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Participation in annual skin cancer screening among women seeking routine mammography☆

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Abstract

Background. Early detection of skin cancer is associated with improved prognosis. The American Cancer Society's current skin cancer screening (SCS) recommendation states that adults over the age of 40 should receive an annual skin examination conducted by a health professional. However, little is known about the psychosocial factors related to participation in annual SCS, which remains relatively low among the general public.

Methods. Data were collected from women, aged 50 and older, seeking routine mammography at a large, urban, breast diagnostic facility.

Results. A total of 253 eligible women completed the survey. Overall, 20.2% of women reported receiving annual clinical SCS. Physician recommendation, self-efficacy, perceived susceptibility, and age were significantly associated with participation in annual skin screening.

Conclusions. Similar to previously reported findings in the literature, our rates of participation in annual clinical skin screening were lower than reported rates for other types of cancer screening. Among older women, multiple covariates for participation in annual skin cancer screening were determined and may serve to guide future health education interventions to promote screening. Our findings suggest that participation could improve through increasing physician recommendation, screening self-efficacy, and individuals' sense of perceived susceptibility to skin cancer.

Keywords: Skin cancer screening; Health beliefs; Screening participation; Prevention; Early detection

Introduction

Skin cancer is the most common form of cancer in the United States with over 1 million cases and approximately 9800 deaths annually [1]. Mortality results primarily from melanoma, the most serious type of skin cancer [1]. Skin cancer is etiologically linked to genetic predisposition and environmental exposure, namely, sunlight or ultraviolet (UV) radiation. Risk factors include fair to light complexion, family history of skin cancer, personal history of skin cancer, chronic exposure to the sun, history of sunburns early in life, atypical nevi, and a large number of nevi or freckles [1–3]. If diagnosed early, the 5-year relative survival rate for melanoma is 96%; however, if not diagnosed and treated early, the 5-year survival rate drops to 61% for regional metastases and 12% for distant metastases [4]. Therefore, early detection increases the potential for improved skin cancer survival, and secondary prevention through a total body visual inspection of the skin conducted by both the individual and a health care professional is currently the most effective method of early detection [5].

The American Cancer Society [4] recommends a visual skin examination conducted by a health professional, once

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every 3 years for adults between the ages of 20 and 39 and annually after the age of 40, in addition to monthly skin self-examination. Clinical skin cancer screening (SCS) involves a 2- to 3-min visual inspection of the patient's entire body [6] and is considered by health professionals to be fairly simple and noninvasive. Participation in annual clinical skin cancer screening lags behind the adherence rates to other recommended cancer screening guidelines. There is no national population data regarding annual clinical skin cancer screening, however, several descriptive studies have compared the rate of skin cancer screening to other cancer screenings.

For mammography, clinical breast examination, cervical and colorectal screening, adherence rates range from 34% to 88% [4,7]. However, for skin cancer screening, only 14% of individuals surveyed reported ever undergoing a total body skin examination conducted by a health care professional [8]. The discrepancy in screening rates between skin cancer and other cancers raises numerous questions about skin cancer screening, specifically regarding the factors that influence individuals to seek and obtain annual skin cancer screening. In addition to the likely health services issues, it is important to understand the motivating and health-promoting factors for clinical skin cancer screening to increase early detection of skin cancer.

Prior research examining covariates of clinical skin cancer screening has been rather limited. In the absence of research regarding covariates of annual clinical skin examinations, research investigating the motivation to participate in public melanoma screenings, the covariates associated with skin self-examinations, and literature examining the covariates of other clinical cancer screening approaches will be examined to identify potential covariates of participation in clinical skin screening.

Factors related to participation in programs for the early detection of melanoma have generally been investigated by comparing participants in public melanoma screenings with the general population [9]. Participants typically expressed greater concern about being diagnosed with skin cancer [9] and reported that the fear of having skin cancer was an important reason to participate in the screening [10]. Brandberg et al. [9] found that a higher proportion of screening participants reported having previously consulted a physician for suspected skin lesions when compared to the general public. They also found that participants had more sources of information about skin cancer (e.g., magazines, television, newspapers, and health care professionals) and were better informed regarding their knowledge about melanoma and its risk factors [9]. Nevertheless, these researchers found no differences in level of perceived risk of developing skin cancer between participants and the general public [9].

The literature examining the performance of skin self-examination (SSE) has typically examined individuals' knowledge and awareness of skin cancer [9,11,12] in addition to the covariates of skin self-examination [13,14], frequently utilizing the Health Belief Model [15,16] as a theoretical framework. One national population-based telephone survey found that individuals were only fairly knowledgeable about skin cancer and that their performance of SSE was related both to higher perceived susceptibility of the development of melanoma and having had discussions about skin cancer with health care professionals [13]. Other researchers have found that higher optimism, greater perceived susceptibility, having multiple reasons for doing skin self-examination, family history of skin cancer, and physician recommendation were most strongly related to intentions to engage in future SSE [17–19]. Only approximately 15% of patients with a first primary melanoma reported performing skin self-examination [14], although a population-based survey found that only 9% of individuals reported performing a thorough SSE at least once every few months [19], and that the frequency of self-examination declined with age [20].

Since there is no literature to date examining the covariates of clinical skin cancer screening, we sought guidance from the burgeoning literature on other clinical cancer screenings, specifically breast (mammography) and colorectal (FOBT, flexible sigmoidoscopy and colonoscopy) cancer screening adherence. Overall, the literature has demonstrated that perceived susceptibility [21–25], physician recommendation [17,21,23,24,26], perceived screening efficacy or response efficacy [27], minimal barriers to screening [24], having adequate knowledge [28], and having a family history of breast or colon cancer [21,22,24,25] are positively related to increased breast and colorectal screening adherence.

In summary, covariates of participation in public melanoma screenings, SSE, and clinical cancer screenings are somewhat varied; however, all three screening modalities are generally associated with higher perceived susceptibility. Skin self-examination and clinical cancer screenings were also associated with family history of cancer and physician recommendation. Public screenings and clinical screenings appear to be related to minimal perceived barriers, which is intuitive given that these screening modalities require a potentially greater investment (with respect to time, money, travel, etc.) than SSE. Given these findings, we would expect that participation in annual clinical skin examinations would be related to similar covariates.

To gain an improved understanding of the facilitators of participation in annual skin cancer screening, the present study was guided by the Health Belief Model (HBM) [15,16] as a theoretical framework, as well as prior empirical findings regarding covariates of cancer screening. The HBM states that a person's decision about undertaking a preventive health action depends mainly upon the value placed by an individual on a particular goal and the individual's estimate of the likelihood that a given action will achieve that goal. The original HBM consists of: (a) perceived susceptibility of developing an illness, (b) perceived severity of the illness, (c) perceived benefits of the preventive action, and (d) perceived barriers to performing the recommended preventive health action. Additionally, some stimulus is thought necessary to trigger the decision-making process, and this ''cue to action''

may be internal (e.g., symptoms) or external (e.g., physician recommendation) [16]. In 1988, it was suggested that the HBM would be strengthened by the addition of self-efficacy; a belief in one's own competence in implementing a specific recommended behavior [29].

Guided by the HBM and prior research findings, this article will examine multiple covariates to understand women's motivation to participate in annual clinical skin cancer screening examinations. It is hypothesized that high perceived susceptibility, high perceived severity, high perceived benefits and low perceived barriers, high self-efficacy and response efficacy, a high degree of knowledge, having a physician recommendation, and a family history of skin cancer and familial screening will be related to participation in annual skin cancer screening.

Method

Participants

Participants were 253 women who were part of a larger study assessing attitudes and participation in multiple cancer screenings among women seeking routine mammography. Participants were required to be at least 50 years old and have no personal history of skin cancer. By utilizing women receiving routine mammography, it is possible to examine skin cancer screening attitudes and behaviors among a group of women who are already attune to health promotion and cancer prevention, as they are currently adherent to breast cancer screening recommendations.

The typical participant in the study was 62 years old (SD = 7.5), married or living with a partner (49.6%), Caucasian (76.3%), had health insurance (98.8%), and had at least a college degree (60.4%). Approximately half of the participants were employed (45.7%) and 47.6% reported a family income between US$30,000 and US$69,999. See Table 1 for additional descriptive information regarding study participants.

Table 1
Frequencies and percentages of the demographic variables and covariates

	N	Percentage (%)	M	SD	Range
Age			62.1	7.5	50–75
Ethnicity					
Caucasian	193	76.3			
African-American	39	15.4			
Latino/Hispanic	9	3.6			
Asian	6	2.4			
Other	6	2.4			
Marital status					
Married/living with partner	124	49.6			
Single	53	21.2			
Divorced/separated	45	18.0			
Widowed	28	11.2			
Highest education level attained					
Junior high school	5	2.0			
High school graduate/GED	47	18.7			
Partial college vocational training	48	19.0			
Standard college or university graduate	43	17.1			
Graduate degree or professional training	109	43.3			
Family income					
Less than US$10,000	2	0.9			
US$10,000–29,999	32	14.1			
US$30,000–49,999	59	26.0			
US$50,000–69,999	49	21.6			
US$70,000–89,999	33	14.5			
More than US$90,000	52	22.9			
Health insurance coverage					
No	3	1.2			
Yes	249	98.8			
Knowledge			5.2	1.3	0–7
Perceived severity of skin cancer			11.4	3.1	3–15
Perceived susceptibility to skin cancer			3.0	0.9	1–5
Response efficacy					
MD effective in detecting early stage skin cancer			3.5	1.1	1–5
Self efficacy					
Confident to go for MD skin exam			4.0	1.1	1–5
Benefits of skin cancer screening			50.0	9.8	20–65
Barriers to skin cancer screening			49.6	10.4	33–88

Procedure and measures

Women, age 50 and over, seeking routine mammography at a large, urban breast diagnostic facility from December 1998 to June 2000 were approached by a research interviewer and invited to participate in a health-belief survey about their knowledge, attitudes, and participation in multiple cancer screening and health-promoting behaviors. Women who provided written informed consent were given an assessment battery to return in a pre-addressed, stamped envelope. If the health-belief survey was not returned in 2 weeks, up to two weekly follow-up phone calls were made to encourage survey completion. The overall response rate was 82.9%. The present study sample size is smaller than the total sample size (n = 435) because all study participants were not asked about their personal skin cancer history. Therefore, to eliminate those individuals who had been diagnosed with skin cancer in the past and were undergoing screening for the purposes of medical follow-up, rather than for preventive purposes, only a subset of the total number of participants could be utilized. This study was approved by the Institutional Review Board of Memorial Sloan-Kettering Cancer Center. Guided by the HBM and prior literature, the study questionnaires included measurement of health beliefs about

skin cancer, and past screening and future intentions to undergo preventive clinical skin cancer screening.

Participation in skin cancer screening

Annual participation in skin cancer screening performed by a physician or nurse practitioner was measured by having participants choose one of seven descriptions that best matched their past screening behavior and future intentions. Descriptions of the different stages of participation in clinical skin cancer screening (see Table 2) were adapted from the stages of readiness to change from the Transtheoretical Model [30] and prior studies applying this classification schema to mammography screening intention [31–33]. This variable was dichotomized and participants were considered currently participating in annual skin exams if they endorsed that they "routinely undergo annual skin cancer screening and plan to have another one within the coming year." This definition was used to follow the American Cancer Society's [34] recommendation that adults over the age of 40 undergo an annual skin screening examination performed by a health professional. We were interested in measuring preventive skin cancer screening and felt that by asking about routine screening adherence, we would minimize the number of individuals classified as adherent who were screened solely for diagnostic reasons.

Health beliefs and attitudes

Participants were asked to rate their *perceived susceptibility* to skin cancer on a five-point scale. Perceived susceptibility was measured with one item, "Compared to other women my age, my chances of having skin cancer in the future are . . . " (much less than other women my age to much more than other women my age). This item was based on previous research on susceptibility to health problems [35–37].

Table 2
Stages of readiness of participation in annual skin cancer screening

Statement	*N*	%
I routinely undergo annual skin cancer screening and plan to have another one within the coming year.	51	20.2
I have not had skin cancer screening within the last year but I intend to have one within the coming year.	43	17.3
I have not had skin cancer screening within the last year but I am thinking about having it in the coming year.	55	22.2
I have never had skin cancer screening and I do not intend to have it in the coming year.	16	6.5
I have had skin cancer screening in the past but I do not intend to have it in the coming year.	18	7.3
I have never thought about having skin cancer screening.	65	26.2
I have decided not to undergo skin cancer screening.	0	0

Perceived severity of skin cancer was measured using three items, "Having skin cancer seriously disrupts health and comfort," "Skin cancer greatly influences a person emotionally," and "The health consequences of developing skin cancer are very severe" [38]. Participants answered each on a five-point scale (strongly disagree to strongly agree) and responses to the three items were averaged to form an overall perceived severity score for each participant (Cronbach's $\alpha = 0.87$).

Participants' *self-efficacy* about undergoing a physician-performed skin cancer screening was measured by the following item, "How confident are you that you can go for a physician-provided skin examination?" Participants answered on a five-point scale (not at all confident to extremely confident).

Perceived response-efficacy of physician-performed skin cancer screening was measured by one item, "How certain are you that your doctor could identify early-stage skin cancer in an examination?" This item was rated on a five-point scale (not at all certain to extremely certain).

Participants' *perceived benefits* of skin cancer screening and *perceived barriers* to undergoing skin cancer screening were assessed with a 27-item questionnaire. The questionnaire utilized was based on prior research examining decisional balance of breast [31] and colorectal cancer screening [39], which assesses benefits (pros) and barriers (cons) to screening. Participants were asked how much they agreed with each statement on a five-point scale (strongly disagree to strongly agree). Summary scores for both perceived benefits (Cronbach's $\alpha = 0.85$) as well as perceived barriers (Cronbach's $\alpha = 0.81$) were calculated for each participant.

Physician recommendation

Participants were asked to whether they had received a *physician recommendation*, by reporting whether their doctor or health care provider had ever recommended a physician-provided total body examination for skin cancer. Assessing recommendation for a total body examination we felt would decrease the number of individuals who had received a physician recommendation for an examination of a specific focused skin area or a suspicious mole.

Skin cancer screening knowledge

Participants' *knowledge of skin cancer screening* was assessed with seven true–false face valid statements about skin cancer risk factors, screening guidelines, and procedures. A total knowledge score for each participant was calculated by summing the number of correct items on the knowledge questionnaire.

Family history of skin cancer and skin cancer screening

Family history of skin cancer was asked with one item, "Have your parents, siblings or children ever been diagnosed with skin cancer?"

Partner's history of skin cancer screening was measured with one item asking participants, "To the best of

your knowledge, has your current spouse or partner ever undergone screening for skin cancer (doctor-provided skin examination)?"

Results

Descriptive information

The majority of participants did not have a prior history of any type of cancer (98.8%) or a family (defined as a first degree relative) history of breast, colorectal or cervical cancer (90.4%). Twenty-four (9.5%) participants reported that they had a first-degree relative who had been diagnosed with skin cancer. Thirty-nine percent of participants reported that their current spouse or partner had undergone skin cancer screening. Twenty-eight percent of participants stated that a physician had recommended clinical skin cancer screening. Approximately half of the participants reported that their health insurance covered skin cancer screening (47.4%) with the other half reporting that they did not know if it was covered (48.9%). See Table 3 for additional descriptive information.

Current participation in annual skin cancer screening

Approximately one-fifth of participants (20.2%, $n = 51$) reported ongoing annual participation in skin cancer screening, as indicated by their endorsement of the statement that they routinely undergo annual clinical skin cancer screening and plan to have another one within the coming year. Approximately four-fifths of participants (79.8%, $n = 202$) were currently nonadherent with recommendations for annual clinical skin cancer screening. See Table 2 for the full distribution of the stages of participation in skin cancer screening.

Table 3

Descriptive information	Percentage (%)
Perceived susceptibility	
Slightly more or much more vulnerable than other women	25.1
About the same susceptibility to skin cancer as others	51.4
Slightly less to much less vulnerable	23.5
Perceived severity	
Strongly agree that skin cancer is severe	28.3
Somewhat agree	32.7
Disagree	39.0
Self-efficacy	
Very or extremely confident to go to MD	69.7
Somewhat confident	19.5
A little or not at all confident	10.8
Response efficacy	
Very or extremely certain MD effective	46.0
Somewhat certain	36.1
A little or not at all certain	17.9
Knowledge	
Heard of skin cancer screening	74.6
Moderate knowledge (at least 70% correct on knowledge questionnaire)	73.5

Table 4
Correlations of annual skin screening participation with covariates

Annual participation in clinical skin cancer screening	Correlation (Spearman's rho)	Significance
Sociodemographic variables		
Age	0.14*	0.024
Ethnicity	0.10	0.099
Marital status	0.03	0.708
Education	−0.02	0.746
Family income	−0.08	0.252
Health insurance	0.05	0.382
Perceived severity of skin cancer	0.08	0.210
Perceived susceptibility to skin cancer	0.32**	<0.001
Physician recommendation	0.58**	<0.001
Response efficacy		
MD effective in detecting early stage skin cancer	0.19**	0.002
Self efficacy		
Confident go for MD skin exam	0.34**	<0.001
Benefits of skin cancer screening (pros)	0.35**	<0.001
Barriers to skin cancer screening (cons)	−0.32**	<0.001
Decisional balance (pros−cons)	0.36**	<0.001
Skin cancer knowledge	−0.04	0.481
Family history of skin cancer	−0.04	0.513
Partner screened for skin cancer	−0.05	0.412

* $P < 0.05$.
** $P < 0.01$.

Correlates of skin cancer screening participation

Bivariate correlations (Spearman's rho) between skin cancer screening participation and each univariate covariate were calculated and are presented in Table 4. The significant correlations ranged from 0.13 to 0.58. The strongest relationship was between participation in skin cancer screening and physician recommendation for screening. Unrelated to screening participation were a majority of the sociodemographic variables, perceived severity of skin cancer, skin cancer screening knowledge, family history of skin cancer, and partner's history of skin cancer screening.

Covariates of skin cancer screening participation

First, univariate logistic regression analyses were performed, utilizing each of the proposed covariates that were found to have a p value at or above 0.20 [40] in the correlational analyses with annual skin cancer screening participation. The covariates included age, perceived susceptibility, physician recommendation, response efficacy, self-efficacy, benefits of skin cancer screening, and barriers to screening.

Then, we tested the utility of the hypothesized covariates in explaining skin cancer screening participation in a single

model utilizing multivariate logistic regression. We performed this analysis by utilizing all of the covariate variables that were significantly related to skin cancer screening participation in each of the univariate logistic regression analyses.

The final multivariate logistic model is presented in Table 5. Participants were significantly more likely to participate in annual clinical skin cancer screening if their physician recommended skin cancer screening (OR = 14.35). As individuals' screening self-efficacy increased, they had significantly greater odds of participation in annual skin cancer screening (OR = 2.87). As women's perceived susceptibility to skin cancer increased, they were significantly more likely to participate in annual screening (OR = 1.93). Finally, older participants had significantly greater odds of participating in annual skin cancer screening (OR = 1.09). Results indicated that with each decade increase in age, participants had 2.38 greater odds of participating in annual skin cancer screening.

Post hoc analyses

Given the following results, we were interested in performing several follow-up analyses to better understand the differences between women who received a physician recommendation for clinical skin cancer screening versus those who did not. We were also interested in our lack of significant findings with regard to perceived severity and response efficacy.

When comparing those women who received a physician recommendation with those women who did not, one finds differences not only in their level of participation, but also with their screening self-efficacy, perceived susceptibility, and response efficacy. In fact, independent samples t tests indicate that self-efficacy [$t(251) = -6.89$, $p < 0.001$], perceived susceptibility [$t(251) = -5.49$, $p < 0.001$], and response efficacy [$t(251) = -3.18$, $p = 0.002$] significantly differed between these two groups of women, with all the above covariates being higher among women who had received a physician's recommendation to obtain skin cancer screening. Given that physician recommendation had such a strong relationship with annual participation in skin cancer screening within the multivariate logistic regression analyses, it was imperative to examine the relationship that the other covariates had with participation when controlling for physician recommendation. A hierarchical stepwise logistic regression was conducted to investigate the contribution of self-efficacy, age, and perceived susceptibility to screening participation, after taking into account physician recommendation. Our findings indicated that even after accounting for physician recommendation, self-efficacy, age, and perceived susceptibility remained significant contributors in explaining participation in annual skin cancer screening.

It is interesting to note that when the contribution of age, self-efficacy, perceived susceptibility, and physician recommendation were taken into account, response efficacy and perceived severity, two variables commonly examined as covariates of screening in the health literature, no longer had significant associations with annual participation in skin cancer screening. Response efficacy (belief that their physician could identify early stage skin cancer during an examination) was found to have a significant univariate relationship with skin cancer screening (OR = 1.59), however, when included in the multivariate model, became nonsignificant (OR = 1.10). When examining this relationship further by calculating partial correlations between screening participation and response efficacy, controlling for either physician recommendation or self-efficacy, the correlation between response efficacy and screening participation became nonsignificant. In addition, when examining the bivariate correlations, response efficacy is highly correlated with self-efficacy ($r = 0.501$, $p < 0.001$) and physician recommendation ($r = 0.330$, $p = 0.018$) among adherent women, indicating possible problems with multicolinearity.

Table 5
Multivariate model of annual skin cancer screening participation

Variable	*B*	P	OR	CI
Physician recommendation for skin cancer screening	2.66	<0.001**	14.35	5.85–35.22
Self-efficacy	1.05	0.001**	2.87	1.53–5.37
Perceived susceptibility	0.66	0.007**	1.93	1.20–3.09
Age in years	0.09	0.005**	1.09	1.03–1.16

B = unstandardized regression coefficient, OR = odds ratio, CI = 95% confidence interval.
Overall model $X^2 = 105.73$, $df = 4$, $P < 0.0001$.
**$p < 0.01$.

Discussion

The current study was designed to examine potential psychological and sociodemographic covariates related to participation in annual preventive clinical skin cancer screening. In this study, we examined skin cancer screening among women, age 50 and older, who were currently adherent to routine mammography recommendations. Among this group of women we found that skin cancer screening participation was relatively low. Approximately 20% of participants were routinely adherent to the American Cancer Society's [4,34] recommendation of an annual total body skin examination conducted by a health care professional. Similar to other findings in the literature, our reported rates of annual participation in skin cancer screening were lower than reported rates for screenings for other forms of cancer, such as breast and colorectal [7]. These findings also indicate that even among women who are attune to their health, as shown by their adherence to breast cancer screening, skin cancer screening rates still fall well below current mammography screening

rates of 79% [7]. This suggests that there may be different mechanisms and psychological factors motivating annual mammography screening and skin cancer screening. In addition, skin cancer screening rates may be lower than other cancer screenings because it has received less public exposure and the lack of a screening test, like PSA or a Pap test. The fact that all of our participants were undergoing routine mammography makes this study's 20% participation rate in skin cancer screening all the more disappointing.

Furthermore, among those women who did not participate in annual clinical skin cancer screening, almost one-quarter reported that they had never even thought about having skin cancer screening, although most women in our sample were fairly knowledgeable about skin cancer. Yet, it is unknown whether these women were specifically aware of the American Cancer Society's recommendations for an annual total body skin examination. Another 22% of women reported that they had not had screening within the last year, but were thinking about having skin cancer screening in the coming year. It is unknown, however, whether this intention will actually translate into future behavior change.

Several measures from the HBM were significantly associated with participation in annual skin cancer screening. Statistically significant variables in multivariate analyses were physician recommendation, self-efficacy, perceived susceptibility, and age. Results of the present study indicated that physician recommendation was strongly associated with skin cancer screening (e.g., 80% of women who participated in screening had received a physician's recommendation, whereas only about 15% who did not participate had received a recommendation). This finding is consistent with the existing literature on the importance of physician recommendation for breast [38,44] and colorectal cancer screening [25,27]. In fact, research has shown that physician influence is the most important predictor of women's participation in mammography [38,44]. Physician recommendation appears to be a potent cue to action and may provide a way to increase current participation in screening [45]. Among those women who received a physician recommendation, 58% reported undergoing annual skin cancer screening, whereas 42% did not participate. This finding indicates that although physician recommendation is important, it may not be sufficient for participation in annual preventive skin cancer screening.

This study also provides some initial evidence for the importance of both self-efficacy and perceived susceptibility in directly promoting participation in annual clinical skin cancer screening. Within our sample of women who participated in annual screening, a majority reported being extremely confident that they could undergo a clinical skin examination. This is consistent with the psychological literature indicating that a person's belief that he or she can implement a health behavior is an important predictor of the maintenance of the health-related behavior [41–43]. An example of this finding is the research that indicates that women's self-efficacy about performing breast self-examination (BSE) is associated with higher levels of BSE adherence [46–48]. Over half of the women who reported undergoing annual skin cancer screening stated that they felt more vulnerable or much more vulnerable of being diagnosed with skin cancer in the future compared to other women their age. This is consistent with the literature that has found significant positive correlations between perceived susceptibility and screening for colon cancer [49], skin self-examination [17,20,50], and prostate cancer [51]. In addition, perceived susceptibility has been found to be higher among women who are adherent to mammography guidelines [38,44].

In the present study, age also appeared to be an important sociodemographic variable related to participation in skin cancer screening. The older women in our sample were more likely to participate in annual skin cancer screening. However, this finding is limited due to the restricted range of the ages (50–75 years) of our participants. The literature regarding the relationship between age and cancer screening is inconsistent. Some research has demonstrated that older adults are more adherent to screening guidelines [52,53], whereas other findings indicate that older adults are less likely than younger adults to engage in cancer preventive practices or seek early cancer detection [54,55]. One study of skin cancer prevention indicated that older individuals engaged more frequently in sun protective behaviors than younger individuals [3].

Perceived severity was a widely cited covariate in the literature that was not significantly related to annual participation in skin cancer screening in this study. However, similar to the literature about perceived severity of breast cancer, many individuals in our study agreed that skin cancer was fairly severe. Because of this decreased variability, many studies of breast cancer do not include this as a covariate [45,56]. In addition, the literature regarding colorectal cancer screening has found a lack of significant association between perceived severity of colorectal cancer and screening adherence [57,58]. Therefore, the nonsignificant relationship between perceived severity and skin cancer screening participation in our study does not differ from a majority of other recently published cancer screening research. The measurement of perceived severity may also be problematic because there are different types of skin cancer (e.g., basal cell) that vary in terms of severity.

Response efficacy was also not significantly related to participation in annual skin cancer screening. It is possible that measuring response efficacy by asking whether individuals thought that clinical skin examination was beneficial and/or saved lives would have yielded different and more varied responses and results, as compared to our response efficacy item regarding individuals' confidence in their physician's ability to detect early stage skin cancer. Al-

though response efficacy had a significant univariate association with annual participation in skin cancer screening, it was nonsignificant in the multivariate model, and therefore, it is less likely that response efficacy contributes any unique estimation of skin cancer screening above and beyond age, perceived susceptibility, physician recommendation, and self-efficacy.

Several limitations of this study should be taken into consideration when interpreting these findings. Our study utilized a cross-sectional design, thereby limiting our ability to investigate causal relationships between the variables. In addition, our data were self-report and collected retrospectively and therefore are subject to potential recall bias or false reporting. The participants in our study consisted solely of older women who were predominantly Caucasian, well educated, of higher socioeconomic status, and had access to health insurance and health care. This limits the generalization of our results to more diverse or disadvantaged populations. It also limits our ability to investigate any possible gender differences in health beliefs and behaviors. Women are generally more likely to report engaging in various health behaviors than men [53]. In addition, the frequency of participation in annual skin cancer screening may be higher than would be expected in the general population because our study only included older women who were adherent to breast cancer screening guidelines and were attending a clinic for a routine mammography. The current study is also limited in that potential selection bias is difficult to assess since we were unable to measure the health beliefs and screening behaviors of study refusers. This may not be a serious problem for this study because there were a limited number of study refusers (less than 18%). Several of our variables were measured by one item, which may be related to some of our nonsignificant findings and may ultimately limit some of the conclusions of this study. Another potential limitation concerns the lack of information about participants' phenotype (e.g., hair color, eye color), however, these characteristics likely influenced an individual's perceived risk and physician recommendation, but we did not find a significant relationship between ethnicity and skin screening participation. Nevertheless, this may not be a serious study limitation, as current skin screening recommendations do not differ by phenotype.

Despite these limitations, the present study points to multiple covariates of skin cancer screening as guiding issues for health education interventions to promote skin cancer screening. Our findings may be relevant for designing future interventions to increase skin cancer screening participation among women, through increasing physician recommendations, individuals' sense of perceived susceptibility, and self-efficacy to get screened. This would not preempt primary prevention (sun protection), which has been demonstrated as imperative in decreasing skin cancer rates [1,4]; however, screening could be promoted in conjunction with sun protection programs. Future research should also longitudinally examine predictors of both primary and secondary skin cancer prevention among both men and women, attempt to identify other cues to action besides physician recommendation, and implement and evaluate the effectiveness of intervention programs for skin cancer to comprehensively prevent and detect one of the most common yet treatable cancers.

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