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The Influence Of Perceived Control On Breast Cancer Screening In Hispanic/latino Women

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Abstract

Background: Breast cancer is the leading cause of cancer mortality for Hispanic/Latino (H/L) women in the United States. Although incidence rates are lower among H/L women than among white women and other minorities, H/L women are more likely to be diagnosed with late-stage breast cancer and to have lower 5-year relative survival compared with non-Hispanic white women. H/L women are less likely than white and African American women to receive screening mammography according to recommended guidelines. This study examines the relationship between perceived control over three health outcome domains: 1.) remaining healthy, 2.) being diagnosed with cancer, and 3.) the ability to recover from cancer if diagnosed, and self-reported history of mammography screening in a population of H/L women living in the northeast United States. **Methods:** As part of a large, prospective cohort study, 1,591 women answered questions about their perceived control over remaining healthy, developing cancer, and recovering from cancer if they were to be diagnosed. They also provided information on whether they had received a breast cancer screening mammogram in the previous year. In addition to analyzing descriptive information, multivariate adjusted logistic regression was conducted to analyze the association of low and moderate levels of perceived control compared with high perceived control on mammography screening non-adherence. Odds ratios (ORs) and 95% Confidence Intervals (CIs) are reported. **Results:** The adjusted odds of non-adherence to mammography guidelines were statistically significantly higher for women who had low or moderate levels of perceived control, as compared to women who had high levels of perceived control. **Conclusions:** Cancer prevention strategies should address culturally-specific beliefs that impact women's sense of control over their health in order to affect consistent, long-term mammography use in this population.

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Background

Breast cancer is a leading cause of cancer mortality for women in the United States, ranking first for Hispanic/Latino (H/L) women and second behind lung cancer for black and white women. Breast cancer incidence rates are lower among H/L women than among white women and other minorities: 127.3 per 100,000 for whites, 118.4 per 100,000 for blacks, and 91.4 per 100,000 for Hispanics in 2006-2010 [1, 2]. Despite these statistics, breast cancer is less likely to be detected at the localized stage in H/L women compared to non-H/L women, which contributes to H/L women being more likely to be diagnosed with larger, more difficult to treat tumors [3]. The underutilization of mammography among racial/ethnic minority and low income women has been well documented, since as early as 1987 [4]. Population-based surveys indicate that Hispanic women are significantly less likely to receive screening mammography and are more likely to be diagnosed with late-stage breast cancer compared with non-Hispanic white women [5, 6]. According to the American Cancer Society, in 2010, only 46.5% of H/L women 40 years of age and older had a mammogram within the previous year, and only 64.4% had a mammogram within the previous two years, as compared to 51.5% of non-H/L women receiving a mammogram in the previous year, and 67.0% receiving mammograms in the previous two years [7].

Theoretical Framework

Theoretical models are often used to understand and identify reasons for low compliance rates for cancer screening among women. The Health Belief Model (HBM) is perhaps most commonly used to identify these factors. HBM, which emerged in the

late 1950s, was first used as an exploratory model to assess why people did not use preventive health services and eventually to understand why people use or fail to use health services [8].

Perceived control (health locus of control) is another construct that is used to assess the relationship between psychosocial factors and health outcomes [9]. Derived from social-learning theory, it describes an individual's beliefs about his/her ability to affect desired outcomes [10]. Individuals who feel that they can influence their circumstances or environment rank higher on perceived control, whereas those who believe that they have little influence in directing their lives have lower perceived control. Locus of control refers to one's belief as to whether control over valued outcomes is "internal" (as a consequence of some action in which the person engages) or "external" (as a consequence of outside forces, such as either the situation itself, the action of other people, or fate/chance). Therefore, a sense of internal control is related to actions to improve health.

One in eight women will be diagnosed with breast cancer in her lifetime. Despite advantages in diagnostic methods and treatment, breast cancer continues to be a leading cause of morbidity and mortality among American women. When detected at a localized stage and confined to its primary site, the five-year survival rate is approximately 99%, while the five-year survival rate drops to approximately 24% when diagnosed at a distant stage [1]. H/L women are less likely to be diagnosed with a localized stage breast cancer as compared to white women [7].

Since 1997, the ACS has recommended annual mammography screening for all women beginning at age 40 [11]. The state of Connecticut has also mandated that individual and group health insurance policies utilize the same age guidelines for mammography screening [12]. This age recommendation is particularly important in the H/L population because it has been found that these women develop more aggressive tumors at younger ages.

The purpose of this study is to investigate the influence of perceived control on breast cancer screening in H/L women living in the northeast U.S., and serves as a baseline evaluation of a large, prospective study which will address adherence over a longer period of time. We hypothesize that those women who have lower perceived control over their health will be less likely to be adherent to mammography screening guidelines as set forth by the ACS [11]. Specifically, we will test the hypothesis that women who have lower control will be less likely to have received a screening mammogram in the previous year.

Materials and Methods

Study Design

Using the baseline data collected as part of a large prospective study of mammography screening in H/L women living in the northeastern United States, we will investigate whether perceived control is associated with history of recent mammography screening. Our study addresses a gap in the literature, as the population of H/L women living in the northeast United States, who are generally of Caribbean ancestry, rather than from Mexico or Central or South America, are underrepresented in the published

scientific literature. These women bring different traditions, beliefs, and attitudes from their home countries regarding health behaviors. Thus, a strategy of studying ethno-regionally distinct subgroups of the larger H/L U.S. population would most likely yield results that could inform meaningful cancer prevention efforts for this population.

Study population

Between October 2009 and March 2011, women who presented for a routine primary care visit at selected primary care clinics in Connecticut were recruited. Women were eligible for enrollment if they self-identified as H/L and were between the ages of 40 and 75 years. Excluded were women with current breast problems, a history of breast cancer or a history of breast surgery (including biopsy or cyst aspiration). Women who reported having had breast surgery for cosmetic reasons were not excluded from eligibility.

Bilingual H/L research assistants approached all women who presented for primary health care appointments during 2 – 4 hour blocks, 2 – 3 days per week, at participating facilities. After eligibility was determined, invitations to participate in the study (a contact letter, information sheet, and consent form for access to radiology records) were mailed to all eligible women. A bilingual interviewer contacted the patients a few days after the mailing to discuss the study, to determine interest, and to set up an appointment for a telephone interview (in-person interviews were arranged when requested). One thousand seven hundred and thirty of the 2,137 women (excluding ineligibles) identified as potential participants were successfully contacted and 1,600 women were interviewed. This study yielded a 75% participation rate among all eligible

women and a 92% participation rate among women who could be contacted based on the information provided at the time of enrollment. Based on careful review of name, address, and date of birth, duplicate cases could not be ruled out for 9 completed interviews, resulting in a final baseline cohort of 1,591 women. Interviews were conducted in English (15%) or Spanish (85%), depending on the participants' preferences. Participants were compensated with gift cards to a large retail/grocery establishment.

According to the U.S. Census Bureau's Annual Population Estimates (2010-2012), the four cities with the largest total H/L populations in Connecticut are: Bridgeport, New Haven, Hartford, and Waterbury [13]. Primary care centers in these cities were selected due to their relatively large H/L patient populations, and were a mix of hospital-based primary care clinics and Federally Qualified Health Centers (FQHCs). The participating primary care centers included: Bridgeport, CT: Bridgeport Hospital, Optimus Health Care, Inc. (Bridgeport Community Health Center, Park City Primary Care Center; Hartford, CT: Hartford Hospital, Community Health Services, Inc.; New Haven, CT: Hill Health Center, Fair Haven Community Health Center, Hospital of St. Raphael, Yale-New Haven Hospital; Junta for Progressive Action; Waterbury, CT: St. Mary's Hospital (StayWell Health Center, Inc., StayWell Health Center- South End), Waterbury Hospital (Chase Outpatient Center).

All study activities were approved by the Yale Human Investigation Committee (HIC), as well as the research oversight committees in the participating facilities. Verbal consent was obtained before conducting the telephone interviews. Written, informed consent (98.6%) was obtained for review of radiology records.

Variables and Measures

The baseline questionnaire covered a range of key factors that have been used in the study of mammography and other cancer screening, including our own earlier study of differences in the process of mammography screening between African American and white women [14-17]. Adaptations were made to the questionnaire for use in the H/L population, as most of the health behavior models were validated in white populations. In addition to a review of the scientific literature, qualitative methods were used to develop the questionnaire. This included key informant interviews with health care providers, radiologists and technicians who provide mammograms to ethnically diverse populations, and 6 focus groups conducted with H/L women, ages 35 and older. The questions used in this study addressing perceived control were taken from the Race Differences in Screening Mammography Process Study [15].

Non-adherence to Mammography Screening Guidelines

The baseline questionnaire included a question "Did you receive a mammogram in the last year?" with "yes" or "no" as possible answer choices. This question served as our dependent variable, in accordance with the American Cancer Society guidelines for early detection of breast cancer [11]. For the purpose of this analysis, women ages 40 years and above were considered non-adherent if they reported not having obtained a mammogram within the previous 12 months. Although not presented in this report, history of mammography screening in the previous 2 years was also analyzed and produced similar results.

Perceived Control

The main predictor, perceived control over one's health, was assessed during the baseline interview with the following three questions: (a) "How much control do you feel you have over whether or not you will remain healthy?" (b) "How much control do you feel you have over whether or not you will develop cancer in your lifetime?" and (c) "How much control do you feel you have over whether or not you could recover from cancer if you had it?" For all three items, responses ranged from least to most perceived control: (1) "No control," (2) "A little control," (3) "Some control,"(4) "A lot of control," (5) "Don't Know." There were 52 participants that answered "Don't Know" for one of the three questions, 3 participants that answered "Don't Know" for two of the three questions, and 1 participant that answered "Don't Know" for all three questions. All responses of "Don't Know" (n=56) were dropped from analysis. Values for respondents who did not provide an answer to any of the index questions (n=1) were also excluded. There were no statistically significant differences between those who were dropped from the analysis and those who were included.

As is often done in perceived control studies [18-20], the responses for the three perceived control questions were summed to create an index (Cronbach's alpha = 0.531). The index was then categorized into tertiles based on the frequencies of each summed response value, in order to compare non-adherence among women with overall low, moderate, and high levels of perceived control.

Primary Covariates

A set of primary covariates (sociodemographic, acculturation, access to medical care, and health status) was included in all adjusted analyses. Sociodemographic

variables included (a) age (40-49, ≥ 50 years), (b) marital status (single versus married/partnered), (c) education level (<12 years, ≥ 12 years), (d) annual household income (<$10,000, $10,000-$14,999, ≥ $15,000). Acculturation variables included (a) years living in U.S. (<10 years, ≥10 years, U.S. born), and self-rated spoken English skill (no English/not well/well versus very well). Access to medical care variables included (a) insurance status (none versus any coverage), and (b) usual care provider (no versus yes). The insurance variable of "some coverage" encompassed public insurance coverage or some private coverage. The usual care provider variable was coded as "yes" if the participant usually saw the same doctor at the same facility, and was coded as "no" if the participant usually saw a different doctor at the same facility, or usually went to a different facility. Health status variables included self-rated health (fair/poor versus good/very good/excellent). Family history (yes versus no) was based on breast cancer diagnosis in primary relatives (mother, sister, or daughter).

Statistical Analysis

Descriptive statistics were used to characterize the study sample. Associations between non-adherence to mammography screening guidelines and individual perceived control questions were examined using a bivariate analysis, and a multivariate analysis was conducted to analyze the associations between not receiving a mammogram versus receiving a mammogram and the individual perceived control questions. Odds ratios (ORs) and 95% confidence intervals (CIs) corresponding to the association between history of screening mammogram and a one-unit decrease in score for the perceived control questions are presented.

A perceived control index was created by summing the responses for the three perceived control questions (range: 3-12). Tertiles corresponding to low perceived control (tertile 1), moderate perceived control (tertile 2), and high perceived control (tertile 3) were analyzed using dummy variables. Unadjusted and multivariate logistic regression analyses were conducted to evaluate the association of moderate and low levels of control compared with high control on receipt of a screening mammogram in the previous year. The multivariate analyses used logistic regression to generate maximum likelihood estimates of odds ratios (OR) with 95% confidence intervals (95% CI). A priori hypotheses and the scientific literature informed our decision to include the primary covariates listed above. Variables that were found not to be statistically significantly associated with mammography non-adherence or perceived control were dropped from the final model presented. Additionally, if the sample size of a covariate was too small to predict its impact on the model it was not included. All of the covariates, with the exception of income, years in the U.S., and family history of breast cancer in primary relatives remained in the final model.

Results

Characteristics of the Study Population

As shown in Table 1, 1,591 H/L women were included in the study population. Most participants were between the ages of 50 and 64 years (47.1%), and two-thirds of the study population was single (66.8%). Slightly more than half of the participants reported less than a high school education (54.0%) and an annual household income of less than $10,000 per year (51.0%), and a large majority had public insurance (72.3%).

Most women were foreign born (83.7%), many of whom had lived in the United States for 10 years or more (69.5%), but only 14.1% of all participants thought they spoke English "very well." Despite having been recruited from primary care centers, nearly half (46.0%) of participants did not have a usual care provider (i.e., the same physician for primary care) and rated their health as "fair" or "poor" (56.7%). Only 10.1% of participants had a family history of breast cancer in primary relatives. Almost two-thirds of the study population had received a mammogram in the previous year (65.0%).

Associations of Perceived Control Items and Mammography Non-adherence

Table 2 shows the unadjusted effects of each perceived control question on mammography non-adherence. Women who reported having lower perceived control over remaining healthy, over whether they would be diagnosed with cancer in their lifetimes, and over whether they could recover from cancer if they had it, were statistically significantly more likely to be non-adherent. The effects of each perceived control question on mammography non-adherence, adjusted for age, marital status, education level, insurance status, usual care provider, self-rated health, and self-rated spoken English are also shown. In the multivariate adjusted models, women who reported having lower perceived control over remaining healthy were statistically significantly more likely to be non-adherent (OR: 1.32, 95% CI: 1.16 – 1.50), as were women reporting lower perceived control over whether they would be diagnosed with cancer in their lifetimes (OR: 1.15, 95% CI: 1.04 – 1.26). The odds of non-adherence for women who reported having lower perceived control over whether they could recover from cancer if they had it were not statistically significant (OR: 1.08, 95% CI: 0.97 – 1.20).

Associations of Perceived Control Index and Mammography Non-adherence

Table 3 displays the unadjusted and adjusted effects of the perceived control index (low, moderate, and high tertiles) on mammography non-adherence. The unadjusted odds of non-adherence among women with low perceived control and with moderate perceived control were statistically significantly more likely to be non-adherent as compared to women with high perceived control. The effects of the perceived control index on mammography non-adherence, adjusted for age, marital status, education level, insurance status, usual care provider, self-rated health, and self-rated spoken English are also shown. The odds of mammography non-adherence among women with the lowest perceived control were 1.64 times the odds of non-adherence for those with the highest perceived control (95% CI: 1.24 – 2.17). The odds of mammography non-adherence among those with moderate perceived control were 1.57 times the odds of non-adherence for those with the highest perceived control (95% CI: 1.18 – 2.08). The odds of non-adherence for women with low perceived control and with moderate perceived control were statistically significant. The associations between the lowest perceived control tertile and the moderate perceived control tertile, however, were not statistically significantly different (p=0.712). Because of the number of records dropped from the multivariate analysis, we included a variable for missing (on any variable) versus non-missing in the model. Final models testing for the impact of missing values yielded similar results. Additionally, tests for plausible interactions were conducted and none were statistically significant.

Discussion

The concept of perceived control is relevant in assessing H/L women's attitudes towards preventive health behaviors. How perceived control improves or maintains health is unclear, but it has been shown that having a sense of control has health benefits, such as better self-rated health [21, 22], emotional well-being, improved performance, a greater likelihood of making difficult behavioral changes [23, 24], and reduced physiological impact of stressors. Evidence demonstrates that individuals who feel a lack of control in their daily life tend to show heightened neuroendocrine and autonomic stress responsiveness [25, 26].

In general, people who feel that they are in control of their destiny tend to have a stronger sense of well-being than those who feel helpless. A recent cross-sectional study of two middle-aged community samples from Sweden and Russia examined the distribution of perceived control scores in the two populations and assessed the association between perceived control and self-rated health. The authors found that the Russians reported lower perceived control on most items, and that they also reported poorer self-rated health than the Swedes. In both countries, perceived control was associated with poor self-rated health [27]. Additionally, individuals with increased perceptions of control over their lives are more likely to take active steps toward reducing or avoiding negative circumstances [28].

Early sociological literature has focused on the social hierarchical differences in individuals' perceptions of control. Findings have revealed that women, minorities, and those of lower socioeconomic status reported lower perceived control than those in more advantaged positions [29, 30]. Although a variety of health locus of control models exist,

there is a paucity of literature investigating the relationship between health locus of control factors and breast cancer screening behaviors of Hispanic women [31].

Common barriers to breast cancer screening identified in studies of mammography use in H/L women include lack of health insurance, the fear that mammograms may be painful, fear of being diagnosed with cancer, limited English proficiency, and low education levels [32-34]. In H/L women, fear of cancer may also be associated with fatalistic beliefs about the disease, which may contribute to negative or pessimistic attitudes toward mammography and other preventive health practices and disease outcomes [35, 36]. Racial and ethnic differences have been identified in the literature. Research has suggested that fatalistic beliefs about cancer that may negatively affect screening efforts are more common among H/Ls and African Americans as compared to whites [35, 37-40].

Our data indicates that H/L women living in the state of Connecticut who have higher levels of perceived control are more likely to have received a mammogram in the previous year than those with lower levels of perceived control. Like most of the H/L population in Connecticut and the Northeast, they are generally of low socio-economic status and live in urban settings. Furthermore, the data demonstrates that the odds of mammography non-adherence for those with the lowest perceived control were 1.65 times the odds of non-adherence for those with the highest perceived control. Our findings are in accord with earlier studies in both breast cancer screening and other chronic disorders [41]. Perceiving oneself as having control over the effects of breast cancer and one's health in general has been shown to be associated with greater intention to obtain a mammogram in the general popualtion [42, 43]. What makes this particularly

important is that the prevalence of low to moderate levels of control is considerably higher in H/L women than in white women, suggesting one pathway to lower mammography screening and perhaps later stage at diagnosis [44].

A similar locus of control construct has been used to compare white women to H/L women regarding their beliefs about breast cancer. Smiley and colleagues (2000) studied 113 Hispanic and 197 white women living in Florida to compare their health beliefs about breast cancer and health locus of control. They found that Hispanic women were significantly more likely than the non-Hispanic women to believe that health is a matter of luck, and to attribute health to chance or to powerful others. These findings suggested that Hispanic women feel less in control of their health and, therefore, may not be proactive in seeking screening services [44].

In another study of minority women in the southeastern U.S., Barroso and colleagues (2000) evaluated self-reported data about how health beliefs related to breast cancer and health locus of control in 197 white women and 152 African American women. The authors found that African American women were significantly more likely to believe in chance, to depend upon powerful others for their health, and to doubt the value of cancer screening and an early cancer diagnosis [45].

Perceived control has also been examined with respect to chronic diseases, other than breast cancer. For example, Stürmer and colleagues (2006) performed a follow-up of a population-based cohort in Heidelberg, Germany. Of 5,114 women and men ages 40-65 during median follow-up of 8.5 years, 257 participants died and 72 participants were diagnosed with myocardial infarction, 62 with stroke, and 240 with cancer. A high

internal locus of control over disease was significantly associated with a decreased risk of myocardial infarction. Another study by Infurna and colleagues (2013) examined the extent to which means the levels and rates of change and perceived control over 16 years predict all-cause mortality over a 19-year follow-up period. The study sample included U.S. residents ages 25 years and older, participating in the nationwide Americans' Changing Lives Study, which assessed a wide range of sociological, psychological, and physical health measures. Shared growth-survival models revealed that higher levels of and more positive changes in perceived control were associated with longer survival times, independent of sociodemographic correlates [46]. These studies suggest that interventions designed to increase patient's perception of control are likely to have a positive impact on mortality and the qualitative aspect of treatment.

Our data demonstrated that those H/L women who felt they had control over their risk of developing breast cancer were more likely to have screening mammograms. For these women, a high level of perceived control may have trumped the fatalistic beliefs that are known to be common in this population [47].

The findings of this study should be evaluated in the context of its strengths and limitations. Among its strengths, this is the first in-depth study of predictors of mammography screening in H/Ls living in the northeast United States, and the first to underscore the importance of perceived control in cancer prevention in this diverse population of mostly recent immigrants. We found that H/L women who had higher levels of perceived control were more likely to have received a mammogram in the previous year than those with lower levels of perceived control. Our results add to the evolving understanding of mammography adherence in this population. On a national

level, mammography screening rates in H/L women are lower than are reported for whites or African Americans [7]. However, studies of predictors of screening may not be generalizable to those living outside of the Northeast, underscoring the need to study this ethnic population by geographic region.

Another strength is that this study is part of a large, prospective cohort looking at many dimensions from theories of health behavior, including the Health Belief Model, the Social Learning Theory, and the Locus of Control Theory. Because of its focus on cancer screening, the perceived control questions were specifically targeted to assess its impact on mammography screening behavior, rather than the more generic control measures used in other studies. Furthermore, because of the detailed information collected on sociodemographic, medical care, and acculturation factors, we were able to control for a wide-range of potential confounding variables.

Additionally, this study provides a baseline evaluation for a large prospective study that is still in progress. The prospective study will address adherence over a longer period of time, will establish temporality, and importantly, will be able to avoid the problem of over-reporting adherence to cancer screening tests that is common in self-reported retrospective screening histories [48].

Limitations of our study should also be noted. Participants were recruited into the study at primary care clinics in Connecticut. Because these H/L women had access to some health care, it is likely that they perhaps had more cues to action, such as physician recommendation to get screened or increased health literacy due to exposure to the health care system, and thus, were more likely to adhere to preventive health screening

guidelines than H/L women who did not attend any primary care clinic. However, the study results remain generalizable to H/L women in Connecticut and the northeast United States. Although the study population was recruited through FQHC- and hospital-based primary care centers, indicating that they were able to access care, they are very similar to the general H/L population living in Connecticut with respect to sociodemographic and socioeconomic characteristics, according to the 2010 U.S. Census [49].

As our questionnaire was broad so as to capture the multifactorial nature of preventive behavior, we were able to include only a few questions to assess the construct of perceived control. Although this has the advantage of being able to control for key sociodemographic, access to care, acculturation, and other factors, future studies focusing on questions on perceived control should consider a more comprehensive, validated questionnaire such as the Perceived Personal Control (PPC) Questionnaire [50].

Conclusion

Early detection of breast cancer through mammography screening is the most effective way to control this common cancer, by detecting tumors when they are small and potentially more treatable. Regular use of mammography is one important way we can achieve meaningful reductions in breast cancer-related mortality [51]. Thus, the identification of mammography barriers is critical to the development of effective and successful health promotion strategies.

We found that the perception of control over one's health positively correlated with mammography screening adherence in a population of H/L women in Connecticut. Perceived control, and other perceived barriers such as fear of cancer, embarrassment,

and fatalistic views of cancer, may impede mammography screening in H/L women. In reaching out to H/L women with regard to cancer screening and prevention, health professionals need to take perceived control into consideration. Future investigations will need to identify specific factors that influence perceived control in order to identify cancer prevention strategies for this population. Prevention strategies should also address culturally specific beliefs that impact women's sense of control over their health in order to affect long-term, regular mammography screening.

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Table 1. Study Subject Characteristics, H/Ls in Connecticut, 2009-2012 (n= 1,591)

Characteristic	n[a]	%
Sociodemographic		
Age (years)		
40-49	688	43.2
50-64	749	47.1
65+	154	9.7
Marital status		
Single	1,063	66.8
Married/Partnered	528	33.2
Education level		
<12 years	856	54.0
>= 12 years	729	46.0
Income		
<$10,000	769	51.0
$10,000-$14,999	364	24.1
$15,000+	376	24.9
Acculturation		
Years in U.S.		
<10 years in U.S.	224	14.2
>=10 years in U.S.	1,095	69.5
U.S. Born	257	16.3
Self-rated Spoken English		
No English/Not well/Well	1,216	85.9
Very well	200	14.1
Access to Care		
Usual Care Provider		
No	726	46.0
Yes	854	54.1
Insurance Status		
None	279	17.6
Public only	1,147	72.3
Some private	160	10.1
Health Status		
Self-rated Health		
Fair/Poor	880	56.7
Good/Very good/Excellent	673	43.3
Family History of Breast Cancer		
Yes	161	10.1
No	1250	78.6
History of Mammography Screening		
Mammogram in previous year		
Yes	1,028	65.0
No	553	35.0

[a] Because of missing data, numbers may not add to 1,591.

Table 2. Unadjusted and adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for associations between non-adherence to mammography screening guidelines and individual perceived control items

Perceived Control Items[a]	n	Mean[b] ± sd	Unadjusted[c] OR[d] (95% CI)[e]	Adjusted[c,f] OR[d] (95% CI)[e]
How much control do you feel you have over whether or not you will remain healthy?	1,587	3.32 ±0.86	1.30 (1.15 – 1.46)	1.32 (1.16 – 1.50)
How much control do you feel you have over whether or not you will develop cancer in your lifetime?	1,563	2.66 ±1.15	1.14 (1.04 – 1.24)	1.15 (1.04 – 1.26)
How much control do you feel you have over whether or not you could recover from cancer if you had it?	1,561	3.11 ±1.02	1.11 (1.00 – 1.22)	1.08 (0.97 – 1.20)

[a] Responses to each question ranged from least to most perceived control: (1) no control, (2) a little control, (3) some control, (4) a lot of control.
[b] Perceived control items were continuous with values ranging from 1 – 4.
[c] Estimates obtained for the unadjusted and adjusted logistic models correspond to a one-unit decrease in the score for the perceived control items (1 – 4) on the odds of mammography non-adherence. Sample size for the adjusted logistic regression: n=1,396 for the first question, n=1,375 for the second question, and n=1,372 for the third question.
[d] Odds Ratios (ORs).
[e] Confidence Intervals (CIs).
[f] Estimates obtained from multivariate logistic regression, adjusted for age, marital status, education level, insurance status, usual care provider, self-rated health, and self-rated spoken English. Income, years in the U.S., and family history of breast cancer in primary relatives were not included in the final model.

Table 3. Unadjusted and adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for associations between non-adherence to mammography screening guidelines and perceived control index

	n (%)	Unadjusted[a] OR[b] (95% CI)[c]	Adjusted[a,d] OR[b] (95% CI)[c]
Perceived Control Index, tertiles (n=1,398)[e] Range: 3-12[f]			
Low	544 (34.2)	1.65 (1.27 – 2.13)	1.64 (1.24 – 2.17)
Moderate	522 (32.8)	1.58 (1.22 – 2.05)	1.57 (1.18 – 2.08)
High	468 (29.4)	1.00 ---	1.00 ---

[a] Estimates obtained for the unadjusted and adjusted logistic models are compared to the highest perceived control tertile on the odds of mammography non-adherence. For the adjusted model, n=1,398.
[b] Odds Ratios (ORs).
[c] Confidence Intervals (CIs).
[d] Estimates obtained from multivariate logistic regression, adjusted for age, marital status, education level, insurance status, usual care provider, self-rated health, and self-rated spoken English. Income, years in the U.S., and family history of breast cancer in primary relatives were not included in the final model.
[e] Respondents who answered "Don't Know" (n=56) or did not answer one or more of the items (n=1) were excluded from analysis.
[f] Perceived control index was created by summing the responses for the three perceived control questions, and categorizing them into tertiles, using dummy variables, based on the frequencies of each summed response value.