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Health Care Access and Breast Cancer Screening Among Latinas Along the California–Mexican Border

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Abstract

Latinas are more likely to exhibit late stage breast cancers at the time of diagnosis and have lower survival rates compared to white women. A contributing factor may be that Latinas have lower rates of mammography screening. This study was guided by the Behavioral Model of Health Services Use to examine factors associated with mammography screening utilization among middle-aged Latinas. An academic–community health center partnership collected data from community-based sample of 208 Latinas 40 years and older in the San Diego County who completed measures assessing psychosocial factors, health care access, and recent mammography screening. Results showed that 84.6 % had ever had a mammogram and 76.2 % of women had received a mammogram in the past 2 years. Characteristics associated with mammography screening adherence included a lower acculturation (OR 3.663) a recent physician visit in the past year (OR 6.304), and a greater confidence in filling out medical forms (OR 1.743), adjusting for covariates. Results demonstrate that an annual physical examination was the strongest predictor of recent breast cancer screening. Findings suggest that in this community, improving access to care

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among English-speaking Latinas and addressing health literacy issues are essential for promoting breast cancer screening utilization.

Keywords

Community–academic partnership research; Health services utilization; Mammography screening; Latinas; Breast cancer

Background

Regular use of mammography is associated with a decreased risk of developing invasive breast cancer (BC) [1] and has been estimated to reduce mortality by about 25 % in women aged 40 years and over [2, 3]. Although Latinas are less likely to develop BC than white women, Latinas are more likely to exhibit late stage cancers at time of diagnosis and have lower survival rates compared to white women in California [4] and nationwide [5]. A contributing factor may be that Latinas have lower rates of mammography use [6, 7].

Theoretical Framework

This study was guided by the Behavioral Model of Health Services Use (BMHSU) to explain predictors of mammography use among Latinas. The BMHSU [8] was developed to explain why individuals use health care, and to define and measure equitable access to healthcare [9]. The BMHSU has been used as a framework to examine access and utilization of hospital, dental, and medical care among diverse adults [10–14], access to care and utilization barriers experienced by Latinos [15–18]. The BMHSU suggests that healthcare use is a function of an individual's predisposition to use services, factors that enable use, and their need for care [9]. In the present study, relevant context-specific[1] variables were added to the model because they were hypothesized to be relevant to Latinas, BC, or screening behavior [19]. Predisposing, enabling, and need domains are outlined below (Fig. 1).

Predisposing factors refer to characteristics that affect the likelihood of health care utilization and include: demographics, social structure, and health beliefs [13]. Age and personal/family history of cancer are two demographic variables targeted in this study. Older Latinas are more likely to use mammography than younger Latinas [17, 18]; however, some studies suggest that age is not significant after adjusting for other factors [20]. Latinas with a personal or family history of cancer show greater mammography use compared to those without history, which relates to an increased awareness and perceived risk of the disease [18, 21–24].

Social structure describes individual's societal status [25] includes education, acculturation, and health literacy. Lower levels of education have been shown to impede BC screening among Latinas [18, 26–31]. The literature offers no consensus on the role of language-based acculturation and country of birth in predicting BC screening [17, 18, 32–38]. An innovative social structure variable not previously examined in studies using the BMHSU is health literacy (HL). Studies show that inadequate HL relates to a lack of knowledge about the

[1]*Context-specific variables* are specifically related to the population, the disease, or the utilization behavior under investigation.

importance of and reasons for preventive health services [39] and low HL relates to mammography underutilization in Latinas and misunderstandings of cancer risk [40].

Health beliefs include attitudes, values, and knowledge that people have about health and health services that may influence use [25]. Health belief variables, not included in the original BMHSU, include cancer fatalistic beliefs and religiosity. Fatalistic beliefs promote an external locus of control, which can deter mammography utilization [41–43]. Latinas can have fatalistic beliefs and misconceptions about cancer, such as divine predetermination as a cause [7, 44–47], which impede use of cancer screening exams [35, 44, 48–50]. Religiosity involves beliefs, behaviors, and personal devotion [51], and is a key facet of Latino culture that promotes health behaviors [52]. Some studies have shown that church attendance is related with a healthier dietary and physical activity [53] and BC screening among Latinas [35].

Enabling factors are defined as conditions that make accessing services possible [9]. The ability to secure health services is affected by personal resources, including health insurance and access to a regular health care source [25]. Studies show that having any health insurance [5, 17, 18, 20, 26, 28, 29, 31, 35, 36, 54, 55]; visiting a physician in the past year [6, 18] or having a usual source of care [5, 17, 38, 54, 56, 57] enables use of mammography among Latinas.

An individual must perceive a need for health care in order for health care utilization to occur [25]. Subjective need is typically measured by health-related quality of life (HRQOL) (i.e., self-rated health status, unhealthy days, and activity limitation) [58, 59]. A lower HRQOL is related to increased general health care utilization [58]. In addition, self-rated health status (a component of HRQOL) has been shown to be significantly related mammography in Latinas [17], but was not associated with breast, cervical, or colorectal cancer screening in another study [60]. Within the context of screening, subjective need can also be conceptualized as individuals' perceptions of future illness risk or concerns about becoming ill. In this study, need was also assessed by BC worry, the emotional reaction to the threat of BC that consists of both cognitive and affective elements [61, 62]. Worrying can stem from a fear of developing cancer, and fear is a barrier to cancer screening in Latinas [63, 64]. No consensus exists on whether worry promotes or inhibits screening [62]. For example, moderate levels of worry actually improve mammography rates [23, 61, 65–67] yet extremely high levels of worry and distress are barriers to mammography screening [61, 68].

The aim of this study was to determine what predisposing, enabling, and need factors were associated with breast cancer screening among Latinas 40 years and older residing in San Diego County. It was hypothesized that variables in the predisposing, enabling, and need domains of the BMHSU would predict recent mammography screening. It was also hypothesized that adding contextspecific variables, not included in the original BMHSU, would improve the prediction of mammography screening utilization.

Methods

Participants and Setting

This study focused on San Diego County, California's most southern region located adjacent to Baja California Norte, Mexico. As part of a larger community health center–academic partnership study funded by the California Breast Cancer Research Program (CBCRP) community research collaborative program, survey data were collected in 2007–2008 through University of California, San Diego Institutional Review Board-approved methods. The CBCRP study aimed to recruit 500 English and Spanishspeaking Latinas to complete surveys frequently used in health and research settings for later use to help evaluate the effectiveness of a culturally-tailored BC clinical trials education program.

Participants were drawn from a community sample of 503 Latinas 21 years and older; women 40 years and older (n = 208) were included for analysis. Eligible women were consented and participated in face-to-face interviews at community-based sites, and were recruited by snowballing and word-of-mouth strategies with the intent of reach women in a culturally competent non-invasive manner [69]. Ten refused to participate, with lack of time being the most frequent reason for refusal. Consented participants received $20.00 for their time and English and Spanish interviews took 60–90 min to complete. Eligibility criteria were: being an adult woman, self-identifying as Hispanic American and preferring English or Spanish for reading and writing.

Ages ranged from 40 to 80 years (M = 50.98; SD = 8.1). Among these, 47.3 % had a high school education or greater, 67.6 % had health insurance, 76.3 % were Mexican-born, and 56.3 % chose Spanish to fill out surveys. Given that the sample was recruited through non-probabilistic sampling strategies, it was important to determine the extent to which the sample was representative. Sample demographic and behavioral data were compared to state and county data; and results showed that the sample was comparable to state and local data on key factors, (e.g. mammography and age), except for health status. The study sample was less likely to report "excellent" health, and more likely to report "good" health, than Latinas sampled throughout San Diego County (Table 1).

Measures

Mammography Screening—Recent mammography screening was assessed by an item derived from the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System Questionnaire (BRFSS) [70]. A dichotomous variable was created to compare those compliant with federal screening guidelines [71] in place at the time of this study [i.e., recent mammogram in past 2 years to non-compliant (never screened or recent mammogram >2 years ago)]. Women were considered adherent if they had received at least one mammogram within the last 2 years.

Predisposing Domain Measures—Age was assessed by date of birth; a linear age variable and age categories (40–49 and 50 years and older) were created. Education was split into categories (<high school and ≥high school) [70]. Country of birth categories (i.e., United States and Mexico) were created. Language-based acculturation was assessed by the

Brief Acculturation Measure for Hispanics (BASH), a four-item scale assessing language use and preference [72]. The four-item BASH had an alpha of 0.97 for the total sample (English $\alpha = 0.95$, Spanish $\alpha = 0.85$; lower alphas reflect the more limited variance in the language subgroups' BASH scores). A mean score was created (ranging from one to five) with higher scores indicating greater acculturation. History of Breast Cancer (BC) was assessed by two items modified from the BRFSS [70] and a dichotomous variable was created (personal or family history of BC vs. otherwise). Health literacy (HL) was assessed by confidence in filling out medical forms and frequency of assistance needed in reading hospital materials [73]. The two items were significantly correlated in the total sample ($r = 0.24$) and in English ($r = 0.35$) ($p \leq 0.01$); but not correlated in Spanish, thus the HL items were kept separate for analysis. Both items ranged from one to five; higher scores indicated higher HL. Religiosity was assessed by the Duke University Religion Index (DUREL), a five-item scale assessing organizational (religious services attendance), non-organizational, (private activities) and intrinsic religiousness (integration of religiosity into one's life) [51]. Intrinsic religiosity was created by taking the mean of three of the items; this three-item scale had an alpha of 0.75 (English $\alpha = 0.80$, Spanish $\alpha = 0.74$), with responses ranging from one to five. Responses to organizational and non-organizational individual items range from 1 to 6. Higher scores reflected greater intrinsic, organizational, and non-organizational religiosity. Cancer fatalism was measured by the 15-item Powe Fatalism Inventory (PFI) [74, 75] and the Spanish PFI (SPFI) [76]. A modified version of the PFI was used and consisted of the following subscales: inevitability of death (items 11, 12, and 15), predetermination (items 1, 4, 5 and 9), and fear (items 8 and 10). Mean scores were created and range from 0 to 1, higher scores indicated more cancer fatalistic beliefs. Inevitability of death sub-scale had an alpha of 0.78 (SPFI $\alpha = 0.82$, PFI $\alpha = 0.74$), predetermination sub-scale had an alpha of 0.72 (SPFI $\alpha = 0.69$, PFI $\alpha = 0.76$), and the fear items were significantly correlated ($r = 0.32$; SPFI $r = 0.34$, PFI $r = 0.32$) ($p \leq 0.01$).

Enabling Domain Measures—Health insurance and recent physician visit were derived from the BRFSS [70]. Health insurance was assessed by type of coverage. A dichotomous variable was created to compare insurance to none; two dummy variables were created to compare private (HMO, PPO, military), public (Medicaid and Medicare), and no insurance groups. Recent physician visit assessed time since last doctor visit for a routine checkup; a binary variable was created (visit in the past year vs. otherwise).

Need-Related Domain Measures—Health-related quality of life (HRQOL) was measured by the CDC HRQOL-4 [70], assessing: self-rated health, number of recent days with physical/mental health was impaired, and number of days of activity limitation due to poor physical/mental health [59]. The CDC HRQOL-4 has demonstrated reliability and validity for population use [77]. Self-rated health status ranges from one to give. The variable for unhealthy days was created by combining responses to recent impaired physical health and impaired mental health, with a logical maximum of 30 days. Activity limitation ranges from 0 to 30 and is the number of days of activity limitation due to unhealthy days. Higher scores indicated poorer health status, more unhealthy days, and more limitation days due to unhealthy days. The Cancer Worry Scale (CWS) was used to assess cognitive elements of recent worry and distress about developing BC [61, 78]. A BC worry three-item

scale was created by averaging the first three items (ranged from one to three) and higher scores reflect more recent worry; this scale had an alpha of 0.86 (English $\alpha = 0.86$, Spanish $\alpha = 0.87$). The BC distress item ranged from one to three; higher scores reflected more recent distress about developing BC.

Statistical Analyses

Means, standard deviations, skewness, and kurtosis were examined to ensure that variables were normally distributed. The HRQOL variable 'activity limitation' that was not normally distributed was transformed [79]. An exploratory factor analysis (EFA) was conducted to determine how the BMSHU variables loaded on an unspecified number of factors [80, 81]. Principal components extraction with orthogonal varimax rotation yielded a three factor solution, explaining 64.5 % of the variance. Using 0.4 as a cut-off criterion for factor loading (e.g., [82]), language-based acculturation, country of birth, and education loaded highly on factor 1 (predisposing); health status, unhealthy days, and activity limitation loaded highly on factor 2 (need); and health insurance, recent physician's visit, and age loaded highly on factor 3 (enabling). Although age has been previously conceived of as part of the predisposing domain, age loaded on the enabling factor in the EFA. Age facilitates or enables use of screening because mammography screening is an age-dependent preventive service [71]. In addition, an increased age is a risk factor for developing breast cancer [1]. Older women are enabled to have a greater frequency of screening than younger women. Thus, a modified BMHSU—where age is treated as an indicator of the enabling domain rather than the predisposing domain—was more appropriate in these analyses. Subsequent logistic regression analyses were conducted with age as an enabling, rather than a predisposing variable. Based on prior studies using the BMHSU, [11, 12, 17, 18], this study used logistic regression models to test the direct effects of the three BMHSU domains [i.e., predisposing (Model 1), enabling (Model 2), and need (Model 3)] on recent mammography screening [83]. A hierarchical logistic regression analysis [83–86] was performed to determine the incremental prediction of adding variables not included in the original BMHSU [8, 25]. All analyses were performed using SPSS version 14.0.

Results

Sample Characteristics

Those who reported a mammogram in the last 2 years were significantly older ($M = 52.0$ years) than those who did not ($M = 47.9$ years) ($p \leq 0.05$). Latinas who had a mammogram in the 2 years had a lower level of recent distress about developing breast cancer ($M = 1.50$, $SD = 0.62$) when compared to those who had a mammogram more than 2 years ago ($M = 1.85$, $SD = 0.93$) ($p \leq 0.05$). Latinas who reported having a mammogram in the past 2 years ($M = 4.03$, $SD = 1.00$) had a greater confidence in filling out medical forms compared to those who reported having a mammogram more than 2 years ago ($M = 3.63$, $SD = 1.16$) ($p \leq 0.05$). Latinas with any insurance were significantly more likely to have received a mammogram in the last 2 years (83.8 %), compared to Latinas without insurance (60.0 %) ($p \leq 0.05$). Latinas that had visited a physician in the past year for a routine physical exam were significantly more likely to have received a mammogram in the last 2 years (85.8 %) compared to Latinas who had not visited a physician in the last year (56.7 %) ($p \leq 0.05$).

Screening did not differ by education, language-based acculturation, country of birth, health status, recent unhealthy days, or recent physical activity limitation, level of assistance needed in reading hospital materials, BC worry, a history of BC, level of cancer fatalistic beliefs, or degree of religiosity (Table 2).

Factors Associated with Breast Cancer Screening

Results from the three regression models assessing the predictability of each BMHSU domain showed that enabling and predisposing domains significantly predicted the likelihood of having a recent mammogram; the need domain was not associated with screening. Next, the three domains were entered simultaneously to test whether the BMHSU, as traditionally conceptualized, predicted recent BC screening utilization (Model 4). The model Chi square for Model 4 was significant ($p \leq 0.05$) and explained a significant proportion of variance in BC screening (Menard [86]). In adjusted analyses, having a high school degree (*OR* 4.634), a lower language-based acculturation (*OR* 0.329), a greater age (OR 1.067), and a physician visit in the past year (OR 4.413) significantly predicted recent BC screening ($p \leq 0.05$); all other variables were not significant (Table 3).

A hierarchical regression analysis was performed to determine the incremental prediction of the two contextual variables significant in bivariate analyses: step 1 including BMHSU variables (i.e., Model 5) and step 2 included confidence in filling out medical forms and breast cancer distress (e.g., Model 6). Model 6, including contained BMHSU variables plus the two context-specific variables, was a good fit to the data, and the two contextual variables significantly added to Model 5 ($p \leq 0.05$), Thus, characteristics associated with BC screening adherence included a lower language-based acculturation (*OR* 3.663) a recent physician visit in the past year (*OR* 6.304), and a greater confidence in filling out medical forms (*OR* 1.743). Being US born (as compared to Mexican-born) (*OR* 6.210) was marginally insignificant ($p < 0.10$). Model 6 constitutes the final modified BMHSU (Table 4; Fig. 2).

Discussion

Use of health services can be conceptualized as discretionary or non-discretionary behavior [8, 9, 25]. The placement of and specified relationships between the predisposing, enabling, and need factors in the BMHSU varies depending on the character of the utilization variable under investigation [25]. Results from the current study imply that enabling and certain predisposing variables (i.e., language-based acculturation) contribute significantly to the prediction of BC screening utilization. These results support the original assumptions of the BMHSU, suggesting that for the discretionary use of health care—such as BC screening—the more likely utilization will be based on predisposing and enabling factors rather than need [8, 9, 25]. Since some research suggests that enabling factors, such as health insurance and a usual source of care matter more for BC screening than predisposing factors such as acculturation [5], studies are needed to explore these relationships further. Studies are also needed to determine the extent to which predisposing and need-related domains matter in the face of enabling domains for other disease contexts, types of health care use, and ethnic populations.

The modified BMHSU provided a reasonable framework for predicting the likelihood of BC screening among this sample of Latinas 40 years and older (Table 4; Fig. 2). Findings from the logistic regression analysis of the modified BMHSU showed that a lower language-based acculturation, a physician visit in the past year, and a greater confidence in filling out medical forms were important facilitators of BC screening use (Table 4). Some of these findings support prior research showing that a higher health literacy [87], visiting a physician in the past year [6, 18], and a higher age [17] promote BC screening among Latinas. Results from this study contrast the literature that deems a lack of health insurance [26, 36, 88] and being unacculturated [18, 34] as important barriers to mammography screening use among Latinas. Of note, breast cancer screening tests in San Diego are covered for the uninsured by California's breast and cervical cancer early detection program "Every Woman Counts" [88]. This leads one to question the unique characteristics of the California–Mexico border context that enabled predominately Spanish-speaking Latinas in this study to obtain mammography screening, irrespective of their education level and country of birth. Results from this study confirm this lack of clarity in the relationship between breast cancer screening, access to care and acculturation.

Study Limitations

Secondary data were derived from a cross-sectional selfreport survey, which limited the ability to develop causal inferences about the relationships among variables examined. Due to the large, but single geographic focus, generalizations from these findings should be made with caution. Despite these limitations, results from this study have the potential to lend insight to future research, community-based health promotion, and primary care practice in relation to increasing mammography adherence among Latinas in the border region of Southern California.

Conclusions

Regular breast cancer screening increases early stage cancer detection and reduces the morbidity of late-stage diagnoses [89]. Andersen's BMHSU [9] provided a reasonable framework for explaining mammography usage in this sample of Latinas 40 years and older. Future studies are needed to empirically test the BMSHU to determine how dependable it is across disease contexts, health care utilization types, and ethnic populations [90].

Results imply that interventions could focus on promoting mammography referrals by primary care health care providers [91, 92]. Since no other factor was more predictive of adherence to BC screening guidelines, the encouragement to have an annual physical examination appears to be the most important health promotion message to convey. Future research should explore the role that culturally competent primary care providers, as trusted sources of health information, play in motivating Latinas to obtain preventive health care services [93]. Research is also needed to explore the application of the Foot-in-the-Door method [94, 95], by which access to the health care system through non-invasive means leads to an increased receptivity to recommendations for more invasive procedures, such as mammography.

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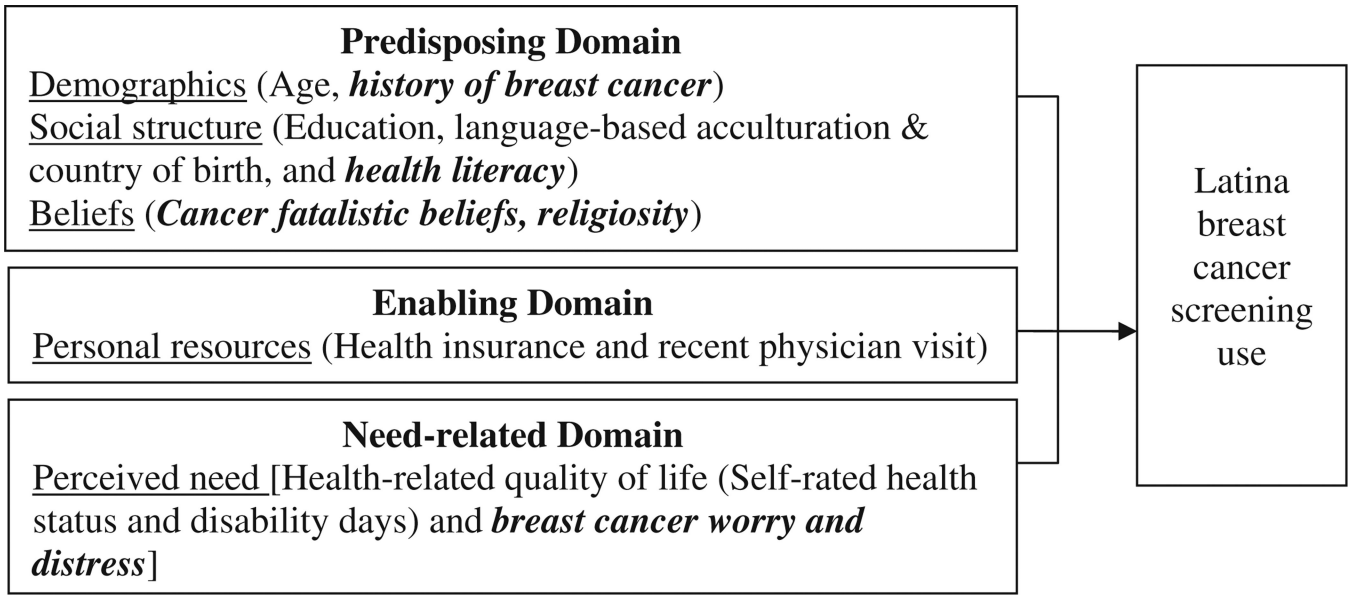

Fig. 1.

Behavioral model of health services utilization. Note. Traditional behavioral model of health services utilization domain variables are listed. Proposed contextual variables are *bolded* and *italicized*

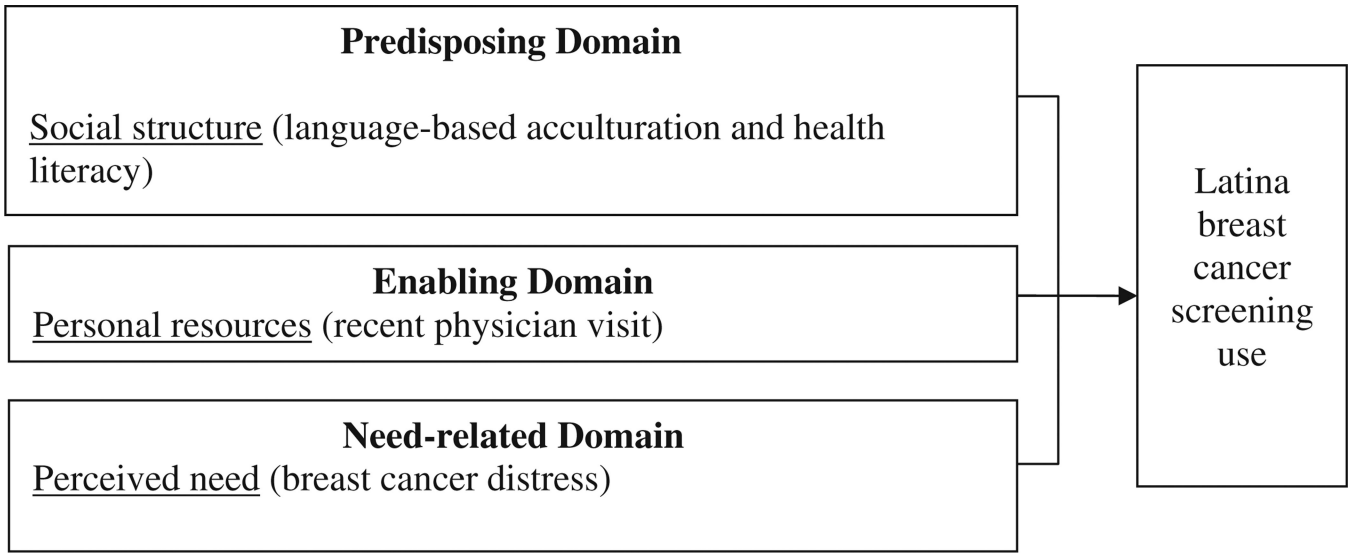

Fig. 2.
Modified behavioral model of health service utilization

Table 1

Comparison of sample demographics with county and state data

Variable	Response	Sample (Latinas, 40+) % (n)	San Diego County (Latinas, 40+) % (n)	California (Latinas, 40+) % (n)
Age[a]	40–49 years old	49.5 (103)	46.1 (56,000)	44.7 (832,000)
	50+ years old	50.5 (105)	55.9 (65,000)	55.3 (1,028,000)
	Total	100.0 (208)	100.0 (121,000)	100.0 (1,860,000)
Education[a]	Did not graduate high school	52.7 (109)	60.2 (61,000)	54.1 (858,000)
	High school or higher	47.3 (98)	39.8 (40,000)	45.9 (729,000)
	Total	100.0 (207)	100.0 (101,000)**	100.0 (1,587,000)
Has health insurance[a]	Yes	67.6 (140)	77.5 (93,000)	79.1 (1,471,000)
	Otherwise	32.4 (67)	22.5 (27,000)	20.9 (389,000)
	Total	100.0 (207)	100.0 (120,000)*	100.0 (1,860,000)*
Health insurance categories[a]	Private	51.7 (104)	52.4 (63,000)	45.3 (842,000)
	Public	14.9 (30)	25.1 (30,000)	33.8 (629,000)
	None	33.3 (67)	22.5 (27,000)	20.9 (389,000)
	Total	100.0 (201)	100.0 (120,000)*	100.0 (1,860,000)*
Country of birth[a]	Mexico	76.3 (151)	62.5 (70,000)	53.8 (836,000)
	United States	23.7 (47)	37.5 (42,000)	45.9 (714,000)
	Total	100.0 (198)	100.0 (112,000)*	100.0 (1,555,000)*
Ever had a mammogram[a]	Yes	84.6 (176)	85.7 (104,000)	88.0 (1,637,000)
	No	15.4 (32)	14.3 (17,000)	12.0 (224,000)
	Total	100.0 (208)	100.0 (121,000)	100.0 (1,861,000)
Mammogram within the past 2 years (40+)[b]	Yes	76.2 (154)	n/a	76.4 (274)
	No	23.8 (48)		23.6 (89)
	Total	100.0 (202)		100.0 (363)
Mammogram within the past 2 years (50+)[b]	Yes	81.2 (82)	n/a	84.8 (168)
	No	18.8 (19)		15.2 (35)
	Total	100.0 (101)		100.0 (203)
Health status[a]	Excellent	8.3 (17)	16.8 (20,000)	10.2 (190,000)
	Very Good	19.0 (39)	17.7 (21,000)	20.0 (372,000)
	Good	37.1 (76)	27.4 (33,000)	30.7 (571,000)
	Fair	29.8 (61)	32.3 (39,000)	31.0 (576,000)
	Poor	5.9 (12)	5.8 (7,000)	8.1 (151,000)
	Total	100.0 (205)	100.0 (120,000)*	100.0 (1,860,000)

Chi square analyses were run using an online Chi square calculator: http://home.ubalt.edu/ntsbarsh/Business-stat/otherapplets/Catego.htm

[a] Source: 2007 California Health Interview Survey (http://www.chis.ucla.edu/; San Diego County, California sample only includes Latinas 40 years and older

[b] Source: 2006 Behavioral Risk Factor Surveillance Survey Data (http://apps.nccd.cdc.gov/BRFSS/); California sample only includes Latinas 40 years and older

* Difference from sample data were statistically significant ($p \leq 0.01$)

** Difference from sample data were statistically significant ($p \leq 0.05$)

Bivariate relationships with mammography screening use

Behavioral model variables Chi square analyses	**Mammography (<2 years) % (n)**		**Sig.**
	Yes	**No**	
Predisposing			
Education			
Less than high school	71.7 (76)	28.3 (30)	$\chi^2(1, 201) = 2.412$
High school or greater	81.1 (77)	18.9 (18)	($p = 0.120$)
Country of birth			
United States	74.5 (35)	25.5 (12)	$\chi^2(1, 193) = 0.047$
Mexico	76.0 (111)	24.0 (35)	($p = 0.828$)
Enabling			
Age			
40–49 years	71.3 (72)	28.7 (29)	$\chi^2(1, 202) = 2.733$
50+	81.2 (82)	18.8 (19)	($p = 0.098$)^
Physician visit <1 year			
Yes	85.8 (115)	14.2 (19)	$\chi^2(1, 201) = 20.814$
No	56.7 (38)	43.3 (29)	($p = 0.000$)*
Health insurance			
Yes	83.8 (114)	16.2 (22)	$\chi^2(1, 201) = 13.732$
No	60.0 (39)	40.0 (26)	($p = 0.000$)*
Health insurance groups			
Private	84.0 (84)	16.0 (16)	$\chi^2(2, 195) = 13.476$
Public	83.3 (25)	16.7 (5)	($p = 0.001$)*
None	60.0 (39)	40.0 (26)	

Behavioral model variables Mean comparisons	Mammography (<2 years) M (SD)		Sig.
	Yes	No	
Predisposing			
Language-based acculturation[a]	2.35 (1.34)	2.43 (1.49)	t = −0.102
	(n = 151)	(n = 44)	(df = 193, $p = 0.919$)
Age (years)	51.99 (9.25)	47.86 (6.96)	t = 2.846
	(n = 154)	(n = 48)	(df = 200, $p = 0.005$)*
Need			
Health status[b]	2.99 (1.04)	3.30 (0.97)	t = −1.823
	(n = 152)	(n = 47)	(df = 197, $p = 0.070$)^
Unhealthy days[b]	8.99 (10.66)	12.32 (12.11)	t = −1.805
	(n = 148)	(n = 47)	(df = 193, $p = 0.073$)^
Activity limitation[b]	5.55 (9.43)	5.29 (9.13)	t = 0.143
	(n = 108)	(n = 35)	(df = 141, p = 0.806)

Behavioral model variables Chi square analyses	**Mammography (<2 years) % (n)**		**Sig.**
	Yes	**No**	
Activity limitation transformed[bc]	1.14 (0.20)	1.13 (0.20)	t = 0.109
	(n = 108)	(n = 35)	(df = 141, p = 0.914)
Contextual variables Chi square analyses	Mammography (<2 years) % (n)		Sig.
	Yes	No	
History of breast cancer			
Yes	79.3 (46)	20.7 (12)	$\chi^2(1, 202) = 0.424$ ($p = 0.515$)
No	75.0 (108)	25.0 (36)	
Contextual variables Mean comparisons	Mammography (<2 years) M (SD)		Sig.
	Yes	No	
Cancer fatalistic beliefs: predetermination[d]	0.46 (0.37)	0.44 (0.34)	t = 0.330
	(*n* = 146)	(*n* = 46)	(df = 190, *p* = 0.742)
Cancer fatalistic beliefs: inevitability of death[d]	0.17 (0.31)	0.13 (0.28)	t = 0.777 (df = 196, *p* = 0.438)
	(*n* = 150)	(*n* = 48)	
Cancer fatalistic beliefs: fear[d]	0.65 (0.39)	0.67 (0.40)	t = −0.289
	(*n* = 152)	(*n* = 48)	(df = 198, *p* = 0.773)
Intrinsic religiosity[d]	4.45 (0.80)	4.40 (0.81)	t = 0.411
	(*n* = 151)	(*n* = 47)	(df = 196, *p* = 0.681)
Organizational religiosity[e]	3.26 (1.21)	3.11 (1.43)	t = 0.649
	(*n* = 145)	(*n* = 44)	(df = 187, *p* = 0.517)
Non-organizational religiosity[f]	3.08 (1.37)	3.22 (1.44)	t = −0.513
	(*n* = 121)	(*n* = 37)	(df = 156, *p* = 0.609)
Health literacy: confidence in filling out medical forms[g]	4.03 (1.00)	3.63 (1.16)	t = 2.360
	(*n* = 154)	(*n* = 48)	(df = 200, *p* = 0.019)**
Health literacy: assistance needed in reading hospital materials[g]	3.75 (1.32)	3.70 (1.52)	t = 0.224
	(*n* = 154)	(*n* = 47)	(df = 199, *p* = 0.823)
Breast cancer worry[h]	1.68 (0.66)	1.64 (0.71)	t = 0.407
	(*n* = 152)	(*n* = 47)	(df = 197, *p* = 0.684)
Breast cancer distress[h]	1.50 (0.62)	1.85 (0.93)	t = −2.961
	(*n* = 153)	(*n* = 47)	(df = 198, *p* = 0.003)*

Chi square tests and independent samples t tests (equal variances assumed) were used to compare variables across mammography adherence groups. Incomplete data are due to participant non-response

^Approaching significance at the 0.05 level (0.05 [p \ 0.10)

*$p \leq 0.01$

** $p \leq 0.05$

[a] Possible range 1–5; higher scores denote higher acculturation to English language

[b] Health status ranges from 1 to 5; unhealthy days and activity limitation range from 0 to 30; higher scores denote worse health status

[c] Activity limitation transformed

[d] Range from 0 to 1; higher scores denote higher levels of fatalistic beliefs

[e] Ranges from 1 to 5; higher scores denote greater religiosity

[f] Ranges from 1 to 6; higher scores denote greater religiosity

[g] Ranges from 1 to 5, higher scores denote more confidence in filling out forms and less assistance needed

[h] Range from 1 to 4; higher scores denote higher levels of worry and distress

Table 3

Four logistic regression models of recent mammography screening

	Recent mammography (<2 years)[a,c]		
	OR	**95 % CI**	***p* value**
Model 1: predisposing domain			
Education			
<High school[b]	1.000		
≥High school	2.999	(1.154, 7.793)	0.024**
Language-based acculturation	0.641	(0.414, 0.995)	0.047**
Country of Birth			
Mexico[b]	1.000		
US	2.042	(0.590, 7.060)	0.259
Model 2: enabling domain			
Age	1.062	(1.006, 1.120)	0.029**
Health insurance			
None[b]	1.000		
Public	1.746	(0.538, 5.667)	0.354
Private	2.391	(1.093, 5.228)	0.029**
Physician visit <1 year			
No[b]	1.000		
Yes	3.336	(1.603, 6.944)	0.001*
Model 3: need domain			
Health status	0.877	(0.580, 1.325)	0.534
Unhealthy days	0.962	(0.922, 1.004)	0.078^
Activity limitation[d]	4.932	(0.411, 59.214)	0.208
Model 4: Full BMHSU			
Education			
Less than high school[b]	1.000		
High school or greater	4.634	(1.020, 21.062)	0.047**
Language-based acculturation	0.329	(0.156, 0.693)	0.003*
Country of birth			
Mexico[b]	1.000		
US	4.945	(0.708, 34.515)	0.107
Age	1.067	(1.010, 1.126)	0.021**
Health insurance			
None[b]	1.000		
Public	3.081	(0.545, 17.420)	0.203
Private	2.964	(0.664, 13.236)	0.155
Physician visit <1 year			
No[b]	1.000		

	Recent mammography (<2 years)[a,c]		
	OR	**95 % CI**	***p* value**
Yes	4.413	(1.610, 12.094)	0.004*
Health status	0.885	(0.484, 1.619)	0.692
Unhealthy days	0.982	(0.927, 1.040)	0.540
Activity limitation[d]	1.069	(0.046, 24.918)	0.967

CI = confidence interval;

^Approaching significance at the 0.05 level (0.05>*p*< 0.10);

*$p \leq 0.01$;

**$p \leq 0.05$

Model 1: [a]*n* = 185; [b] reference category, [c] model Chi square: 6.467 (df = 3, *p* = 0.091); GOF χ^2 = 2.317, (df = 6, *p* = 0.888)

Model 2: [a]*n* = 195; [b] reference category; [c] model Chi square: 29.355 (df = 4, *p* = 0.000); GOF χ^2 = 4.568, (df = 8, *p* = 0.803)

Model 3: [a]*n* = 141; [c] model Chi square: 3.819 (df = 3, *p* = 0.282); GOF χ^2 = 4.155, (df = 8, *p* = 0.843); [d] activity limitation is transformed

Model 4: [a]*n* = 124; [b] reference category; [c] model Chi square: 31.373 (df = 10, *p* = 0.001); GOF χ^2 = 5.304, (df = 8, *p* = 0.725); [d] activity limitation is transformed

Table 4

Model comparisons: full BMHSU model (Model 5) and the modified BMSHU (Model 6)

Factors	Model 5			Model 6		
	Mammography (<2 years)[a]			Mammography (<2 years)[a]		
	OR	95 % CI	*p* value	OR	95 % CI	*p* value
Education						
Less than high school[b]	1.000			1.000		
High school or greater	4.631	(1.021, 21.002)	0.047**	3.075	(0.624, 15.139)	0.167
Language-based Acc.	.330	(0.157, 0.695)	0.004**	0.273	(0.123, 0.605)	0.001*
Country of Birth						
Mexico[b]	1.000			1.000		
US	4.917	(0.706, 34.246)	0.108	6.210	(0.777, 49.645)	0.085^
Age	1.037	(0.969, 1.109)	0.298	1.044	(0.970, 1.125)	0.250
Health insurance						
None[b]	1.000			1.000		
Public	3.026	(0.535, 17.123)	0.211	2.804	(0.451, 17.422)	0.269
Private	2.959	(0.664, 13.190)	0.155	3.020	(0.611, 14.940)	0.175
Physician visit <1 year						
No[b]	1.000			1.000		
Yes	4.400	(1.607, 12.050)	0.004*	6.304	(2.074, 19.159)	0.001*
Health status	0.886	(0.485, 1.619)	0.694	0.991	(0.512, 1.918)	0.979
Unhealthy days	0.983	(0.927, 1.041)	0.552	0.994	(0.934, 1.058)	0.849
Activity limitation[c]	1.037	(0.044, 24.373)	0.982	1.812	(0.061, 53.930)	0.731
Breast cancer distress	–	–	–	0.540	(0.263, 1.108)	0.093^
Confidence in filling out medical forms	–	–	–	1.743	(1.033, 2.940)	0.037**
−2 log likelihood		105.774[d]			97.945[e]	

^Approaching significance at the 0.05 level (0.05 > *p*< 0.10);

*$p \leq 0.01$;

** $p \leq 0.05$

[a] $n = 123$

[b] Reference category

[c] Activity limitation is transformed

[d] Model 5 Chi square: 30.888 (df = 10, $p = 0.001$); GOF $\chi^2 = 5.226$, (df = 8, $p = 0.733$)

[e] Model 6 Chi square: 7.829 (df = 2, $p = 0.020$); GOF $\chi^2 = 13.558$, (df = 8, $p = 0.094$). Model 6 was a better fit. A likelihood ratio χ^2 test indicated that the two context-specific variables significantly added to the Model 5 [$\chi^2_2 = 7.829 >$ critical value $(\chi^2_{2(\alpha=.05)} = 5.991)$, $p \leq 0.05$]