely to have ever used an antiestrogenic agent compared with women in the moderate-risk and average to low-risk groups. There were only 10 mastectomies carried out among the three groups, thus precluding meaningful comparisons. Although the time since last mammogram was similar across all three risk groups, an age-stratified analysis revealed that among women ages <40 years, 82% of the high-risk women had ever had a mammogram (51% within the previous 1.5 years), compared with 47% of moderate-risk (27% within 1.5 years) and 35% of average to low-risk women (17% within 1.5 years); $P < 0.001$, χ^2 test. For all other age strata (10-year increments from age 40 to 70+), there were no differences between groups with regard to mammogram history: 87% of women in their 40s had ever had a mammogram, as did 90% of women in their 50s and 60s, and 81% of women ages ≥70.

Table 1. Association of breast cancer family history with categorical lifestyle behavioral outcomes

Variable	High-risk blood relatives		Moderate-risk blood relatives		Marry-ins with no family Hx		P*	$P^{\dagger}$
	n (%)*	Adjusted percentage†	n (%)*	Adjusted percentage†	n (%)*	Adjusted percentage†		
Physical activity							0.20	0.18
High	181 (33.2)	38.5	210 (30.4)	31.5	388 (34.6)	33.2		
Medium	171 (31.3)	28.3	235 (34.1)	33.2	381 (34.0)	35.3		
Low	194 (35.5)	33.2	245 (35.5)	33.3	353 (31.4)	31.9		
Vigorous physical activity							<0.001	0.16
Twice or more per week	85 (15.6)	20.0	114 (16.5)	16.7	196 (17.5)	17.3		
Monthly or weekly	83 (15.2)	18.5	141 (20.4)	20.3	282 (25.1)	25.4		
Rarely or never	378 (69.2)	61.5	435 (63.0)	63.0	644 (57.4)	57.2		
Moderate physical activity							0.06	0.11
More than four times per week	115 (21.1)	21.7	117 (17.0)	18.8	237 (21.1)	21.9		
Two to four times per week	202 (37.0)	37.9	285 (41.4)	39.2	477 (42.6)	41.7		
Once per week	96 (17.6)	17.4	127 (18.4)	20.9	182 (16.2)	17.7		
At most monthly	133 (24.4)	23.1	160 (23.2)	21.1	225 (20.1)	18.7		
Alcohol consumption							0.21	0.23
Never	92 (17.0)	12.5	114 (16.6)	15.5	156 (13.9)	13.6		
Monthly	321 (59.2)	58.1	392 (57.0)	58.4	702 (62.7)	62.4		
Weekly	101 (18.6)	24.0	150 (21.8)	20.4	217 (19.4)	19.8		
Daily	28 (5.2)	5.4	32 (4.7)	5.7	45 (4.0)	4.2		
Smoking status							<0.001	<0.001
Never	307 (56.2)	54.2	345 (50.0)	52.4	630 (56.2)	57.7		
Former	152 (27.8)	27.8	185 (26.8)	24.8	324 (28.9)	28.7		
Current	87 (15.9)	18.0	160 (23.2)	22.8	168 (15.0)	13.6		
Vitamin supplement use							0.41	0.84
No	91 (30.2)	29.7	138 (34.1)	34.3	356 (34.3)	35.2		
Yes	210 (69.8)	70.3	267 (65.9)	65.7	683 (65.7)	64.8		

*Unadjusted analyses. P calculated using χ^2 test of significance.
†Analyses adjusted for age and education level. For outcomes with two levels, P values calculated using ordinary logistic regression analyses. For outcomes with more than two levels, P values calculated using multilevel (polytomous) logistic regression analyses.

Table 2. Association of breast cancer family history with dietary pattern

Variable	High-risk blood relatives		Moderate-risk blood relatives		Marry-ins with no family Hx		P*	$P^{\dagger}$
	Mean (SD)*	Least squares mean (SE)†	Mean (SD)*	Least squares mean (SE)†	Mean (SD)*	Least squares mean (SE)†		
Daily servings of fruit	2.8 (2.1)	2.6 (0.1)	2.7 (1.9)	2.8 (0.1)	2.8 (2.0)	2.9 (0.1)	0.61	0.04
Daily servings of vegetables	4.0 (2.7)	4.0 (0.2)	3.9 (2.6)	3.9 (0.1)	4.2 (2.8)	4.2 (0.1)	0.17	0.11
Daily servings of fruits and vegetables	6.8 (3.9)	6.6 (0.2)	6.6 (3.9)	6.6 (0.2)	7.0 (4.2)	7.1 (0.1)	0.22	0.05
Total daily caloric intake	1871 (652)	1895 (41)	1941 (696)	1948 (35)	1937 (694)	1943 (22)	0.30	0.53
Percent calories from total fat	29 (7)	29 (0.4)	30 (6)	30 (0.3)	30 (6)	30 (0.2)	0.01	0.06
Daily dietary fiber (g)	23.1 (9.5)	23.0 (0.6)	22.9 (9.4)	23.1 (0.5)	23.3 (10.4)	23.6 (0.3)	0.82	0.50

*Unadjusted analyses. P values calculated using ANOVAs.
†Analysis adjusted for age and education level. P values calculated using analyses of covariance.

Analyses accounting for the possibility that behaviors are correlated within a family did not appreciably change the results (data not shown).

Discussion

This study aimed to fill a gap in current knowledge by assessing the health behavior patterns in various familial breast cancer risk groups. Overall, we found no strong differences in lifestyle behaviors across family history groups, with the exception of lower smoking rates in women at average risk. However, there were differences for some medical behaviors: The highest-risk women were more likely to have ever used an antiestrogenic agent and to have had a mammogram before the age of 40.

Our finding that increased-risk women do not report healthier lifestyle behaviors (and possibly in the case of smoking and fruit/vegetable intake, report less healthy behaviors) contrasts with the results of others. Several studies have looked at health behaviors within cohorts of moderately increased-risk women (those with a first-degree relative with breast cancer). One recent study found that 42% of first-degree relatives of breast cancer patients self-reported making at least one health behavior change (dietary, exercise, alcohol, or smoking) after their relative's diagnosis and in another study, the rate of meeting physical activity guidelines among first-degree relatives of breast cancer patients was higher than the rate among women in the general population (24, 25). In a study of relatives of cancer patients (breast, lung, and other), 25% reported changing their diet after their relative's diagnosis, and additional relatives expressed an intention to do so (26). Women with a family history of breast cancer strong enough to qualify for BRCA1/2 testing have been reported to have better health behaviors than women in the general population (27, 28); however, women presenting for genetic testing in a high-risk clinic may not be representative of all high-risk women. It is unlikely that genetic testing for breast/ovarian cancer syndrome would influence our results as testing was not largely available at the time of data collection. Although these studies suggest that at least some relatives of breast cancer patients self-report spontaneously making lifestyle changes, to our knowledge there are no published studies comparing unaffected women with varying strengths of breast cancer family history nor any that include a comparison group of women without any family history of breast cancer.

There are some relevant studies that have been carried out in populations other than unaffected women with breast cancer family histories. One study of breast cancer patients found that women with a strong family history of breast cancer were more likely to engage in surgical medical management behaviors (prophylactic contralateral mastectomy, bilateral oophorectomy) than women with no reported family history, but there were no differences with regard to lifestyle behaviors (including diet, exercise, supplement use, smoking, and alcohol intake; ref. 29). Similarly, individuals with a strong family history of cardiovascular disease have been found to be more likely to be regular aspirin users, but are not more likely

Table 3. Association of breast cancer family history with medical management variables

Variable	High-risk blood relatives		Moderate-risk blood relatives		Marry-ins with no family Hx		P*	$P^{\dagger}$
	n (%)*	Adjusted percentage†	n (%)*	Adjusted percentage†	n (%)*	Adjusted percentage†		
Time since last mammogram (mo)							0.009	0.05
<11	220 (40.7)	40.5	250 (26.4)	36.9	404 (36.0)	37.5		
11-17	98 (18.1)	19.2	120 (17.5)	16.7	191 (17.0)	16.1		
≥18	150 (27.7)	26.7	178 (25.9)	25.2	281 (25.0)	24.0		
Never	73 (13.5)	13.6	139 (20.2)	21.3	246 (21.9)	22.4		
Prophylactic mastectomy status							0.03	—
No	518 (94.9)	93.5	660 (95.7)	95.4	1,090 (97.2)	96.7		
Yes, one breast	2 (0.4)	0.2	2 (0.3)	0.3	1 (0.1)	0.1		
Yes, both breasts	4 (0.7)	0.6	1 (0.1)	0.1	0 (0)	0.0		
Lumpectomy	22 (4.0)	5.8	27 (3.9)	4.2	31 (2.8)	3.2		
Bilateral oophorectomy							0.07	0.43
No	450 (83.5)	83.9	598 (87.3)	88.2	976 (87.4)	87.0		
Yes	89 (16.5)	16.1	87 (12.7)	11.8	141 (12.6)	13.0		
Ever antiestrogen use							<0.001	0.002
No	244 (89.1)	91.0	375 (95.9)	95.4	646 (96.6)	95.9		
Yes	30 (10.9)	9.0	16 (4.1)	4.6	23 (3.4)	4.1		

*Unadjusted analyses. P values calculated using χ^2 tests of significance.
†Analyses adjusted for age and education level. For outcomes with two levels, P values calculated using ordinary logistic regression analyses. For outcomes with more than two levels, P values calculated using multilevel (polytomous) logistic regression analyses.

to undertake preventive lifestyle behaviors when compared with average-risk individuals (30).

Our results suggest that women with a strong family history of breast cancer may be more likely to undertake health behaviors with a physician ''gatekeeper'' (mammography and antiestrogen use). It is unlikely that this finding is due in part to the current guidelines for the management of high-risk individuals that include medical options but do not address lifestyle changes (9, 10) because these guidelines were published after the data were collected for this study. One possible explanation may be physician recommendation (8). Physician behavior has been found to be an important correlate of breast cancer screening in women at highest risk of familial breast cancer (those with a BRCA1/2 mutation; ref. 31), and there is evidence that there is a great degree of variability with regard to physician-to-patient discussions on the topics of screening, chemoprevention, and lifestyle recommendations within high-risk breast cancer clinics (32).

As with any study using survey data, there is a potential for nonresponse bias. We compared responders to the food frequency questionnaire and antiestrogen follow-up surveys to nonresponders (data not shown). The results were quite typical for health-related survey research; women who were younger, more highly educated, and more ''medicalized'' or ''health conscious'' (as reflected by use of medications, time of last mammogram, physical activity, and smoking) were more likely to provide follow-up information. These findings, whereas statistically significant at $P < 0.05$, were rarely clinically significant; age was the only variable that had an effect size >0.19, with a clear dropoff in response in the over 70 age group. It is unlikely that these findings would compromise the validity of our comparisons across family history groups. Additionally, because the moderate-risk and high-risk women all had complete family history data but only 50% of the marry-ins provided family history information, there is the potential for some bias to be introduced if the nonresponding marry-ins (without any family history of breast cancer) had less healthy behaviors than those responding. This would result in an attenuation of any effect where family history did correlate with healthier behaviors.

By including a control group with no family history of breast cancer, as well as a group with very strong breast cancer family histories, any effect of the strength of family history on health behaviors could be elucidated. The analyses are cross-sectional, and, thus, we cannot determine any temporal relationships between the diagnosis of breast cancer in family members and health behaviors. The family history information was collected only for one side of the family, that of the original proband. Thus, there may be some misclassification of individuals who have additional unreported family history. This was an exploratory study, as such some of our findings may be due to chance. For example, the differences in smoking history are not readily explainable in the context of breast cancer family history. We are not aware of important details of the participants' smoking histories, such as whether former smokers were likely to quit at the time of their relative's diagnosis, or at some other time in their life (e.g., during pregnancy). The average to low-risk group seems to be less likely to ever begin smoking, and among those who do start, average to low-risk women seem more likely to quit. Whereas it is tempting to speculate on possible reasons for this finding, we suggest that this is an avenue for further research. The survey was administered in the early 1990s; antiestrogen use was not prevalent during that time frame. It was in the early 1990s that tamoxifen was first considered a preventive agent (33, 34). However, that 9% of the high-risk women (compared with <5% of moderate-risk and average to low-risk women) were using antiestrogenic agents at that time suggests that at least some of the highest risk women and their physicians were pursuing risk-reduction measures because of their family history, although specific reasons for using antiestrogens were not assessed in this cohort.

In summary, women at high familial risk of breast cancer are more likely to undergo mammographic screening at younger ages and more likely to take antiestrogenic agents than women at moderate and average risk. However, these familial risk groups are all similar with regard to most lifestyle related health behaviors, including supplement use, physical activity, and alcohol intake. There may be slightly lower fruit and vegetable consumption and higher current smoking rates among higher risk women, but additional research is needed to address these findings. These results are a starting point toward understanding health behavior patterns in those at increased familial risk of breast cancer.

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