

# Change in Breast Cancer Screening Knowledge is Associated With Change in Mammogram Intention in Mexican-Origin Women After an Educational Intervention

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## ABSTRACT

**PURPOSE:** To determine the relationship between breast cancer screening knowledge and intent to receive a mammogram within 6 months in a sample of Mexican-origin women living in El Paso, Texas.

**METHODS:** A total of 489 uninsured Mexican-origin women were assigned to treatment or control and completed surveys at pre- and post-intervention. Pre-post associations between breast cancer screening knowledge and intent were tested.

**RESULTS:** Participants were on average were 56.7 years of age and spoke primarily Spanish (92.6%). Most of the samples had not had a mammogram in 3 or more years (51.6%) and 14.6% had never had a mammogram. At baseline, the majority intended to be screened for breast cancer within the next 6 months (93.4%). At postintervention, half of the intervention group changed their 6-month intent to be screened for breast cancer from likely to unlikely. Change in intent was associated with a change in knowledge of risk of having a first child by the age of 30 and breast cancer being rare after the age of 70.

**DISCUSSION:** Intent to be screened for breast cancer in Mexican-origin women may be influenced by the type of knowledge.

**CONCLUSIONS:** Change in screening knowledge may influence perceived risk that influences intention to be screened.

**KEYWORDS:** Breast cancer, knowledge, screening, intent, Hispanic, women

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## Introduction

Breast cancer is the leading cause of cancer deaths among Mexican American women.<sup>1</sup> Mexican American women are more likely to be diagnosed at advanced stages of breast cancer and more likely to be diagnosed with hormone receptor-negative tumors, despite lower overall incidence compared with non-Hispanic white women.<sup>1</sup> Earlier detection of breast cancer, therefore, is likely to be the most effective strategy in reducing documented breast cancer mortality disparities in Mexican American women. However, recent data show that only 61% of Mexican American women have had a mammogram in the past 2 years.<sup>1</sup>

Although insurance status, income, and education levels are the most consistent predictors of preventive screening behaviors among Mexican Americans,<sup>2,3</sup> breast cancer screening depends on heavily on the type of information available on risk in this population.<sup>4–8</sup> There has been less consistent evidence

that cultural and social barriers impede on Hispanic women's follow-through in being screened.<sup>3</sup> Nevertheless, interventions to increase mammogram utilization in Hispanic women have generally focused on increasing breast cancer screening knowledge, self-efficacy, or decreased real or perceived barriers to screening.<sup>9–12</sup> There continues to be a limited amount of information on what type of knowledge acquired through breast cancer screening interventions is important to affect behavioral change.<sup>4,13,14</sup> This is despite the consensus that having the correct screening knowledge on breast cancer risk is essential to making informed decisions to be screened.<sup>7,15–17</sup>

Breast cancer screening knowledge is most often measured through multifactorial indices such as assessing myths, misconceptions, or actual knowledge on cause of the disease.<sup>17–22</sup> Although this approach has facilitated the assessment of changes in screening knowledge after educational programs,<sup>23</sup> it is difficult to disentangle the specific type of knowledge that has the



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most influence on uptake in screening for breast cancer. This may be one reason why findings on screening knowledge and mammogram uptake have not been previously consistent<sup>4,9,24</sup> and type of knowledge may matter for mammogram screening in other populations.<sup>5,15,25</sup> For example, Australian women were less likely to be up to date on their screening if they were unsure of the recommended age to begin screening.<sup>15</sup>

Among vulnerable populations, such as those on the United States-Mexico border, there are often misconceptions about cancer that may serve as principal barriers to breast cancer screening.<sup>18</sup> Currently, no published studies have explored individual components of a screening knowledge scale on intention to be screened for breast cancer. Intention to be screened has been considered as a surrogate outcome for actual screening in surveys where mammogram uptake information may not be readily accessible. It is critical to identify which specific screening knowledge might influence the screening behavior that translates to actual screening and practice. Furthermore, no published study has investigated this relationship in economically disparate Hispanic populations such as Mexican American women residing in the United States-Mexico border region. Having this information would help better inform what type of screening knowledge is most important in making the decision to undergo breast cancer screening and mammography in this population.

### Purpose

The El Paso and Hudspeth County Breast Cancer Education, Screening and NavigaTion program (BEST) (2014-2017) was an outreach, education, and breast cancer screening program that targeted low-income, uninsured women living in El Paso and Hudspeth Counties in the United States-Mexico border region of Texas. (*Because the BEST program is comprehensive, it alleviates many barriers to screening that are associated with low socio-economic status. Although most women went through with getting a mammogram [87.6%], there was a substantial shift in intent to be screened in the intervention group. Because of this change, the purpose of this study was to determine what aspects of knowledge were most closely related to the change in screening intent.*) This study was intended to provide insight on how changes in understand of risk may affect intentions or perceived urgencies to be screened.

## Methods

### Sample

El Paso and Hudspeth County BEST is a large-scale community-based partnership to promote breast cancer screening knowledge and screening. (El Paso and Hudspeth Counties are located in the far Western tip of the state of Texas. Approximately, 82% of the population is of Mexican origin and 22.5% live below the poverty line.<sup>26</sup> Of notable concern for this population is the high rate of uninsured which is estimated be 23.8%.<sup>26</sup> As insurance coverage is a substantial

barrier to screening in this population,<sup>2</sup> the BEST program offers women an opportunity to be screening for breast cancer at no cost for those without insurance.)

The inclusion criteria for the study were as follows: Mexican American women who were 50 to 75 years old, did not have insurance, and had not had a mammogram within the past 2 years and overdue for a mammogram. The exclusion criterion for this study was past history of breast cancer. A total of 1734 women were recruited by promotoras (community health workers) through referrals, health fairs, and clinics. Eligible participants were enrolled into the educational program and received navigation by patient navigators for breast cancer screening, mammograms, and transportation. In a subset of the 1734 women, 600 were asked to participate in a pre-post survey. Participants were assigned to the intervention or delayed intervention at random. A total of 300 served as the intervention group receiving the education and mammogram on enrollment. The other 300 served as the control group, receiving a delayed intervention.

### Intervention program

The educational program had 5 main components: outreach, education, navigation, direct service provision, and access to treatment assistance. The program was intended to address low overall screening, knowledge of breast cancer in the community, cultural misconceptions on the cause of breast cancer, and poor access to screening and treatment. (All eligible women were offered mammograms at no cost. A total of 87.6% of women offered mammogram followed through with the screening. The education program consisted of breast cancer cause and screening guidelines. In addition, women were offered free navigation services by a community health worker to screening that included mammogram appointments, assistance with transportation, and free work-up of abnormal mammogram findings.)

### Survey data

Survey items included demographic information such as age, race and ethnicity, years of education, birth country, insurance status, marital status, preferred language, acculturation, work status, past breast cancer screening history, and self-reported health status. It also included psychosocial constructs such as screening knowledge, perceived barriers to screening, fear, self-efficacy, and fatalism.<sup>27-32</sup> The psychosocial constructs are existing measures that are valid and reliable for the Spanish-speaking population.

### Variables

#### Outcome

*Mammogram intent.* Mammogram intent was measured by participants' intent for getting a mammogram within the next 6 months. The outcome variable was measured dichotomously: yes = 1, no = 0. To determine change between pre- and

**Table 1.** Variable description for mammogram intent and breast cancer knowledge<sup>a</sup>.

Intent to have a mammogram
I plan to have a mammogram in the next 6 mo (yes/no)
Breast cancer knowledge
A hard blow to the breast may cause a woman to get breast cancer later in life ( <i>false</i> )
The constant irritation of a tight bra can, over time, causes breast cancer ( <i>false</i> )
One out of every 8 women in the United States will get breast cancer sometime during her life ( <i>true</i> )
In some women, being overweight increases the risk of developing breast cancer ( <i>true</i> )
A woman who has her first child before the age 30 is more likely to develop breast cancer than a woman who has her first child after the age of 30 ( <i>false</i> )
Women with no known risk factors for breast cancer rarely get breast cancer ( <i>false</i> )
Some types of fibrocystic breast disease (noncancerous breast lumps) increase a woman's risk of breast cancer ( <i>true</i> )
Breast cancer is more common in 65-year-old women than in 40-year-old women ( <i>true</i> )
The most frequently occurring cancer in women is breast cancer ( <i>true</i> )
Women over age 70 rarely get breast cancer ( <i>false</i> )
Most breast lumps are cancerous ( <i>false</i> )
Mammography is recommended every 2 years between 50 and 75 years of age ( <i>true</i> )

<sup>a</sup>Adapted from Stager<sup>33</sup>.

postintervention, an additional dichotomous variable was created. Responses were compared between pre- and postintervention and if their response changed from “yes” to “no” between pre- and postintervention measurement was coded as “1.” Responses that did not change between pre- and postintervention or changed from “no” to “yes” were coded as “0.”

**Breast cancer screening knowledge.** Pre- and postintervention breast cancer screening knowledge was measured using a modified version of the Stager Comprehensive Breast Cancer Screening knowledge Test.<sup>33</sup> Participants were asked a total of 12 questions assessing their screening knowledge of breast cancer risk and to evaluate whether the question was true or false. A full list of questions can be seen in Table 1. Their responses were then coded as 1 if they responded correctly or 0 if their response was incorrect. Individual question responses were assessed for their association with intent and mammogram uptake. A dichotomous variable was then constructed to assess change in correct screening knowledge between pre and post data collection. A change in screening knowledge from “incorrect” to “correct” was coded as “1” and “correct” to “incorrect” or no change was coded as “0.”

### Analysis

To test for successful randomization, a univariate and bivariate analysis was conducted by intervention/control group by key demographic factors including age (continuous), years in the United States (0–10, 11–20, 21–30, 31–64) and preferred language (English, Spanish, both), married or partnered (yes/no), employment status (unemployed, full-time, part-time), self-reported health (excellent, very good, good, fair, poor), most recent mammogram (never, 1–2 years ago, 3 or more years). Unpaired *t* tests and  $\chi^2$  tests were conducted to determine statistically significant differences between the intervention and control groups at both pre- and postintervention measurement points. Adjusted logistic regression models using bootstrap variance estimates were conducted to predict change in intent between pre- and postintervention by change in screening knowledge for the intervention group only. Results are reported using odds ratio (OR) and *P* value. This study was approved by the Institutional Review Board at the University at which the research was conducted.

### Results

The total number of participants with completed both the pre- and postsurveys was 489 (*n* = 237 intervention; *n* = 252 control) (81.5% return rate). Table 2 reflects key demographic and health covariates for the BEST sample by intervention condition group. On average, participants were 56.7 years of age and spoke Spanish (92.6%) as their preferred language. Years living in the United States ranged from less than 1 year to 64 years and most of the participants were immigrants from Mexico (not shown). About half were married or living with a partner (50.4%) and were not employed at the time of the survey (55.1%). Most of the full sample rated their health as fair or poor (54.9%) and had not had a mammogram in 3 or more years (51.6%) and 14.6% had never had a mammogram. Significant differences existed between the intervention and control group in mean age (intervention 57.2 vs control 56.3 years [*P* = .042] and language preference, ie, a higher percentage spoke English [4.7 vs 3.0] or both English and Spanish [5.5 vs 1.3] in the control group [*P* = .020]). Nearly all participants at preintervention had plans to have a mammogram within 6 months (98.4%). However, at postintervention, there was a significant shift in intent and likelihood to have a mammogram within 6 months in the intervention group. At postintervention, only half of intervention participants intended to have a mammogram within 6 months (52.8% intervention vs 96.4% control, *P* ≤ .0001).

Preintervention screening knowledge varied extensively by question and by control or intervention group (see Table 3). At postintervention, significant differences between the intervention and control groups in screening knowledge only existed for having had a hard blow to the breast (false) (86.1% vs 58.7%, *P* ≤ .0001), wearing too tight of a bra (false) (90.7% vs 70.2%, *P* ≤ .0001), 1 out of 8 women will get breast cancer (true)

**Table 2.** Comparison of preintervention demographic and health characteristics between intervention groups.

	TOTAL (N = 489)	INTERVENTION	CONTROL	P VALUE
Age (mean ± SD)	56.7 (5.0)	57.2 (5.4)	56.3 (4.6)	0.042
Language preference (No. (%))				0.020
English	19 (3.9)	7 (3.0)	12 (4.7)	
Spanish	452 (92.6)	225 (95.7)	227 (89.7)	
Both	17 (3.5)	3 (1.3)	14 (5.5)	
Years in United States (No. (%))				0.076
0-10	103 (21.2)	56 (23.8)	47 (18.8)	
11-20	124 (25.6)	66 (28.1)	58 (23.2)	
21-30	117 (24.1)	57 (24.3)	60 (24.0)	
31-64	141 (29.1)	56 (23.8)	85 (34.0)	
Married or living with partner (No. (%))				0.646
Yes	246 (50.4)	121 (51.5)	125 (49.4)	
No	242 (49.6)	114 (48.5)	128 (50.6)	
Currently employed (No. (%))				0.845
No	269 (55.1)	127 (54.0)	142 (56.1)	
Part time	164 (33.6)	82 (34.9)	82 (32.4)	
Full time	55 (11.3)	26 (11.1)	29 (11.5)	
Self-rated health (No. (%))				0.125
Fair/poor	268 (54.9)	132 (56.2)	136 (53.8)	
Good	166 (34.0)	84 (35.7)	82 (32.4)	
Very good/excellent	54 (11.1)	19 (8.1)	35 (13.8)	
Most recent mammogram (No. (%))				0.133
Never	71 (14.6)	36 (15.3)	35 (13.8)	
Less than 3 y	165 (33.8)	69 (29.4)	96 (37.9)	
3 or more years	252 (51.6)	130 (55.3)	122 (48.2)	

(95.8% vs 87.7%,  $P = .001$ ), and having children before the age of 30 (false) (39.2% vs 16.7%,  $P \leq .0001$ ), suggesting that the educational program may have had the most influence on these aspects of screening knowledge. (We conducted a further analysis, results not shown, to assess differences by age group [50-64 vs 65-75] and only observed differences for the knowledge question on having the first child before 30 and breast risk. On average, it was the older women who got the answer correct [false] than the younger women [ $t = -2.50$ ,  $P = .013$ ]).

In an effort to better understand the relationship between a change in screening knowledge and a change in intent between pre- and postintervention measurement, a logistic regression was conducted for the intervention group only (see Table 4). In the adjusted analysis, participants in the intervention group who answered incorrectly at preintervention, but correctly at

postintervention, had a significantly higher relative risk ratio of a change in intent for having a child before the age of 30 (false) (OR = 16.5,  $P = .000$ ) and cancer being rare over the age of 70 years (OR = 3.14,  $P = .036$ ) only.

## Discussion

Mexican American women are least likely to be screened for breast cancer and breast cancer is the leading cause of cancer mortality in this population.<sup>1</sup> There is limited information on the type of cancer screening knowledge that is important to make the decision to be screened for breast cancer among Mexican American women. This study made use of pre- and postintervention survey data to determine in how an intervention to increase breast cancer screening knowledge affects intention to be screened after participating in an

**Table 3.** Comparison of mammogram intention and knowledge at postintervention between intervention groups.

	PRE			POST		
	INTERVENTION	CONTROL	P VALUE	INTERVENTION	CONTROL	P VALUE
	NO. (%)	NO. (%)	NO. (%)	NO. (%)	NO. (%)	NO. (%)
<b>Intention</b>						
I plan to have a mammogram within 6 mo						
Yes	234 (98.7)	247 (98.0)	.531	126 (53.2)	243 (96.4)	.000
No	3 (1.3)	5 (2.0)		111 (46.8)	9 (3.6)	
<b>Knowledge (correct)</b>						
A hard blow	129 (54.4)	51 (20.6)	.000	204 (86.1)	148 (58.7)	.000
Tight bra	149 (62.9)	107 (42.5)	.000	215 (90.7)	177 (70.2)	.000
1 out of 8 women	208 (87.8)	203 (80.6)	.030	227 (95.8)	221 (87.7)	.001
Overweight	194 (81.9)	162 (64.3)	.000	194 (81.9)	197 (78.2)	.309
Child before 30	44 (18.6)	85 (33.7)	.000	93 (39.2)	42 (16.7)	.000
Risk factors	38 (16.0)	71 (28.2)	.001	46 (19.4)	57 (22.6)	.384
Fibrocystic breast disease	181 (76.4)	177 (70.2)	.126	184 (77.6)	200 (79.4)	.642
More common in 65 y than 40 y	160 (67.5)	106 (42.1)	.000	166 (70.0)	159 (63.1)	.104
Most frequent cancer in women	200 (84.4)	183 (72.6)	.002	197 (83.1)	217 (86.1)	.359
Over 70 rarely	45 (19.0)	91 (36.1)	.000	50 (21.1)	59 (23.4)	.539
Lump	85 (35.9)	147 (58.3)	.000	98 (41.4)	117 (46.4)	.258
Recommended every 2 y	205 (86.5)	186 (73.8)	.000	207 (87.3)	213 (84.5)	.371

education program. Findings from this study revealed that at preintervention, women in both the intervention and control groups had high correct preintervention screening knowledge of breast cancer cause. At postintervention, nearly half of the intervention group had changed their 6-month intent to be screened for breast cancer as likely to unlikely. The change in intent was strongly associated with a change from incorrect to correct screening knowledge of having a first child before the age of 30 and breast cancer being rare after the age of 70.

Despite the fact that most of the participants were uninsured, immigrants, and Spanish-speaking, participants in our study had an unexpectedly high level of both intent to be screened and breast cancer screening knowledge at preintervention. Internationally, immigrants have been documented as low utilizers of breast cancer screening services and have low levels of screening knowledge.<sup>34-37</sup> One explanation has often been that due to linguistic barriers, less acculturated women may be less likely to get screened for breast cancer.<sup>11,38</sup> Information on Hispanic-origin Spanish-speaking immigrants to the United States and breast cancer screening knowledge has largely focused on destination of immigrant and occupation.<sup>6,7,20,35,38</sup>

In El Paso, 72% of all residents speak Spanish in the home<sup>26</sup> and language does not serve as a barrier to health care screening knowledge and services for immigrants as documented in other regions of the United States.<sup>2</sup> The proximity to Ciudad Juarez, Mexico, also provides an alternative to uninsured residents because many cross the border to purchase medications and access health care.<sup>39-41</sup> In places such as El Paso, where language does not serve as a barrier to screening knowledge, actual screening may have more to do with where to get or how to pay for a mammogram than actual screening knowledge of breast cancer risk.<sup>42</sup> Future research should examine how context may affect the response to educational interventions to prevent cancer and how intent may be differentially affected based on where one lives.

### Strengths

In addition, the identification of what type of knowledge change may result in change in intent to be screened in a vulnerable Hispanic sample from the United States-Mexico border region is a strength of this study. Looking at different types of screening knowledge provided a better insight into what information was most associated with intent to be screened for

**Table 4.** Change in individual factors of knowledge scale associated with change between pre- and postintervention in likelihood of mammogram screening within 6 months (yes/no).

	INTERVENTION GROUP RRR (P VALUE)
Hard blow to breast (false)	.416 (.153)
Tight bra (false)	1.19 (.794)
1 in 8 women (true)	2.14 (.288)
Overweight (true)	.580 (.473)
First child age 30 (false)	16.5 (.000)
No risk factors (false)	2.22 (.316)
Fibrocystic (true)	1.04 (.958)
65y more common 40 (true)	1.29 (.657)
Breast most common cancer (true)	1.13 (.880)
Rare 70+ (false)	3.14 (.036)
Lumps cancerous (false)	1.48 (.498)
Mammograms every 2y (true)	.953 (.940)
Adjusted for age	

Abbreviation: RRR, relative risk ratio.

breast cancer. Our findings showed that after our educational intervention, participants who incorrectly answered at pre-intervention, but correctly responded at postintervention as to whether women who had their first child before the age of 30 are more at risk (false) or that breast cancer is less common in women over the age of 70 (false), were significantly more likely to change their intent to be screened for breast cancer. Approximately half of these women went from yes to no in their intent to obtain a mammogram within the next 6 months. This was an unexpected finding and likely to be the first time this relationship has been documented in Hispanic women.

Women in our sample began childbearing in their early 20s, which is consistent with national averages in this population.<sup>43</sup> Earlier fertility may have increased their perception of greater risk for breast cancer prior to participation in the educational intervention. However, after receiving education and learning that their earlier age at first birth may not increase their risk of breast cancer, participants may have changed their sense of urgency to get a mammogram, thereby explaining the reduction in intent. There has been little research conducted on the relationship between timing of fertility and perceived risk for breast cancer in Hispanic other ethnic groups.<sup>4</sup> However, some evidence suggests that misinformation about breast cancer and mammogram screening is a significant barrier in other Hispanic populations.<sup>44</sup> Another possibility could be due to the intervention not improving individual components of screening knowledge to the level which it would have positively impacted intention behaviors as opposed to other screening knowledge

factors (improvement more than 70%). So, the low level of screening knowledge on some components after the intervention may adversely affect the intention behavior. Future studies should focus on evaluating the impact on how misinformation may inadvertently also serve as a motivation to be screened for breast cancer and how correcting that screening knowledge may affect perceived risk of cancer and screening behavior.<sup>42</sup> More studies are also needed to understand what information is needed to make decisions to be screened for breast cancer and most effectively affects follow-through.

### Limitations

Although this study does provide initial evidence on the relationship between type of screening knowledge and intent to be screened for breast cancer in low-income, uninsured Mexican American women living in the United States-Mexico border region, there are noteworthy limitations that need to be acknowledged. First, this study's findings can only be inferred to uninsured, primarily Spanish-speaking immigrant women from Mexico. It may be that findings would vary by insurance and immigration status, as well as by Hispanic ethnic group. It is essential to conduct future studies in other populations to determine whether the findings also apply to other populations and race/ethnic groups. Another potential limitation to this study is how screening knowledge and intent were measured. We made use of a modified version of the Stager Comprehensive Breast Cancer Knowledge Test.<sup>33</sup> It is possible that using the nonmodified scale or another screening knowledge scale would yield different findings depending on measurement. (In addition, although the program addressed many logistic barriers such as cost and transportation, we did not assess psychological barriers such as worry and perceived pain of mammogram screening.) Finally, women were recruited to the BEST program because they were overdue for the breast cancer screening, it is possible that this is a unique subpopulation, and if a larger population-based sample were surveyed, their results might vary.

### Implications for practice

Despite acknowledged and other limitations not mentioned, this study provides important insight into how information shared in interventions to increase mammogram uptake influences intent to be screened in a sample of low-income Mexican American women. Future studies should evaluate further how screening knowledge acquisition affects preventive screening uptake for breast and other types of cancer. Furthermore, studies should be conducted in other settings and other race/ethnic groups to determine the extent to which these findings might vary between groups and geographic contexts. Distinguishing what screening knowledge is associated with an increase in uptake in cancer screening could help better tailor intervention and education programs to improve screening rates in this and other disparate populations.

## Author Contributions

JJS: Conceptualization, analysis, main writer; TB: Intervention conceptualization, manuscript editing; CM: Supervising physician, manuscript editing; AKD: Assisted with manuscript writing and interpretation of statistical analysis; AA: Data entry and analysis; RS: Project coordinator; NKS: Principal investigator, assisted with manuscript writing.

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