



# College Women and Breast Cancer: Knowledge, Behavior, and Beliefs Regarding Risk Reduction

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## ABSTRACT

**Background:** Although breast cancer prevention should begin in youth, many young women are not aware of the modifiable lifestyle risk factors for the disease. **Purpose:** The purposes of this study were to examine the breast cancer-related knowledge, behaviors, and beliefs of young women; to determine whether knowledge about lifestyle risks was related to risk-reducing behaviors; and to determine whether value expectancy constructs could predict risk-reducing behaviors. **Method:** Surveys assessing knowledge, behaviors, beliefs, and demographics were administered to 522 college women. **Results:** The majority of the participants lacked knowledge about the lifestyle risk factors for breast cancer, and knowledge and beliefs were unrelated to their behaviors. **Discussion:** The results of the study have implications for health educators, health care providers, and researchers who provide young women with the information and skills to engage in behaviors that may protect them against breast cancer. **Translation to Health Education Practice:** Young women need to understand that engaging in certain behaviors can lower their risk of breast cancer. Health educators need to incorporate breast cancer risk reduction into their educational efforts with young women.

## BACKGROUND

Breast cancer is the most commonly diagnosed cancer and the second leading cause of cancer deaths for women in the U.S. In 2007, approximately 178,480 women were projected to be diagnosed with breast cancer, and 40,460 of them were projected to die of the disease.<sup>1</sup> Over her lifetime, a woman has a 1 in 8 chance of developing breast cancer.<sup>1</sup>

Breast cancer incidence rates are higher for postmenopausal women than premenopausal women. Postmenopausal women have anywhere from a 1 in 25 to a 1 in 15 chance of being diagnosed, while women under 40 have a 1 in 210 chance.<sup>1</sup> More than 11,000 annual cases of breast cancer are estimated to occur in women under 40<sup>2</sup>; 1,225 women under 40 died from breast cancer in 2004.<sup>1</sup> Surveillance Epidemiology and End Results (SEER) data collected over 25 years from 73,367 women found that although

premenopausal women had a comparatively smaller breast cancer incidence rate than postmenopausal women, younger women were often diagnosed with a more aggressive form of the cancer and had higher mortality and recurrence rates.<sup>3</sup> In addition to battling a life-threatening disease and undergoing aggressive and invasive treatments, young women of childbearing age who develop breast cancer face more challenges and anxieties because of the potential side effects of treatment on their reproductive systems.<sup>4,5</sup>

Cancer is considered a continuum along which interruptions can take place at any point, from susceptibility to clinical manifestation.<sup>6</sup> One way to interrupt the continuum of breast cancer is to help young women acquire knowledge about risk factors and become motivated to reduce these factors in the face of a disease that poses an increasing threat as one ages.

## RISK FACTORS

Most risk factors associated with breast cancer are very complex, and some of them are not well understood. Knowledge of some is backed by strong scientific evidence while studies of others have yielded conflicting results. Risk factors can be organized into two main groups: genetic, inherited, and environmental factors that are usually non-modifiable, and lifestyle factors that can be modified in most cases. Women have no control over established risk factors such

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as gender, age, race, genetic makeup, family history, and environmental exposures to certain carcinogenic contaminants. They do, however, have control over risk factors such as reproductive choices, body weight, nutritional choices, physical activity, and alcohol consumption.

The American Cancer Society<sup>7</sup> identifies parity and age at first birth, breastfeeding, oral contraception, hormone replacement therapy (HRT), obesity and high-fat diets, activity and exercise level, and alcohol consumption as potentially modifiable risk factors for breast cancer. Oral contraception, diet, exercise, and alcohol consumption are particularly relevant to this study's population of interest—female college students.

The relationship between breast cancer risk and present or prior use of oral contraceptives (OC) is not clear-cut; findings from various studies have shown differing results. Although one study of 9,000 women showed that neither past nor present OC use resulted in an increased risk for breast cancer<sup>8</sup>, a meta-analysis of 54 studies indicated that women who used combined OC (i.e., estrogen + progestin) experienced a slight increase in breast cancer risk,<sup>9</sup> and a Swedish study of women under 40 found that use of OC before age 20 significantly increased their risk for early-onset breast cancer.<sup>10</sup>

Body weight, weight gain, body fat distribution, and the age at which weight changes occur also have an impact on a woman's risk of developing breast cancer. Preventing obesity is one of the few available means of breast cancer prevention.<sup>11</sup> Having a high body-mass index (BMI) after menopause has been associated with an increase in breast cancer risk,<sup>12,13</sup> and prevention of weight gain after age 18 and before menopause can lower a woman's risk for the disease.<sup>14</sup>

Other studies have linked high-fat diets with breast cancer. One prospective trial of premenopausal women found that those who ate a diet high in red meat and high-fat dairy products experienced a modest increase in breast cancer risk.<sup>15</sup> Red meat consumption was also linked with an increased risk of the disease among British

women.<sup>16</sup> A meta-review of 4,500 studies suggested that nutritional practices consistent with a Mediterranean-type diet and reduced red meat consumption could help reduce the risk for breast cancer and other chronic diseases.<sup>17</sup> Williams and Hord<sup>17</sup> recommended three habits for cancer risk reduction: maintenance of a healthy weight, consumption of a plant-based diet, and regular physical activity.

Indeed, the short- and long-term benefits of physical activity on breast cancer risk are unambiguous. Long-term, strenuous physical activity has been shown to decrease the risk,<sup>18</sup> with data indicating that 1.3 hours of exercise per week, starting at age 10, could mean as much as a 20% risk reduction.<sup>19</sup> The American Cancer Society<sup>20</sup> guidelines for nutrition and physical activity suggest that individuals engage in purposeful physical activities for 45–60 minutes per day on 5 or more days per week.

The risks of alcohol consumption in respect to breast cancer have also been well established.<sup>21–24</sup> Horn-Ross et al.<sup>25</sup> studied more than 100,000 women and found that recent intake of 2–3 drinks per day was related to an increase in breast cancer risk, with recent consumption most likely playing a larger role than intake in past years, and with average quantity of intake more significant than frequency of consumption. Accordingly, the American Cancer Society recommends avoiding or limiting intake of alcoholic beverages.<sup>20</sup>

### **Risk Awareness and Prevention**

Despite the evidence linking lifestyle behaviors to breast cancer risk, studies indicate that many young women are not cognizant of these links. In one international study of more than 10,000 college-age women in 23 countries, participants had low levels of awareness regarding risk factors, with only 1 in 20 (8%) identifying alcohol, obesity, diet, and exercise as factors.<sup>26</sup> Of the 1,120 U.S. college students who participated in the study, only 10.1% identified alcohol consumption as a possible risk factor, 15.9% identified overweight, and 13% identified dietary fat; similarly, only 17.9% indicated that breast cancer was influenced by exercise.

Wendt<sup>27</sup> found that female undergraduate students had little knowledge about risk factors for breast cancer even though they were very worried about the disease. And a study of Irish women found that they had a fairly high awareness of the disease and its symptoms and treatment methods, but a poor understanding of risk factors.<sup>28</sup> The authors of that study suggested that many women were not in a position to make healthy decisions and choices for themselves due to a lack of accurate information and knowledge about risk factors.

Given their apparent lack of awareness of breast cancer risk and protective factors, young women are a priority audience for breast cancer prevention efforts. For preventive lifestyle changes to occur, women must have accurate information about the disease, the risk factors, and their personal risk assessment. Such knowledge may be a first step in enabling young women to engage in healthy behaviors. Knowledge of risk factors alone, however, is not sufficient to bring about behavior change—women need to believe that engaging in risk-reducing behaviors will result in positive outcomes, and they must be motivated to engage in said behaviors. Value expectancy theories posit that health-related behavior is a function of an individual's beliefs, values, and expectations that a behavior will lead to a given outcome. The Health Belief Model (HBM) and the Protection Motivation Theory are both value expectancy frameworks for examining health-related behaviors. The former posits that individuals will engage in preventive health behavior if they believe themselves threatened by an illness or condition and believe that taking preventive action will result in a positive outcome.<sup>29</sup> The main components of this model include perceived susceptibility, perceived severity, and perceived benefits and barriers. Similarly, the Protection Motivation Theory<sup>30</sup> deals with cognitive factors that are associated with motivation for performing a behavior, including the severity of an event or condition, the probability of an event's occurrence (susceptibility), and the effectiveness of a recommended response.



## PURPOSE

Because it appears that many young women are not very knowledgeable about lifestyle risk factors for breast cancer, examining the characteristics of those who are knowledgeable may provide some clues on how to increase the awareness among others. Understanding the determinants of their risk-reducing behaviors can likewise assist in the promotion of risk-reduction practices. Accordingly, the purposes of this study were (1) to examine college women's knowledge, beliefs, and behaviors regarding breast cancer, (2) to examine the characteristics of young women who were knowledgeable about lifestyle risks for the disease, (3) to determine whether knowledge about lifestyle risks was related to risk-reducing behaviors, and (4) to determine whether value expectancy constructs could predict risk-reducing behaviors.

## METHODS

The study participants were 522 women attending a midsize suburban state college in New England. After the study was approved by the college's institutional review board, student research assistants distributed self-administered surveys in the college's residence halls, dining facilities, library, student union, and technology center. Specifically, they approached women in those areas and asked whether they would be willing to complete a survey about breast cancer. Only 20 individuals declined to participate. Women who had already completed the survey were not eligible to complete it again. Along with the surveys, the students were given informed consent letters explaining the study's purpose. They were also informed that participation was voluntary and that the questionnaire was anonymous. They were instructed to avoid making any identifying marks on the surveys and to place the completed surveys in the provided envelopes.

### *Instrumentation*

A 68-item questionnaire was created to examine young women's knowledge about breast cancer, awareness of risk factors, and behaviors regarding said factors. The survey also assessed respondents' perceptions re-

garding their susceptibility to breast cancer and the severity of the disease, as well as their beliefs regarding risk reduction. The items were based on reviews of the literature and information derived from the American Cancer Society.<sup>2,7</sup>

Participant knowledge was assessed via a list of factors that affect health in general. Respondents were instructed to check those factors that they considered risk factors for breast cancer. Three additional items addressed general breast cancer knowledge (e.g., "Breast cancer is always curable—true or false?"). A knowledge score was computed by summing correct responses. The lifestyle knowledge score was computed by summing the correct responses to only those items that addressed established lifestyle risk factors for the disease.

Participant behaviors were assessed with questions addressing frequency and types of exercise; number of daily servings of fruits, vegetables, and whole grains; weekly consumption of alcoholic beverages, red meat, and high-fat meals; and use of oral contraception. The researchers also calculated participants' BMI using their self-reported heights and weights. In addition, the women were asked whether they performed breast self-examinations (BSE).

Three items assessed participants' perceived susceptibility to breast cancer, and three others examined their beliefs about the severity of breast cancer. These items were rated on 5-point scales. For example, "My risk of getting breast cancer is..." ("very high" to "very low"), and "Breast cancer is..." ("very serious" to "very minor"). The susceptibility and severity scores were computed by summing the respective items. Beliefs about the efficacy of risk reduction were examined with two items rated on 5-point scales, which were summed to compute the risk-reduction efficacy score (e.g., "Engaging in healthy behaviors may reduce my risk for breast cancer"; "completely agree" to "completely disagree").

A risk-reduction measure was created by combining exercise frequency, BSE performance, and consumption frequency of fruits, vegetables, and whole grains. Three

other factors were included in this measure: BMI of between 18.5 and 25, three or fewer alcoholic beverages per week, and three or fewer meals containing red meat per week.

The survey also addressed family history of breast cancer and asked participants whether they had personal knowledge of individuals with the disease. Other items included basic demographic information and questions about health education classes.

The survey was examined for face validity by three health educators/researchers and then piloted with a group of students representative of the study population for clarity, readability, and comprehension. Reliability was assessed with a test-retest procedure carried out with 22 female students who were also representative of the study population. The administrations were one week apart; item-by-item correlation analysis yielded correlation coefficients ranging from 0.6 to 1.0. All data analyses were performed using SPSS, Version 13.0.

## RESULTS

### *Characteristics of the Participants*

The 522 study participants ranged in age from 18 to 24 years; their mean age was 19.77 (SD=1.41). Nearly 97% (n=505) were white. Approximately 25% were freshmen (n=132); 28.7% (n=150) were sophomores; 24.7% (n=129) were juniors, and 21.3% (n=111) were seniors. Nearly 15% (n=78) reported having had a college-level health class. Their BMIs ranged from 16.06 to 48.91; the mean BMI was 23.17 (SD=3.38).

Nearly three quarters of the women (n=385) were personally acquainted with someone who had developed breast cancer, and nearly a third (n=173) had relatives with the disease. Among these relatives were 22 mothers, 65 maternal grandmothers, 22 paternal grandmothers, 87 maternal aunts, and 26 paternal aunts.

### *Knowledge, Behavior, and Beliefs*

The participants' knowledge scores ranged from 2 to 13; the average score was 6.09 (SD=2.17). Although 93% of the women knew that family history was a risk factor for breast cancer, and nearly half (48.2%) knew that age was a factor, knowledge of



lifestyle risk factors was weaker. Only 44% indicated that obesity was a factor, and less than a third knew that alcohol consumption (31.4%), lack of exercise (32.2%), or diets high in red meat (24.4%) were factors.

The behaviors examined included exercise, diet, alcohol consumption, oral contraception use, and BSE. More than three-fourths of the women engaged in exercise (n=411), with 74.7% (n=390) engaging in aerobic exercise, 37.9% (n=198) in strength training, and 41.0% (n=214) in flexibility exercise. The participants exercised an average of 3.13 times per week (SD=1.29), and 55% of them had been exercising regularly for an average of 5.25 years (SD=3.5).

The women ate an average of 2.3 (SD=1.55) daily servings of vegetables, 2.6 (SD=2.28) daily servings of whole grains, and 2.9 (SD=2.10) average weekly meals with red meat. Nearly 79% of the participants drank alcoholic beverages; the number of weekly drinks ranged from .5 to 40, with the average being 5.4 (SD=5.35).

More than 57% (n=300) of the participants reported using oral contraceptives. The average age at which they began using OC was 17.08 years (SD=2.09). The length of time that they had been using OC ranged from 3 months to 10 years; the mean length was 2.96 years (SD=1.91).

Approximately 41% (n=214) of the participants conducted BSEs. Only 43.9% of these women (n=94) reported doing so on a monthly basis.

The women believed themselves to be somewhat susceptible to breast cancer; their mean score was 9.93 out of a possible 15. They believed that breast cancer is serious, with a mean severity score of 9.47 out of a possible 13. Their belief in the efficacy of risk-reducing behaviors yielded a score of 7.75 out of a possible 11.

#### *Comparisons, Associations, and Predictions*

Upon comparing those individuals who had higher knowledge scores ( $\geq 8$ ) (n=140) with those who had lower scores ( $< 8$ ) (n=382), the researchers found no significant differences in their beliefs, behaviors, or demographics, other than college class level.

Those with higher knowledge scores were more likely to be seniors and juniors than freshmen or sophomores ( $p=.008$ ).

Tables 1 and 2 show the variables significantly associated with overall knowledge about breast cancer and with knowledge about specific lifestyle risk factors. The only behavior associated with either knowledge variable was high fat consumption—those students with more knowledge about lifestyle risk factors consumed fewer high-fat meals.

To determine whether the value expectancy constructs of susceptibility, severity, and beliefs about the efficacy of risk reduction could predict risk-reducing behavior, a multiple regression analysis was conducted using the risk-reduction measure as the criterion. This analysis found that the constructs explained less than 1.5% of the variance in risk-reducing behaviors, with none of them making any significant contribution. Subsequently, multiple regression analysis was used to assess the individual risk-reducing behaviors (exercise; low fat, red meat, and alcohol consumption; BSE), determining whether they could be predicted by beliefs regarding susceptibility, severity, and efficacy of risk reduction. The researchers found that BSE was the only behavior that might be minimally explained by

the value expectancy constructs. Regression analysis indicated that 5.2% of the variance in BSE performance could be explained by the constructs, with susceptibility making the only significant contribution.

## DISCUSSION

Although young women are less likely to develop breast cancer than older women, they can begin at a young age to implement the lifestyle behaviors that can help prevent a disease that strikes nearly 180,000 women each year. The purpose of this study was to examine young women's knowledge about lifestyle behaviors that influence breast cancer, their participation in risk-reducing behaviors, and their beliefs about their susceptibility to breast cancer, the disease's severity, and the efficacy of risk-reduction efforts.

The study's finding about participants' knowledge was similar to what Peacey et al.<sup>26</sup> found in their study of university women in 23 countries. The participants in both studies had more awareness of the nonmodifiable risk factors for breast cancer (age and heredity) than of the modifiable lifestyle risk factors. Only 11% of the participants in the Peacey study correctly identified the four most well-established lifestyle risk factors: obesity, lack of exercise, eating a diet high

**Table 1. Factors Significantly Associated with General Knowledge about Breast Cancer**

	Correlation coefficient	p value
Perceived susceptibility	.128	.004
Beliefs about efficacy of risk reduction	.183	.000
Family member with breast cancer	.162	.000
College-level health course	.098	.028

**Table 2. Factors Significantly Associated with Knowledge about Lifestyle Risk Factors for Breast Cancer**

	Correlation coefficient	p value
Family member with breast cancer	.092	.036
Beliefs about efficacy of risk reduction	.111	.011
Frequency of high fat meals	-.139	.001



in red meat, and alcohol consumption. The current study went a step farther, examining risk-reduction behaviors to determine whether participants' knowledge about risk factors was associated with said behaviors. The resultant finding—knowledge was associated with only one risk-reducing behavior, eating a lower fat diet—should not be surprising; health professionals are well aware that knowledge is necessary but insufficient to bring about behavior change. Many theories and models of behavior posit that behavior is mediated by values, cognitions, and beliefs. This study examined the beliefs associated with value expectancy models such as the Protection Motivation Theory and the Health Belief Model. Both of these models contend that beliefs about susceptibility to a condition and beliefs about the severity of the condition influence behavior regarding that condition. Although the study participants felt somewhat susceptible to breast cancer, and most of them believed that breast cancer is quite serious, their beliefs were not associated with risk-reducing behaviors. Nor were their beliefs about the efficacy of such behaviors associated with their actual behavior.

Overall knowledge was, however, associated with perceptions of susceptibility and with beliefs about the efficacy of risk-reduction behaviors. In other words, women who were most knowledgeable about breast cancer perceived themselves to be more susceptible to the disease and were also most likely to believe in the efficacy of risk-reduction efforts. Unfortunately, their knowledge and beliefs were not related to their risk-reducing behaviors. Knowledge about breast cancer was also significantly associated with having family members who had developed the disease; nearly a third of the participants had relatives with breast cancer. Yet, even this factor was not associated with risk-reducing behaviors. This finding is somewhat inconsistent with other studies indicating that women with family histories of breast cancer are more likely to engage in screening for the disease.<sup>31</sup>

Although studies have indicated that women often overestimate their risks for

breast cancer,<sup>32,33</sup> that was not the case in this study—only 27.5% of the participants perceived themselves as being at very high or high risk. Their risk perceptions are perhaps more realistic than those of women who are unduly frightened of breast cancer, yet their lack of knowledge of what can put them at risk is disconcerting.

Young women need to understand that a fifth of breast cancer cases in industrialized countries are likely attributable to modifiable lifestyle behaviors.<sup>26</sup> They need to understand that engaging in certain behaviors will indeed lower their risks for breast cancer, as well as other diseases. And they should understand that, even at a young age, they are at a higher risk for breast cancer than for any other cancer. Women under 40 have a 1 in 210 chance of developing breast cancer, compared to a 1 in 631 chance of cervical cancer. In 2004, 462 women under 40 died of cervical cancer, while 1,225 died of breast cancer.<sup>1</sup> Yet, in a three-month period in 2007, Merck pharmaceuticals sold an estimated 3–4 million doses of a vaccine against HPV, which causes cervical cancer.<sup>34</sup> One wonders whether the ubiquitous advertising for the vaccine may be partially responsible for making women feel at risk and for encouraging them to believe that they could reduce their risk with the vaccine; unfortunately, there is no similar advertising blitz linking lifestyle risk factors with breast cancer.

Klein and Stefanek<sup>35</sup> claimed that individuals who feel more at risk spend more time looking for information that can be used to reduce their risks. They also claimed, however, that understanding and perceiving risk is problematic and influenced by innumeracy, heuristics, and motivational, emotional, and affective factors. The college environment may add to the problems of understanding risk. College students often engage in behaviors that put them at risk for health problems.<sup>36</sup> Peer pressure, stress, the availability of alcohol, and the abundance of high-fat foods may contribute to the clouding of careful considerations of risk, leaving risk-reducing behaviors perhaps incompatible with the group values of college students. Many such students may also

have “here-and-now” time orientations rather than future orientations, which have been shown to be related to health protection behaviors.<sup>37</sup>

Despite their lack of awareness of the associations between risk-reduction behaviors and breast cancer, many of the women participating in this study engaged in healthy behaviors. Nearly three-fourths of them exercised, although only about a half of them did so the recommended 5 times per week. More than 77% ate three or fewer red-meat meals per week. And 84% of those who drank reported consuming fewer than 10 alcoholic beverages per week. Yet, only 10% reported eating the recommended minimum of five daily fruits and vegetables, and 53% ate 2 or fewer servings of whole grains per day. Because young people's health-directed behaviors are often not driven by desires to prevent disease,<sup>38</sup> the participants' exercise and dietary behaviors may not be related to health concerns.

It should be noted that this study was limited by a nonrandom and racially homogenous sample; the findings clearly cannot be generalized to all college women. Another limitation is that the study relied on self-information from the participants. Self-reported data about alcohol consumption and dietary and exercise practices may be inaccurate due to faulty recall. A third limitation is that much of the knowledge score was based on identifying risk factors from a list, which may not be considered an adequate assessment of knowledge. The results of the study, nevertheless, have implications for health educators, health care providers, and researchers.

## TRANSLATION TO HEALTH EDUCATION PRACTICE

The modifiable lifestyle risk factors for breast cancer that are relevant to young women—obesity, lack of exercise, high-fat diets, and alcohol consumption—are also risk factors for other cancers and chronic conditions such as cardiovascular disease, which remains the leading cause of death among women in the United States. In addition to understanding their risks for disease,



young women need to receive information and skills that enable them to engage in healthy behaviors, which may in turn confer protection against breast cancer and contribute to overall good health.

One way to provide relevant information and skills is through college-level health courses. The participants in this study who reported a past college health course had greater knowledge of breast cancer ( $p=.028$ ), perceived themselves to be more susceptible to the disease ( $p=.04$ ), and were more likely to engage in risk-reduction behaviors ( $p=.04$ ) than those who had not taken such a course. Indeed, studies have indicated that college-level health classes can have a significant impact on knowledge and behaviors.<sup>39-41</sup> Although some colleges and universities require students to take health or wellness classes, most do not. Advocating for required college health courses can be one step in the direction of providing young people with information and skills they can use to prevent disease and promote health.

Education and awareness about risk and risk reduction belong in classrooms, clinics, health centers, and provider offices. And because health behaviors are clearly complex phenomena that are influenced by many more factors than this study addressed, research leading to a better understanding of young women's perceptions and assessments of risk and how those perceptions relate to behavior may lead to more effective education and prevention efforts.

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