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Knowledge, Cultural, and Attitudinal Barriers to Mammography Screening among Non-Adherent Immigrant Chinese Women: Ever versus Never Screened Status

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Abstract

Background—Chinese-American women have much lower mammography screening rates than the general population. This study examined the collective impact of knowledge, cultural views, and health beliefs on intentions to obtain mammography among Chinese women who had not had a mammogram in the previous year.

Methods—Five-hundred, sixty-six immigrant Chinese women from the Washington, DC and New York metropolitan areas completed baseline assessments for a longitudinal intervention study. Validated surveys were used to measure variables of interest. The outcomes were 1) past mammography use (ever versus never) and 2) future screening intention.

Results—Only 35% of the participants reported intentions to obtain mammograms, with approximately 19% of the never users reporting intentions (vs. 44% ever users). Ever users had higher knowledge (OR 1.13, 95% CI 1.03–1.25), less Eastern cultural views (OR 0.78, 95% CI 0.70–0.87), and perceived fewer barriers (OR 0.78, 95% CI 0.70–0.87) than never users, controlling for covariates. Never users were more likely to be recent immigrants, have low income and English ability, and lack regular sources of care than ever users (all $p < .001$). Multivariate models showed that ever users who were employed, received physician recommendations, had less Eastern views, and perceived higher susceptibility were more likely to have intentions. Among never users, only being ages 40–49 and perceiving fewer barriers led to increased intention.

Conclusion—Understanding cultural patterns and health beliefs in Chinese women is critical to changing their screening behaviors. Interventions that address their common beliefs and specific group barriers are optimal for promoting mammography adherence.

Keywords

Mammography adherence; Chinese-American women; Cultural views; Health Belief Model

INTRODUCTION

By 2010, national mammography screening rates are expected to reach the Healthy People target of 70% adherence for women ages 40 and older.¹ However, recent national reports show that only 54% of Asian-American women reported mammography use within the past 1–2 years -- the lowest rate among all ethnic groups.² Chinese-American women, the largest Asian population, have even lower screening rates than their Asian counterparts.³

Mammography screening has been shown to have the same benefits for Chinese-American women as for White women.⁴ Chinese-American women have higher breast cancer incidences than their counterparts living in Asian countries⁵ and their breast cancer mortality rates have not declined over the past decades.^{3,6} Thus, improving their adherence to mammography screening guidelines is essential to reducing their breast cancer mortality.

Cultural beliefs are important predictors of screening behavior among Chinese-American women.⁷⁻⁹ For example, traditional Chinese women believe that cancer cannot be cured and that the best way to prevent cancer is to use natural approaches (e.g., maintaining balanced diets, using traditional herbs, and practicing mind-body fitness like Tai-chi).^{10,11} As a result, many Chinese women believe that secondary prevention (e.g., cancer screening) is not essential to avert cancer mortality. As a result, these women are less interested in using screening modalities such as mammography.¹⁰

Similar to other ethnic groups,¹²⁻¹⁴ Chinese women have misconceptions and inaccurate knowledge about breast cancer and screening.¹⁵ Many view themselves as having much lower susceptibility to developing breast cancer compared to White women.⁹ They express concern that radiation from mammography may harm the body or even *cause* cancer.^{10,16} Evidence indicates that asymptomatic Chinese women are unlikely to participate in cancer screening.⁷ In addition, Chinese women are likely to have negative experiences associated with mammograms, such as difficulties in accessing the Western medical care services and feelings of discomfort. These experiences may substantiate their disinclination to mammography screening.¹⁰ Considering that 70% of Chinese-American women are immigrants and 48% have limited English proficiency,¹⁷ we hypothesized that low rates of mammography use among Chinese-American women are related to knowledge, cultural, and attitudinal barriers and that these problems are intensified among less acculturated women and recent immigrants.¹⁸

A few studies have examined correlates of mammography screening among Chinese-American women.^{15,18} However, there is little information about why some Chinese-American women have never participated in, or discontinued, mammography screening and how knowledge, cultural views, and health beliefs collectively impact these women's use of mammography. Utilizing cross-sectional data collected from Chinese-American women who have not adhered to the American Cancer Society (ACS) mammography screening guideline (referred to as non-adherence), the current study examined 1) whether knowledge, cultural, and attitudinal barriers explain past use of mammography among non-adherent women and 2) which factors are associated with future intentions to obtain a mammogram by ever and never screened women (i.e., past screening history).

METHODS

Setting and Participant Recruitment

With approval from the Georgetown University Institutional Review Board, this study utilized cross-sectional survey data from a longitudinal intervention study promoting mammography use among non-adherent Chinese-American women. We recruited Chinese women from the metropolitan Washington, DC and New York City areas. Eligible women were ages 40 and older, had no personal history of breast cancer, had not had a mammogram in the previous 12 months, and did not have a mammogram scheduled in the six months following time of recruitment. Short-term visitors (e.g. tourists or women visiting relatives/friends) to the US were ineligible.

We used community-based approaches to enroll eligible women in the study sites. We visited a variety of Chinese community events (e.g. health fairs and activities in Chinese

schools, temples/churches, and senior centers) to introduce this study and distribute Chinese-language recruitment brochures. Women were individually approached to evaluate eligibility and interest in participation. Eligible women were told about the purpose, procedures, benefits, and risks of participating in the study. The same description of this study was provided to women responding to our calls from the recruitment fliers and articles posted in Chinese newspapers, Asian restaurants and grocery stores, and local Chinese associations' newsletters and websites. Overall, 71% of the participants were recruited during face-to-face encounters at community events, 14% from public advertisement, and 16% from community members' referrals.

We approached 2,211 women, of whom 1309 women reported regular screening or had mammograms in the past 12 months; 25 had a mammography appointment; 36 were breast cancer survivors; and 841 were eligible per our criteria. Among 841 eligible women, 631 women were interested and 603 women finally consented to participate, for an overall response rate of 72% (603/841). Among the 603, 568 (94%) completed the baseline interview; 35 (6%) withdrew from the interview. Reasons for the 35 study withdrawals included too busy and no longer interested (n=15), incorrect contact information (n=8), family and personal reasons (n=6), comorbidity (n=3), and relocation out of town (n=3). All but two of the sample were born outside the US. We excluded the two US-born participants in order to focus on issues pertaining to immigrant Chinese women's mammography adherence. Thus, the final study sample for this paper was 566 women.

Data Collection

We used a structured telephone interview to collect information on our study outcomes, predictors, and covariates. All interviews were conducted between November, 2007 and July, 2008 by trained female interviewers speaking Chinese dialects including Mandarin, Taiwanese, or Cantonese. On average, it took participants approximately 30 minutes to complete the baseline assessment. Participants who completed the baseline interview were compensated with a \$15 gift card.

Measures

All surveys used in this study have been validated in Chinese populations.

Outcome Variables—Our primary outcome was adherence to the ACS mammography guideline in place at the time of data collection, which recommended annual mammograms for women beginning at age 40. Prior to baseline assessment, we examined women's eligibility with a series of questions. First, participants responded to, "Have you ever had a mammogram before?" (yes/no). If yes, we queried, "When did you obtain your last mammogram?" (within 1 year, 1–2 years, 2–3 years, 3–4 years, or 5 years ago). If within a year, we inquired about the specific year and month. If the woman had obtained her last mammogram prior to the previous 12 months, we asked whether she had scheduled an appointment for a mammogram in the following six months. Women who had mammograms within the previous 12 months or who had appointments scheduled for the next six months were not eligible for further participation. Based on responses to these questions, we categorized the primary outcome in two groups: ever and never screened women (hereafter referred to ever and never users). Ever users had a mammogram > 1 year. Of the 566 respondents, there were 369 ever and 197 never users.

Our secondary outcome was intention to obtain a mammogram in the next six months (yes/no). We evaluated the intention for the six-month period because all women in the sample were already overdue for mammograms at baseline based on annual screening guidelines. Furthermore, as part of the larger clinical trial, women were subsequently randomized into

intervention arms and interviewed six months post-intervention. Women who responded “unsure” to the intention question were coded as having no intention at the baseline point.

Predictor Variables

Knowledge: We measured Chinese women’s knowledge of breast cancer, benefits of mammography, and screening guidelines using 10 questions (e.g., “Breast cancer will only happen to women who have family history?” (yes/no/don’t know)).⁹ An overall knowledge score was based on the number of correct answers to the questions. A correct response was scored as 1 and the response “don’t know” was scored as an incorrect answer. The overall knowledge scores ranged from 0 to 10 points.

Cultural Views of Healthcare: We used a Chinese cultural scale that we developed to assess Eastern cultural perspectives on health and cancer.⁸ This scale was reliable ($\alpha=.80$) and predicted the utilization of cancer screening among Chinese-American women.⁷ To improve the reliabilities of a few subscales, we revised some questions and tested the revision with the current study cohort. For example, we added two new items to the original 3-item “self-care” subscale (e.g., “If I’m healthy, I do not have to take time off to visit my doctor because she/he will not find any problems with me.”). We combined the “herb use” and “Western medicine” subscales (e.g., “Herbs are a better choice for preventing diseases than Western medicine.”). This 5-point scale included choices ranging from *strongly disagree* to *strongly agree*. The revised cultural scale was reliable at .84 in our current sample. All 31 items were summed to yield a general score on cultural views; higher scores on the cultural scale indicated more Eastern cultural views of care.

Health Beliefs and Attitudes: We used the Chinese Mammogram Screening Beliefs Questionnaire¹⁹ to measure health beliefs and attitudes toward breast cancer screening along four dimensions: perceived susceptibility (3 items), perceived seriousness (5 items), perceived benefits (6 items), and perceived barriers (17 items). Answer choices were: *strongly agree*, *agree*, *neutral*, *disagree*, and *strongly disagree*. The reliabilities of these subscales ranged from .52 to .85 in our sample. For analysis, we generated an overall score for each construct by adding its individual item scores; higher scores represented higher perceptions of susceptibility, seriousness, benefits, and barriers.

Covariates

Sociodemographics: We assessed age, educational level, marital and employment statuses, annual income, length of residence in the US, English ability, and self-reported health status. Age was divided into three categories (40–49, 50–64, and ≥ 65) to reflect differential age distribution among our participants and potential generational differences in attitudes toward preventive screening. Annual income was subsequently excluded from the analysis because there were >10% missing values. We used four questions to assess English ability in speaking, listening, reading, and writing.⁹

Medical Access Variables: We measured regular sources of care by assessing whether participants had either health insurance (yes/no) or regular providers (yes/no). We also assessed whether participants had received a physician recommendation for mammography screening in the past two years (yes/no).

Data Analysis—We conducted chi-square tests and Wilcoxon tests to investigate bivariate associations between measured variables and outcomes of interest. We examined intercorrelations between predictor variables using Pearson correlations. Only significant bivariate associations were included in the multivariate logistic models to identify independent predictors of the outcomes. As there were linear relationships between predictor

variables and the outcomes, we used continuous scores in our regression analyses. We excluded missing responses in all our analyses. English ability was excluded in the multivariate models due to its strong relationship with length of residence in the US.^{9,20} To examine the independent effect of each predictor variable, we conducted three separate logistic regression models using a hierarchical entry method: 1) demographic, 2) medical access, and 3) each predictor variable. Next, we entered all three predictors into one regression model using backward variable deletion to examine whether all three were independently predictive of the outcomes. In addition, we conducted logistic regression models using the backward variable deletion to identify statistically independent factors associated with mammography intentions by ever and never groups. Odds ratios (OR) with 95% confidence intervals (CI) were estimated to determine the magnitude of associations between predictor variables and the outcomes. OR for continuous predictor variables was estimated for half standard deviation (SD) changes in order to facilitate comparisons across the continuous variables and to enhance clinical interpretations.

RESULTS

Sample characteristics

The mean age of our Chinese sample was 56.25 years (SD =11.10). The average length of residence in the US was 14.07 years (SD =10.13). All were foreign-born. About 69% of the participants reported having regular sources of care. Women ages 65 and older were less likely to have ever had a mammogram ($p<.05$) or to have intentions to obtain a mammogram ($p< .0001$). These women were also less likely to receive screening recommendations from their physicians (32%) vs. women ages 40–49 and 50–64 (47% and 45%, respectively, both $p<.01$). Our data showed that older women (55%) were more likely to report poor health status than younger women (44% for ages 50–64 and 37% for ages 40–49, both $p<.01$) and this might have affected their receipt of physician recommendation.

In addition, only 44 never users (23%) received physician recommendations for screening in the past two years compared to 196 ever users (53%). About 18% of the 44 never users and 57% of the 196 ever users, respectively, had intentions to obtain a mammogram in the future. Never users or women who reported no future screening intention were less educated ($p<.01$), more likely to be recent immigrants ($p< .0001$), and less likely to have regular sources of care ($P<.0001$) or a physician screening recommendation ($p<.0001$) compared to ever users and those who had intention.

The predictor variables were moderately to strongly intercorrelated (Table 2). Women with more Eastern views were more likely to perceive barriers to obtaining mammograms ($r =.53$, $p<.0001$) and have low knowledge about breast cancer and screening ($r =-.21$, $p<.0001$). Also, women with more knowledge were likely to perceive fewer barriers ($r =-.30$, $p<.0001$) and more benefits of mammography screening ($r =.28$, $p<.0001$). This is consistent with the bivariate associations shown in Table 1; women who were never screened and had no future intention were more likely to have low knowledge, hold Eastern cultural views, and report more barriers than women who were ever screened and had future intentions (all $p<.0001$). Women who perceived low benefits of mammography screening were more likely to be never users ($p<.05$).

Predictors of past mammography use

Logistic regression analysis (Table 3) indicated that after adjusting for demographic and medical access variables, knowledge, cultural views, and perceived barriers each independently predicted current screening status. Every half standard deviation increase in knowledge was associated with a 13% increased likelihood of having used mammography

($p < .05$). Every half standard deviation increase in both Eastern cultural views and perceived barriers was associated with a 22% decrease in the odds of having used mammography (both $p < .0001$). In the final model, when all three predictor variables were included in the model, Eastern cultural views (OR 0.84_{0.5SD}, 95% CI 0.74–0.95, $p < .01$) and perceived barriers (OR 0.85_{0.5SD}, 95% CI 0.75–0.96, $p < .01$) independently predicted past mammography use, but knowledge became non-significant. This suggests that the association between knowledge and past mammography use may be mediated by cultural views and perceived barriers. Length of US residency (OR 2.88, 95% CI 1.88–4.39, $p < .0001$) and physician recommendation for screening (OR 2.04, 95% CI 1.29–3.24, $p < .01$) are also key predictors of the outcomes. There was no interaction between these predictors.

Factors associated with future screening intentions by ever and never users

Our results showed that only 35% of the participants reported intention to obtain a mammogram in the next six months. Approximately 81% of the never users reported no screening intentions compared to 56% of the ever users ($p < .0001$). Since ever and never users were likely to have different barriers to obtaining a mammogram (see Table 1), we examined independent predictors of future screening intention by stratified groups. Among ever users (see Table 4), intention outcomes were significantly associated with Eastern cultural views (OR 0.79_{0.5SD}, 95% CI 0.70–0.89, $p = .0001$), perceived susceptibility (OR 1.17_{0.5SD}, 95% CI 1.04–1.32, $p < .01$), employment status (OR 2.50, 95% CI 1.57–3.98, $p < .001$), and physician recommendation (OR 2.84, 95% CI 1.79–4.50, $p < .0001$). For the never users, only age and perceived barriers had significant impacts on their intentions to obtain mammograms in the future (Table 4). Compared to never screened women ages 40 to 49, never screened women ages 50 to 64 (OR 0.42, 95% CI 0.18–1.00, $p = .05$) or over 65 (OR 0.22, 95% CI 0.08–0.63, $p < .01$) had much lower odds of having future screening intention. Never users who perceived greater barriers to mammography screening were less likely to have future screening intention (OR 0.81_{0.5SD}, 95% CI 0.67–0.99, $p < .05$).

DISCUSSION

Within our study cohort of non-adherent Chinese-American women, a low proportion (35%) expressed having intentions to obtain mammograms in the near future and it was particularly lower among never screened Chinese women (19%). The results reveal that Chinese-American women who were never users and had no intention to obtain a mammogram faced greater knowledge, cultural, and attitudinal barriers to mammography use than those who were ever users and intended to use screening in the future. Eastern views of care and perceived barriers to mammography are especially related to mammography screening adherence among ever and never users. In particular, Eastern cultural views were key to ever users' future mammography use, whereas perceived barriers were predictive of never users' future screening intention.

Specifically, never users reported less access to regular sources of care and information about mammography screening. When never users *feel* healthy and are faced with difficulties in transportation and communication with providers in English, they believe that it is unnecessary to subject themselves to such challenges for a mammogram.²¹ These access obstacles are likely multiplied when a woman holds strong Eastern views of care such as viewing cancer as a result of fate; preferring herbal medicine to Western medicine; and stressing self-care over medical checkups. As a result, they are unlikely to overcome obstacles in order to obtain mammograms. Issues related to access and Eastern cultural views also influence behavioral adherence to cervical and colorectal cancer screening in Chinese-American women.^{7,22} According to our results, cultural and access barriers are likely to hinder one's attainment of knowledge about breast cancer screening.

Health beliefs such as perceived susceptibility, benefits, and barriers have been found to explain adherence to mammography screening among other minority female populations.^{23,24} Although these perceptions more or less explain Chinese women's mammography use, or lack thereof, our results show that perceived barriers was the key variable affecting Chinese women's screening behavior. Notably, perceived barriers, cultural views, and knowledge were correlated with each other. These interrelationships might collectively affect Chinese women's use, or discontinuation of, mammography screening. Although perceived barriers and cultural views were independently associated with prior mammography use, individual effects were reduced when they were included in the model together. Further, these variables appeared to mediate the association between knowledge and prior mammography use. Knowledge about breast cancer has been found to affect personal beliefs and attitudes toward cancer screening.²⁵ The current study could not determine whether knowledge drives individual beliefs and perceptions of barriers to mammography screening or vice versa. Future research is needed to examine this mediation hypothesis to enhance our understanding of the causal chains among cognitive, cultural, and attitudinal influences on screening behavior.

In line with previous reports that mammography use is associated with nativity and immigration status,^{26,27} length of residence in the US explains individual differences in mammography use in our Chinese sample. Recent immigrant Chinese women living in the US ≤ 10 years were about three times more likely to be never users than their counterparts living in the US for over 10 years. Recent immigrants were more likely to report limited English ability, lack of employment and sources of care, and barriers to screening than those living in the US for over 10 years (data not shown). These deprived conditions pose substantial constraints to obtaining mammograms. As a result, recent immigrants may rely more on their traditional ways of healthcare, disregarding mammography screening guidelines.

Our study showed that while there are differences in the barriers to mammography between ever and never users, there is considerable overlap between the two groups. While the specific barriers endorsed by ever and never users were similar, never users had an increased likelihood of having intentions to obtain mammograms when they were younger and had fewer access barriers. Moreover, ever users seemed to experience fewer obstacles to mammography as they were more likely to be highly educated with good English ability and to be employed, which granted them access to medical resources. For ever users, perceived susceptibility and Eastern cultural views were determinants of screening intention, but knowledge and perceived barriers were not. It is possible that these ever users might understand the benefits of mammography well, but feel that they were at low risk and prefer Eastern ways of care, so they are disinclined to obtain mammograms. Nevertheless, among ever users who have access to medical care, physician recommendations influence their future screening intention. Although our data showed that many ever users had received a recommendation for screening from their physician, a low percentage of the women adhered to the recommendation. Adherence to the recommendation was even lower among never users. Individual perceptions of personal risk and barriers to mammography as well as personal beliefs about cultural practices seem to play a greater role among these women.

There are several limitations in this study. First, our sample is not likely representative of the general Chinese-American population since we only targeted on non-adherent Chinese women and we employed a convenience sample of women that were recruited from limited geographic areas. Our sample seemed to include a higher proportion of impoverished, uninsured, and recent immigrated women compared to prior research on general Chinese-American women.^{8,18} Second, our results only portrayed non-adherent Chinese women's barriers to screening, which might have limited the generalization of our results for the

target population. Moreover, research in the general Chinese female population has suggested that Eastern cultural views and access barriers are related to regular mammography screening.⁸ Third, since this report was based on our baseline assessment, our outcomes were assessed retrospectively in the case of past mammography use and cross-sectionally in the case of future intention. Thus, we were limited in the conclusions that we can draw regarding the directionality of the associations. In our ongoing longitudinal research, we will be able to prospectively evaluate these associations and examine whether these results extend to actual mammography screening utilization. Finally, the small sample size of the never screened group limited our power to detect small differences in intention outcomes.

In summary, this study has advanced prior literature inasmuch as it documents the collective association between cognitive, cultural, and attitudinal barriers and non-adherence to mammography among Chinese-American women. Our results lend empirical support to the hypothesis that the persistence of these barriers among Chinese-American women may explain their low rates of mammography use.^{2,3} Our results do not suggest that we should intervene to diminish Chinese-American women's Eastern cultural values. Rather, this study demonstrates the importance of understanding patients' backgrounds and cultural health beliefs in order to effectively promote health behavior change in ways that are consistent with their values. Considering our results which indicated that the majority of non-adherent Chinese-American women were not interested in obtaining a mammogram, it is likely that this growing minority group will fail to meet the 2010 Healthy People target goal for mammography screening. This study provides important implications for the development of interventions directed at this large immigrant population.

More specifically, interventions aimed at increasing Chinese women's mammography use should be sensitive to their culturally-based beliefs and obstacles to access screening resources. For example, the educational program should stress that a balanced diet and regular exercise are essential to maintaining health and that regular screening is also a part of self-care that helps detect hidden problems in the breasts. Cancer is a chronic disease. Early detection can reduce complications of medical treatment and save lives. Information that addresses Chinese women's access barriers such as free and low cost mammography screening programs and assistance in addressing transportation and linguistic obstacles will be useful for recent immigrants. Prior interventions targeting on Chinese women have not been found to be effective.²⁸ Based on these principals, we developed a culturally tailored video. Our preliminary evaluation of the video shows a significant increase in Chinese women's intentions and a decrease in their cultural and attitudinal barriers.⁹ Our ongoing intervention trial is examining the impact of the cultural video on actual receipt of mammography. In short, culturally and linguistically appropriate interventions that interweave factual information and Chinese cultural views about mammography will be optimal to resolving disparities in breast cancer screening experienced by Chinese-American women.

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Characteristics of Immigrant Chinese-American Women Who Were Non-Adherence to Mammography Screening by Past Mammography Use and Future Screening Intentions

TABLE 1

	All (n=566)	Past mammography use		P values	Future screening intentions		P values
		Ever (n=369)	Never (n=197)		Yes (n=200)	No (n=366)	
Age				.0476			<.0001
40–49 years old	198	66%	34%		46%	54%	
50–64 years old	228	70%	30%		35%	65%	
65 years old and over	140	57%	43%		20%	80%	
Education				.0014			.0092
>High school	341	70%	30%		40%	60%	
≤High school	225	57%	43%		29%	71%	
Marital status				.4519			.0694
Married	435	64%	36%		33%	67%	
Non-married	131	68%	32%		42%	58%	
Annual income [†]				<.0001			.0003
>\$20,000	265	77%	23%		44%	56%	
≤\$20,000	241	57%	43%		28%	72%	
Employment				.0011			<.0001
Yes	294	71%	29%		46%	54%	
No	271	58%	42%		24%	76%	
Years in the US				<.0001			.0005
>10 years	321	79%	21%		41%	59%	
≤ 10 years	242	47%	53%		27%	73%	
English ability				.0008			<.0001
High	211	74%	26%		49%	51%	
Low	355	60%	40%		27%	73%	
Regular sources of care				<.0001			<.0001
Yes	392	74%	26%		41%	59%	
No	174	45%	55%		23%	77%	
Health status				.3134			.4795
Excellent/very good/good	313	63%	37%		34%	66%	

	All (n=566)	Past mammography use		P values	Future screening intentions		P values
		Ever (n=369)	Never (n=197)		Yes (n=200)	No (n=366)	
Fair/Poor	251	67%	33%		37%	63%	
Physician recommendation							
Yes	241	82%	18%	<.0001	49%	51%	<.0001
No	323	53%	47%		25%	75%	
Future screening intention							
Yes	200	81%	19%	<.0001			
No	366	56%	44%				
Knowledge [‡]	566			.0002			<.0001
Mean		7.85	7.27		8.02	7.45	
Standard deviation (SD)		1.52	1.82		1.53	1.68	
Cultural views [‡]	566			<.0001			<.0001
Mean		89.53	94.68		87.58	93.37	
SD		11.65	11.51		12.29	11.09	
Health belief variables [‡]							
Perceived susceptibility	566			.5739			.0202
Mean		10.54	10.38		10.79	10.32	
SD		1.96	2.07		1.98	2.00	
Perceived seriousness	566			.5588			.9825
Mean		19.38	19.41		19.31	19.44	
SD		2.53	2.30		2.77	2.26	
Perceived benefits	565			.0995			.8264
Mean		24.74	24.41		24.58	24.66	
SD		2.60	2.23		2.55	2.44	
Perceived barriers	566			<.0001			<.0001
Mean		48.24	53.86		47.13	51.88	
SD		8.32	8.62		8.50	8.59	

Note. Some column frequency did not add up to 566 due to missing values.

[‡] income variable with > 10% missing values was excluded in the multivariate analysis

[‡] high mean scores indicate more knowledge, more Eastern views, and higher perceptions of susceptibility, seriousness, benefits, and barriers.

TABLE 2

Inter-correlations between Knowledge, Cultural views, and Health beliefs

	Knowledge	Cultural views	Susceptibility	Seriousness	Benefits
Cultural views	-.21***				
Susceptibility	.23***	-.02			
Seriousness	.16***	.11*	.28***		
Benefits	.28***	-.08	.23***	.33***	
Barriers	-.30***	.53***	-.09*	-.02	-.17***

Note. High scores indicate more knowledge, more Eastern views, and higher perceptions of susceptibility, seriousness, benefits, and barriers.

* p <.05;
*** <.0001.

TABLE 3

Adjusted Odds Ratios (OR) for Past Mammography Use (vs. Never Use)

	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI) [§]
Demographic				
Education				
≥College (vs. <College)	1.37 (0.92–2.03)	1.25 (0.84–1.87)	1.20 (0.80–1.81)	NS
Years in US				
>10 yrs (vs. ≤10 yrs)	2.71 (1.81–4.07)****	3.07 (2.02–4.67)****	2.59 (1.71–3.91)****	2.88 (1.88–4.39)****
Employment				
Yes (vs. No)	1.48 (1.00–2.18) [†]	1.56 (1.06–2.32)*	1.54 (1.04–2.28)*	1.56 (1.05–2.32)*
Medical access				
Regular sources of care				
Yes (vs. No)	1.59 (1.02–2.48)*	1.64 (1.05–2.58)*	1.45 (0.92–2.27)	1.56 (0.99–2.46) [†]
MD recommendation				
Yes (vs. No)	2.22 (1.42–3.49)***	2.18 (1.38–3.45)***	2.05 (1.29–3.025)**	2.04 (1.29–3.24)**
Predictors[‡]				
Knowledge	1.13 (1.03–1.25)*	--	--	NS
Cultural views	--	0.78 (0.70–0.87)****		0.84 (0.74–0.95)**
Perceived barriers	--	--	0.78 (0.70–0.87)****	0.85 (0.75–0.96)**
Perceived susceptibility	--	--	1.02 (0.92–1.12)	NS

Note. OR = odds ratios; CI = Confidence interval. NS = non-significant. MD=Medical doctors or physicians. Dashed lines indicated that the variables were not included in the testing model.

[‡]High mean scores indicate more knowledge, more Eastern views, and higher perception of susceptibility, seriousness, benefits, and barriers. The OR and 95% CI associated with these predictors were estimated using a half standard deviation.

[§]Model using backward variable deletion.

[†]<.10;

* p <.05;

** <.01;

*** <.001;

**** <.0001.

TABLE 4

Adjusted Odds Ratios (OR) for Future Screening Intention (vs. No Intention) by Ever and Never Users

	Ever users		Never users	
	OR	(95% CI)	OR	(95% CI)
Demographic				
Age				
50–64 years (vs. 40–49 years)	NS		0.42	(0.18–1.00) [†]
65 years + (40–49 years)	NS		0.22	(0.08–0.63) ^{**}
Education				
≥College (vs. < College)	NS		---	
Years in US				
>10 yrs (vs. ≤ 10 yrs)	NS		NS	
Employment				
Yes (vs. No)	2.50	(1.57–3.98) ^{***}	NS	
Medical access				
Regular sources of care				
Yes (vs. No)	NS		---	
Physician recommendation				
Yes (vs. No)	2.84	(1.79–4.50) ^{****}	---	
Predictors[‡]				
Knowledge	NS		NS	
Cultural views	0.79	(0.70–0.89) ^{****}	NS	
Perceived susceptibility	1.17	(1.04–1.32) ^{**}	NS	
Perceived barriers	NS		0.81	(0.67–0.99) [*]

Note. NS = non-significant. Dashed lines indicated non-significant bivariate associations which were not included in the logistic models.

[‡]High mean scores indicate more knowledge, more Eastern views, and higher perceptions of susceptibility, seriousness, benefits, and barriers. The OR and 95% CI associated with these predictors were estimated using a half standard deviation.

[†]<.10;

^{*}p <.05;

^{**}<.01;

^{***}<.001;

^{****}≤.0001.