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A Systematic Review of Barriers and Facilitators to Mammography in Hispanic Women

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### Abstract

**Purpose:** A systematic review of the research on barriers and facilitators to mammography in Latinas was conducted to determine if the challenges faced by these women are unique to this population.

**Methods:** Medline and CINAHL database searches for the years 2005 – 2013 were included. The PRISMA guidelines were used to guide this review.

**Results:** Of the 174 articles identified, 18 articles met inclusion criteria. The most consistent findings were that income and education were associated with screening.

**Conclusions:** Financial barriers and social characteristics were significant predictors of mammography in these studies, which were comprised almost exclusively of low income Latinas. These findings are similar to those found in other populations of low income women and therefore are not likely unique to Latinas.

**Implications for Practice:** It is likely that there is little difference between poor Latinas and other populations of poor, non-English speaking women in barriers and facilitators to mammography.

## Introduction

After skin cancer, breast cancer is the most frequently diagnosed cancer and the second greatest cause of cancer mortality for women, exceeded only by lung cancer (American Cancer Society [ACS], 2014). An estimated 232,670 new cases of invasive breast cancer will be diagnosed in women in the United States (U.S.) in 2014 (ACS, 2014). Although Latinas are less likely to be diagnosed with breast cancer than White or African American women, breast cancer is the most frequently diagnosed cancer and the greatest cause of cancer death in Hispanic women. An estimated 17,100 Latinas are likely to have been diagnosed in 2012 (ACS, 2012). Latinas are more often diagnosed at a later stage and with negative prognostic features such as greater tumor size and higher grade tumors (ACS, 2012; Hill, et al., 2010). This disparity remains constant even after controlling for age, socioeconomic status, and means of detection (Lantz, et al., 2006).

Obtaining a mammogram is one of the most effective means of identifying breast cancer at an early stage. In 2010, 66.5% of women in a national survey reported having had a mammogram within the past two years (ACS, 2013a). Adherence to a regular schedule of mammography is necessary to gain the full benefit of early detection, i.e. improved prognosis and wider range of treatment options (ACS, 2013b). Despite widespread availability of mammography services, Hispanic women, particularly those who are low income, less educated, uninsured, or new immigrants, have lower rates of screening including the likelihood of ever having a mammogram (ACS, 2011; Centers for Disease Control [CDC], 2005). Although screening rates for all women have increased since the 1990's, the increase has not been symmetrical; for example, the screening disparity between White and Hispanic women increased three-fold from 1995 to 2005 (Betancourt, Flynn, Riggs, & Garberoglio, 2010).

Various interventions in the recent past have targeted Hispanic women with the intention of improving adherence to mammogram screening recommendations, but they have been met with mixed results (Deavenport, Modeste, Marshak, & Neish, 2011; Fernández, et al., 2009; Tejeda, Thompson, Coronado, Martin, & Heagerty, 2009). These studies on Hispanic women tend to both generalize between and among different subpopulations, but also to isolate Hispanics from other women who may be equally challenged by structural and functional barriers in their attempts at health seeking.

The purpose of this systematic review was to synthesize the current knowledge on the factors that enable or impede Hispanic women from obtaining mammography. The framework for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was followed in writing this article.

### Methods

MEDLINE and CINAHL databases were systematically searched to identify all the relevant research articles published from 2005 through 2013. Search terms included: mammograms, mammography, Hispanic, Latina, facilitators, and barriers. The search limits were: (1) original research and (2) written in the English language. Inclusion criteria were: 1. Latinas/Hispanic women 40 years and older (the age at which mammogram screening has been recommended to commence by the American Cancer Society since 1983 [ACS, 2013c]); 2. barriers and facilitators to mammography utilization; and 3. studies based in the US. The cancer burden faced by Latinas living in the U.S. is generally similar to that in their country of origin (ACS, 2012). But by focusing on studies of Latinas residing in the U.S. the varying access factors of other countries are removed from consideration, and the concepts of acculturation, health literacy, and language dissonance become relevant. The review was limited to

quantitative studies that measured associations between various facilitators or barriers to screening and the receipt of mammography. Qualitative studies were excluded.

The first database searched was CINAHL, which provides indexing for 3083 journals from the fields of nursing and allied health (EBSCO Health, 2014), followed by a search of MEDLINE, which includes 19 million references to journal articles in the life sciences (U.S. National Library of Medicine, 2013). A total of 188 articles were identified from these databases. A title screen was conducted eliminating 119 records that were either duplicates or irrelevant, leaving 68 records that were then screened in full. Eighteen research articles were eligible based on the inclusion criteria. A hand search of the reference lists of the included articles resulted in six additional articles that underwent a full screen and were excluded as irrelevant. Figure 1 summarizes the article selection process. [Figure 1 about here]

## Results

This review began with an examination of the design and sampling methodology used in the included studies. The studies are reviewed and summarized by the specific barriers and facilitators identified. A discussion of findings follows which includes recommendations for future research and nursing implications.

### Study Characteristics

Each study was evaluated for design and sample with a focus on specific facilitators and / or barriers and control of covariates. Data are presented in Table 1. Every study included age as a covariate. Education was included in all but two studies (Lawsin, Erwin, Bursac, & Jandorf 2011; Medina- Shepherd & Kleier, 2012). Marital status was considered in all but one (Lawsin, Erwin, Bursac, & Jandorf, 2011). Two studies looked at number of children (Borrayo, et al., 2009; Teran, Baezconde-Garbanati, Marquez, Castellanos, & Belkic, 2007), four studies at a

woman's employment (Cronan et al., 2008; Gonzalez & Borrayo, 2010; Nuno, Castle, Harris, Estrada, & Garcia, 2011; Teran et al., 2007), and one study (Lopez-McKee, McNeill, Bader, & Morales, 2008) included religion as a covariate. All of the studies were cross sectional, and the questionnaires were completed by the subject herself or an interviewer. All but one study (Martinez-Donate, et al., 2013) considered income. The majority of respondents in these studies earned \$10,000 or less a year. Although Martinez-Donate and colleagues (2013) did not report income, it is likely that income was low for these subjects as the sample consisted of relatively recent immigrants with reportedly low levels of assimilation (Martinez-Donate, et al., 2013).

[Table 1 about here]

### Study Samples

There was much variability and little rigor in the sample selections. Seven studies used convenience samples (Gonzalez & Borrayo, 2011; Graves, et al., 2008; Guerra, Krumholz, & Shea, 2005; Lawsin, et al., 2011; Medina-Shepherd & Kleier, 2012; Palmer, Fernandez, Tortolero-Luna, Gonzalez, & Mullen, 2005; Sheppard, et al., 2008), eight studies used random samples (Banegas, et al., 2012; Bird, Moraros, Banegas, & King 2010; Borrayo, et al., 2009; Coronado, Thompson, & Chen, 2009; Cronan, et al., 2008; Nuno, Castle, Harris, Estrada, & Garcia, 2011; Pagan, Brown, Asch, Armstrong, & Bastida, 2012; Teran, et al., 2007), three described purposive sampling procedures (Buki, Jamison, Anderson, & Cuadra, 2007; Lopez-McKee, McNeill, Bader, & Morales, 2008; Sheppard, et al., 2008). Martinez-Donate (2012) used snowball sampling. Two studies included Hispanic and non-Hispanic white women in the sample (Borrayo, et al., 2009; Coronado, Thompson, & Chen, 2009). Two studies had relatively small, ethnically diverse samples (Cronan, et al., 2008; Teran et al., 2007). Five studies included a sample that was primarily or completely Mexican (Gonzalez & Borrayo, 2011; Lopez-McKee,

McNeill, Bader, & Morales, 2008; Nuno, et al., 2011; Pagan, et al., 2012; Palmer, et al., 2005).

The remaining nine studies included Hispanic women from various countries of origin in Central America, the Caribbean, and South America. All but five studies used the indicator “ever had a mammogram” to evaluate screening behaviors. Other variables included: the number of mammograms in the last 5 years (Lopez-McKee, McNeill, Bader, & Morales, 2008); mammogram in last year (Nuno, et al., 2011); specific month and year of last mammogram (Palmer, et al., 2005); report mammogram in last 2 years (Sheppard, et al., 2008) and timing of most recent mammogram (Teran, et al., 2007).

#### Study Findings: Barriers to Mammography

Characteristics such as income, education, and age were found to be predictive of mammography screening. Cronan and colleagues (2008) and Buki and colleagues (2007) found that as income and education increased likelihood of having a mammogram increased. Graves et al. (2008) and Sheppard et al. (2008) found an association between increased age and screening. Banegas et al. (2012) found positive associations between both age and education and having a mammogram.

The effect of insurance on mammography was quite evident in this review. In the 12 studies that captured data on health insurance, the percent of uninsured ranged from 11.5% of the total sample (Coronado, Thompson, Chen, 2008) to 75% of a foreign born sample (Gonzalez and Borrayo, 2011). Nine of these studies found a positive association between having insurance and having a mammogram (Banegas, et al., 2012; Coronado, Thompson, & Chen, 2009; Gonzalez & Borrayo, 2011; Graves, et al., 2008; Guerra, Krumholz, M., & Shea, 2005; Nuno, et al., 2011; Pagan, et al., 2012; Palmer, et al., 2005; Sheppard, et al., 2008). Although Martinez-Donate and colleagues (2013) did not find insurance to be significantly related to screening, these authors



proposed that proximity of a National Breast and Cervical Cancer Early Detection Program (NBCCEDP) site may have minimized the need for insurance in their study population. (The NBCCEDP is a federally financed service providing free or low cost mammograms to women ages 40 to 64, uninsured and underinsured with household incomes at or below 250% of federal poverty level) (CDC, 2013).

Of the four studies that evaluated 'usual source of care', three found that a regular source of care was significantly associated with screening. Nuno et al (2011) found that for U.S. born Latinas, having a regular source of care increased the likelihood of mammography by 9.2 times. Palmer et al. (2005) found a significant association between regular source of care and mammography ( $p < .001$ ) as did Martinez-Donate et al (2013) (OR 4.94). Cronan et al. (2008) found that Mexican American women were significantly less likely to have a regular source of care than non-Hispanic White women, but that this was not significantly related to adherence.

Fatalism was a sociocultural barrier that was considered in four studies. Teran and colleagues (2007) defined fatalism as the belief that there is little one can do to alter fate. Using four items from the Cuellar fatalism scale to measure the construct, fatalism was found to be significantly higher for the Hispanic subsample; this construct had significant negative association with screening ( $p = .03$ ). Lopez-McKee and colleagues (2008) defined cancer related fatalism as the belief that death is inevitable when cancer is diagnosed. These authors evaluated the association between cancer fatalism and mammography with the Powe Fatalism Inventory. Fatalism scores were significantly higher for a group of non-adherent women (one mammogram in five years) than the adherent women (four mammograms in five years) ( $p = .02$ ). Martinez-Donate et al. (2013), while not explicitly defining fatalism as a construct, asked subjects whether the fear of finding cancer as a result of a mammogram would deter them from having the test.

Having a mammogram within the last year was negatively related to fear that the procedure could find an abnormal result (AOR=0.17). On the other hand, Cronan et al. (2008) found that a fear of cancer measure was not significantly associated with screening.

### Familism

Familism was defined by Teran and colleagues (2007) as the sense of support, belonging, identity and purpose obtained from the immediate and extended family. One's family can provide social support and encourage screening; familism would be expected to facilitate mammography. But family can be seen as a barrier as well, if caring for your family becomes a greater priority than caring for yourself (distorted familism). These authors used items from the Cuellar Familism Scale and also read subjects a list of 28 possible barriers that might discourage mammography. The most frequently chosen barrier (from the 28 item list) cited by the 10 Latinas who had not had a mammogram within 2 years was "My family is my first priority and I end up not taking care of my own health." For those Latinas who reported being adherent, high familism was found to have a significant positive association with screening ( $p=.02$ ). Therefore familism was found to be a negative factor for non-adherent women and positive for adherent women, which somewhat obviates the utility of this variable.

### Acculturation

Acculturation refers to the process by which immigrants adopt the attitudes, values, customs, beliefs, and behaviors of their new home (ACS, 2012). Lawsin and colleagues (2011) considered years in the U.S. a proxy for acculturation, while other studies directly measured acculturation by such measures as the Short Acculturation Scale for Hispanics, language use and preference, ethnic identification of self and place of birth, or language use items extracted from the Marin Acculturation Scale. Graves et al. (2008) found acculturation to be positively

associated with mammogram adherence. Lawsin and colleagues (2011) found years in the U.S. to be positively associated with mammogram adherence, while Gonzalez and Borrayo (2011) did not find an association. Banegas et al. (2012) compared screening behaviors in a sample of Mexican women (living near the U.S. Mexico border) to a sample of U.S. Latina women living in New Mexico. Those living in the U.S. had significantly greater odds of ever obtaining a mammogram ( $p < 0.001$ ). Martinez-Donate and colleagues (2013) used several measures of acculturation (length of time in the U.S., Marin Acculturation Scale, language spoken at home) to evaluate a sample they describe as a low acculturated population of women. They found that a monolingual Spanish status was a significant barrier to screening (OR 0.32) as was a lack of English fluency (OR 0.2).

#### Perceived Barriers

Palmer and colleagues (2005) defined decisional balance as the difference between the perceived facilitators (pros) and barriers (cons) of undertaking a specific health seeking behavior. A higher decisional balance score reflects an individual's perception of a greater number of pros than cons in this behavior, thus making that behavior more likely. In this study, women with higher decisional balance scores were 2.5 times more likely to have been screened ( $p = .01$ ).

Two studies used Champion's Health Belief Model Scales (CHBMS) which includes five items of perceived benefits and eleven items of perceived barriers to mammography, with mixed results. Medina-Shepperd & Kleier (2010) found the barriers measures to be the only significant predictor variables; women who perceived more barriers were less likely to have had a mammogram ( $p < .05$ ). Cronan et al. (2008) found that benefit measures were significantly related to mammogram for Latinas ( $p = .04$ ). Barriers were not significantly associated with

mammography, although the Hispanic sample had the highest mean barriers scores and had the lowest percentage of women screened.

### Facilitators of Mammography

#### Physician Recommendation as a Cue to Action

Cues to action can be any event or stimulus that triggers an individual to perform a targeted behavior (Zhang, Oldenburg, & Turrell, 2009). In mammography studies these cues are usually recommendations from a doctor, family members, or friends (Tanner-Smith & Brown, 2010). Two studies considered the influence of a doctor's recommendation on a woman's screening behavior. Gonzalez and Borrayo (2011) found that when a physician gave a woman instruction on breast self-examination she was 3.4 times as likely to have a mammogram ( $p=.003$ ). When a physician recommended mammography women were 5.1 times more likely to report adherence ( $p=.000$ ). These results remained after adjustment for demographics. Nuno and Borrayo (2011) found that women who visited a healthcare provider in the past year for any reason were more likely to report being screened in that year (AOR 3.8) and those who received a provider recommendation were more likely to have a mammogram (AOR 1.7).

Sheppard et al. (2008) looked at a woman's perception of satisfaction with her provider as a determinant of screening. Women who trusted their providers and who were less likely to report perceptions of racism and discrimination were more satisfied with their provider. Women with high satisfaction levels were 3.34 times more likely to have had a recent mammogram ( $p<.05$ ).

#### Health literacy

Functional health literacy encompasses health literacy (the ability to read, understand and take action based on health information), but also includes the skills needed to understand and

access services in a complex health system (Sørensen, Van den Broucke, Fullam, Doyle, & Pelikan, 2012). Two studies measured functional health literacy using the Short Test of Functional Health Literacy (STOFHLA). Guerra et al. (2005) found this construct was low overall in their sample and associated with being less acculturated ( $p=.02$ ). Health literacy was significantly associated with ever having had a mammogram (OR 1.14) only after adjusting for age, education, and acculturation. Pagan (2012) found that half of all respondents had inadequate or marginal health literacy; greater functional health literacy was strongly associated with ever having a mammogram (OR 2.31) and adherence (2.14). Clearly these two studies reflect the language barrier that is unique to immigrants and non-native English speakers.

### Knowledge

Knowledge is frequently addressed in mammography studies, with the assumption that women who are not being screened must lack the requisite knowledge of its importance or of how to access services. Mixed results were found in the four studies that examined the association between breast cancer knowledge and screening. Bird et al. (2010) evaluated breast cancer knowledge in Hispanic women with and without a family history of breast cancer and found no significant difference in knowledge or screening behavior. Banegas et al. (2012) measured knowledge in a sample of Mexican women and Latinas living in the U.S., and found that while the Mexican women had greater breast cancer knowledge, the U.S. Latinas had higher screening rates. Therefore knowledge was not associated with screening behavior. Lawsin and colleagues (2011) found that adherent women had more correct answers on a test of breast cancer knowledge, and Martinez-Donate et al., (2013) found that knowledge of mammogram recommendations encouraged screening (OR 2.46).

### Medical History

Awareness of a family history of breast cancer did not appear to encourage screening in the studies that considered this factor. Bird and colleagues (2010) measured the effect of family history on mammogram use, and found no effect on women's behavior. Graves et al. (2008) used a women's medical history to determine objective risk using the Gail Risk Model (Gail, et al., 1999). Women with a higher objective level of risk were no more likely to be adherent to mammography than women with lower objective risk scores, yet 81% of the sample overestimated their breast cancer risk as compared to objective risk measures. Three studies measured a woman's perceived sense of susceptibility, using different measures. Palmer et al. (2005) measured perceived susceptibility with a four item scale previously used for colorectal cancer and found no association with screening. Medina-Shepherd and Kleier (2010) measured susceptibility with Champion's Health Belief Model Scales and also found no association. Cronan et al. (2008) used a three item scale, with no association found for Hispanic women.

### Discussion

This study examined the facilitators and barriers to Latinas' use of mammogram screening by reviewing the last eight years of original research. The results suggest that socioeconomic barriers to screening are consistently found in this population and that findings of cultural and social barriers vary by study. Acculturation when measured as years in the U.S. or primary language spoken was found to be associated with mammogram use. When more sophisticated measures of acculturation were used, such as a previously validated acculturation scale, acculturation was either not associated with screening (Coronado, Thompson, & Chen, 2009; Martinez-Donate, et al., 2013, Nuno et al., 2011) or only showed an association when adjusted for demographic and socioeconomic variables including health literacy (Pagan, et al.,

2011). These proxy measures of acculturation (years in the U.S. and language fluency) are most likely not accurate measures of the complex process of acculturation.

In this review women are more likely to have been screened on the basis of length of time in the U.S. (Lawsin, Erwin, Bursac, & Jandorf, 2011), their ability to speak English (Borrayo et al., 2009; Graves, et al., 2008; Martinez-Donate, 2013) or level of health literacy (Guerra, et al., 2005; Pagan et al., 2011). More sophisticated measures of acculturation should be used in future studies to tease out the “[acculturation] process by which immigrants understand and adopt the customs, values and traditions of the new country influenced by societal and cultural norms” (Lawsin, Erwin, Bursac, & Jandorf, 2011, p. 835) from the effects of length of time in the U.S. or English fluency.

Fatalism was found to have a negative association with screening in the studies that measured it. Yet, fatalism as a construct has weaknesses that must be considered. It is not clear that the construct validity of fatalism has been clarified to the extent that it is separated from the concept of “destino” (destiny), a world view also commonly held by Latinas. Florez and others (2009) propose that Latinas hold both an optimistic and a pessimistic view of cancer screening at the same time, a view that is not consistent with the construct of fatalism. These authors also suggest that studies that rely only on a Mexican sample cannot generalize findings about fatalism to other populations of Latinas.

Cues to action, in the form of a physician’s recommendation, were significantly associated with mammogram adherence, as was satisfaction with the physician relationship. Indeed a physician’s recommendation has been found to be the strongest predictor of mammogram use across all ages and populations of women (Bibliography: Prevention, 2000; Peek & Han, 2004). Having health insurance and a regular source of care were significantly

related to screening. The importance of these findings is that they are not specific for Hispanic women; rather they are commonly noted in samples of low income women (De Alba, Hubbell, McMullin, Sweningson, & Saitz, 2005). Indeed having insurance, a regular source of care, and a physician's recommendation are routinely cited as predictors of screening for all populations of women (ACS, 2011; Dominick, et al., 2003; O'Malley, Earp, Hawley, Schell, & Mathews, 2001; Tanner-Smith & Brown, 2010).

These studies all focused on low income populations of Hispanic women. Lower rates of mammography screening have been found to be related to low income level across racial and ethnic groups (Cui et al., 2007; Gerend & Pai, 2008), and it is possible that the lower screening rates found in these studies are a function of low socioeconomic status alone rather than ethnicity. No studies were found that looked at middle or upper income educated Latinas, who may behave in very similar ways to other populations of relatively wealthy, educated women in the U.S. Indeed there is a dearth of research on middle or upper income Latinas residing in the U.S. Therefore at this time and based on the literature on Latinas' health behavior in regards to mammogram utilization, the generalizability of these findings are limited to low income Hispanic women only and cannot be considered meaningful for middle or upper income Hispanic women in the U.S.

Finally many of these studies included heterogeneous samples of Hispanic women. The Hispanic population in the U.S. is large, growing quickly and extremely heterogeneous, including immigrants from 25 different countries. Differences may exist among these subcultures that make generalizations problematic. Yet if we find that the main barriers and facilitators to preventive health seeking are structural and financial, the importance of these differences tends to dissipate.



### Limitations

As with all research there are limitations to the results reported in this review. Each of these studies was based on a cross sectional design. As such, causality cannot be determined nor can opposing hypotheses be disconfirmed. Many of the studies relied on convenience sampling which impedes the study's generalizability. Even in cases of random sampling, sample sizes were small. Only one of the eighteen studies included a discussion of sample size and an a priori power analysis although the final sample did fall short of that specified (Medina-Shepherd & Kleier, 2010). Seven of the studies were related to larger interventional studies, but the data reported here were collected prior to the start of the intervention. For these studies, details relating to sampling and research design were not included.

Each of these studies relied on a woman's self-report of mammogram use. Although there has been only one study that addressed the validity of self-reported mammograms in Latinas, this study found that Latinas have a lower rate of agreement between self-report and medical record as compared to African American and non-Hispanic White women (Tumiel-Berhalter, Finney, & Jaén, 2004).

### Conclusion

Much of the cancer prevention and treatment research in the past decade has focused on narrowly delineated populations in specific settings. This has resulted in a patchwork of duplicative programs and a competition between specific racial or ethnically focused programs for limited funding. What is clear is that poor and uninsured women have lower survival rates at every stage of disease (ACS, 2014). Yet even this statistic is likely to change with full implementation of the Affordable Care Act (ACA) in 2014. What is less clear is whether this focus on specific subsets of women is the best use of limited research funding.

Based on this review, and the (primarily socioeconomic) variables most commonly identified as significant barriers and facilitators, it can be assumed that there are less differences than previously expected between poor Hispanic women and other populations of low income women. An additional important barrier is that of language dissonance, but even with that barrier newly immigrated Hispanics are similar in health seeking behavior to other groups of poor, non-native English speaking immigrants.

#### Implications for Nursing Practice

In 2014 most of the major ACA provisions will be implemented. While the newly insured will no longer face financial barriers to screening, factors such as limited education, poor breast cancer knowledge, and the lack of a physician's recommendation will likely still deter low income women from being screened. In order to encourage and support women in their health seeking efforts, nurses must be cognizant of the factors that enable women to seek preventive care.

In addition, insurance coverage and cost will likely continue to be barriers for undocumented Hispanic women or those who have been in the U.S. less than five years because these women are not covered by the ACA. Nurses should be aware of these issues and advocate for women who are trying to be proactive in their own healthcare.

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Figure 1. *Flow diagram of article selection process*

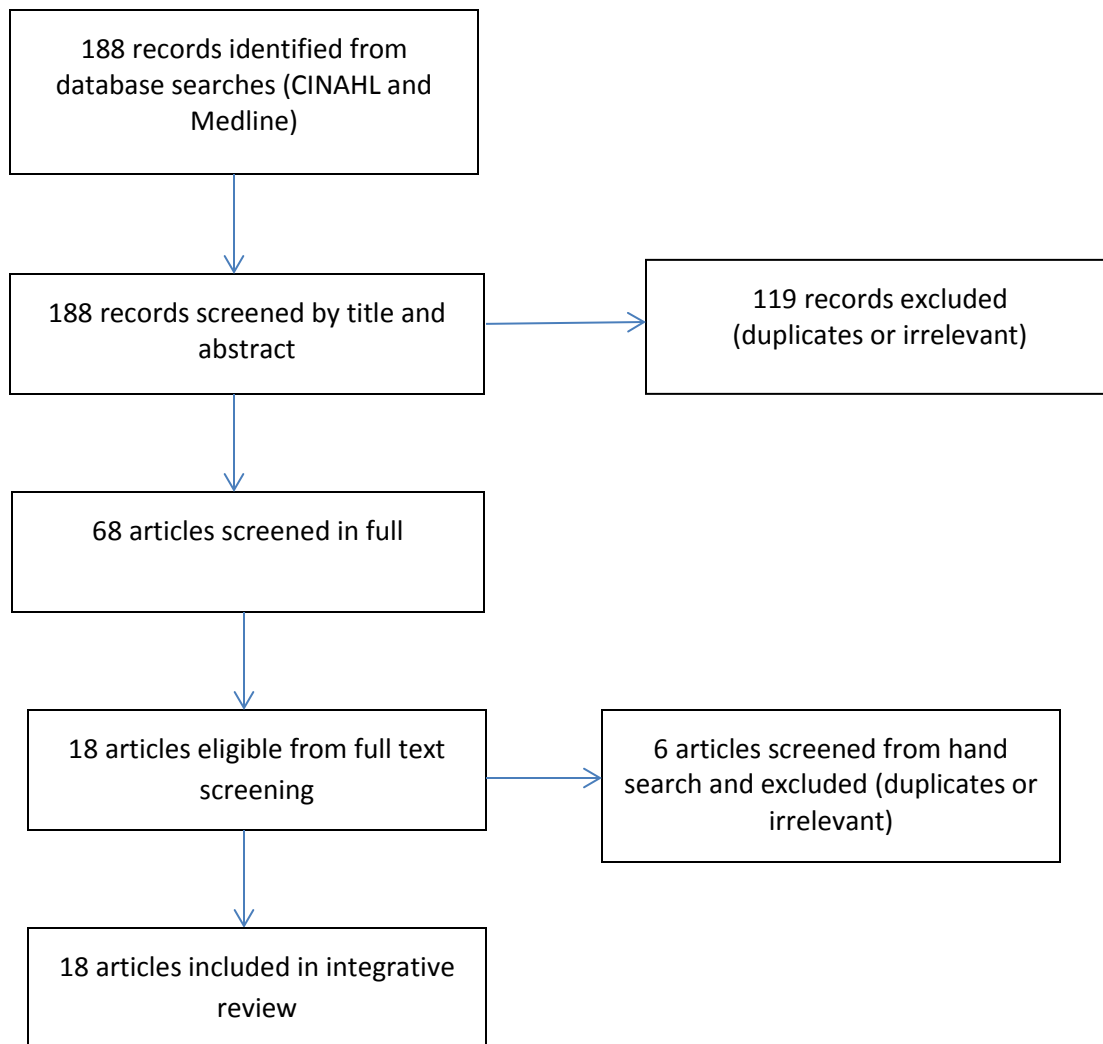


Table 1: Findings Related to Facilitators and Barriers in Mammography Studies

Study	Sample	Design	Mammography Indicators	Facilitators / Barrier Findings
Banegas, et al., 2012	Random (N= 265) Mean age: Mexican: 48.2 years U.S. Latina: 52.0 years	Cross-sectional Interviewer survey	Self-report ever had a mammogram	U.S. participants had significantly greater odds of ever obtaining a mammogram.  Older age more likely to be screened ( $p<0.05$ ), mammography more likely with insurance ( $p<0.01$ ) and more education ( $p<0.05$ ).  Mexican participants had higher level of knowledge about breast cancer ( $p=0.01$ ), although U.S. Latinas believed they were more likely to get breast cancer ( $p=0.013$ ).  U.S. Latinas were more likely to have ever had a mammogram than Mexican women ( $p<0.001$ ).  67% of Mexican women had never had a mammogram.
Bird, et al., 2010	Random (N =143) Mean age: - Family history: 52.6 years - No family history: 51.6 years	Cross-sectional Interviewer survey	Self-report: 1. ever had a mammogram 2. mammogram last 2 years	Women with a family history of breast cancer (32.2%) had similar levels of knowledge about breast cancer and preventive screening procedures compared as women without a family history.  No difference in mammogram use or breast cancer knowledge or attitudes based on family history
Borrayo, et al., 2009	Random (N= 2,231) Age range: 40 to 79 years	Population-based, Case-control Interviewer survey	Self-report ever have a mammogram  Adherence defined as first mammogram at <51 years of age and one mammogram every 2 years.	Hispanic women over 60 years-old were less adherent (AOR 0.51) with mammogram screening  Women with a family history of breast cancer (AOR 1.92); with no children (AOR 1.85); taking hormone replacement therapy (AOR 2.15), taking aspirin prophylactically (1.35) and those who did self-breast exams (1.63) were more likely to be adherent with mammogram screening.  Acculturation and ethnicity were not significant predictors of adherence.
Buki, et al., 2007	Purposive (N=467)	Cross-sectional	Self-report:	71.4% of women ever had a mammogram and

	Mean age: 53 years	Interviewer survey Spanish only	1. ever had mammogram 2. mammogram up-to-date (within 1 year)	25.2% of women were up to date (mammogram within one year)  Significant association between cancer education and ever having a mammogram for women with less than 6th grade education (OR 6.07)  More education (OR 1.51) and cancer education (OR 1.56) were positively associated with ever having had a mammogram
Coronado, et al., 2009	Random (N=420) Age range: 18 to 65 years	Cross-sectional Interviewer survey	Self-report: 1. ever had a mammogram 2. mammogram last 2 years	86.4% of women over 40 years-old had a mammogram in the past 2 years.  Women with private insurance were 2 times as likely as women with Medicare to have had a mammogram in the past 2 years.
Cronan, et al., 2008	Random (N=146; Latina n= 46) Latina mean age: 52 years	Cross-sectional Self-survey	Self-report: 1. ever had mammogram 2. mammogram last 2 years	Latinas had both the highest mean barriers score (2.35) and the lowest percent screened (59.6%) Latinas had highest fear of cancer ( $p=0.02$ ) and more education = more likely to be screened ( $p=0.05$ )  In Latinas the benefits of screening scale was significantly associated with mammography ( $p=0.04$ )
Gonzalez & Borrayo, 2011	Convenience (N=344) Mean age: 51.7 years	Cross-sectional Interviewer survey	Self-report: 1. ever had a mammogram 2. most recent mammogram 3. plan to get mammogram	52% of women ever had a mammogram.  Physician recommendation was significantly related to mammography adherence (exams every 2 years) (OR 5.1), as was age (OR 1.04), and having had a Pap test with 3 years (OR 6.6)  Physician instruction on breast self-exam was also positively associated with mammogram adherence (OR 3.4).
Graves, et al., 2008	Convenience (N=328) Mean age: unknown	Cross-sectional Interviewer survey Primarily Spanish	Self-report: 1. ever had a mammogram 2. mammogram last 2 years 3. timing of most recent mammogram	29% of women 43years-old and older were not adherent (more than 2 years since mammogram) 81% overestimated their breast cancer risk; risk perceptions and cancer worry were not associated with mammography adherence  Age over 50 years-old (OR 2.99), having insurance (OR 1.81) greater acculturation

				(OR1.18), and higher breast cancer knowledge (OR 2.03) positively associated with adherence
Guerra, et al., 2005	Convenience (N=97) Mean age: 58 years	Cross-sectional Interviewer survey	Self-report: 1. ever had a mammogram 2. mammogram last year 3. mammogram last 2 years	88% ever had a mammogram 52% had inadequate functional health literacy Significant association between functional health literacy and ever had a mammogram (OR 1.14) Uninsured less likely to be screened (OR.17).
Lawsin, et al., 2011	Convenience (N=247) Mean age: 38.7 years Women over 40 years: (n=107)	Cross-sectional Self-survey	Self-report ever had a mammogram  Adherence defined as having a mammogram annually after 40 years of age.	86% of women 40 years-old and older had had a mammogram  More time in the U.S. ( $p<.01$ ) and higher breast cancer knowledge ( $p<.01$ ) scores were significantly associated with mammogram adherence.
Lopez-McKee, et al., 2008	Purposive (N=68) Mean age: 57.6 years	Cross-sectional Telephone survey	Self-report of the number mammograms in the last 5 years  Infrequent screeners defined as having one mammogram in last 5 years.	Significant differences between the mean total fatalism score in the infrequent screener group (8.03) compared to the regular screener group (5.85) ( $p = 0.02$ ).  Significant differences in the opinion of infrequent screeners compared to regular screeners with respect to control beliefs  Infrequent screeners felt less control over their health, little difference between regular and infrequent screeners in perceived behavioral beliefs.
Martinez-Donate, 2012	Snowball (N=278) Mean age: 34.5 years Women over 40 years: (n = 66)	Cross-sectional Self-survey	Self-report: 1. ever had a mammogram 2. mammogram last year 3. mammogram last 3 years	39% of women over 40 had a mammogram within the past year.  Education (OR3.73), knowledge of mammogram guidelines (OR 2.46), having a regular source of care (OR 4.94) were associated with mammogram screening.  Concern with cost (OR 0.25), lack of English fluency (OR 0.2), being monolingual Spanish (OR 0.32), and fear of result (OR 0.17) were negatively associated with screening.
Medina-Shepherd &	Convenience (N=195)	Cross-sectional	Self-report:	89.7% reported having had a mammogram



Kleier, 2012	Mean age: 56.2 years	Self-survey	1. ever had a mammogram 2. plan to get mammogram in next 2 years	Perception of barriers had a significant negative association with ever having had a mammogram (OR 0.49) ( $p<.05$ ).  Of the single barrier items, only one “I don’t know how to go about getting a mammogram” was significantly associated with never having had a mammogram ( $p=.01$ )
Nuno, et al., 2011	Random (N =504) Mean age: unknown	Cross-sectional Interviewer survey	Self-report of mammogram in last year.	Self-reported screening did not differ between Mexican born and U.S. born women.  Enabling factors were strongest predictors for mammography: visit to a provider within 1 year (OR 4.7); doctor recommendation were associated with mammography (OR 4.9).  Having medical insurance statistically significant predictor of mammography (AOR 1.6).  Acculturation not associated with mammogram use.
Pagan, et al., 2012	Random (N=722) Age range: 40 to 70 years	Cross-sectional Interviewer survey	Self-report: 1. ever had a mammogram 2. most recent mammogram  Adherence defined as: a) mammogram in last year b) mammogram in last 2 years	86% reported having had a mammogram  79% had low level of U.S. acculturation.  Women 50-69 years-old were more likely to have ever had a mammogram (OR 2.23).  Insurance was significantly associated with ever having a mammogram (OR 0.56), having a mammogram in the last year (OR 0.62) and having a mammogram in the last 2 years (OR 0.65)  Low acculturation significant only in unadjusted regression.  Adequate functional health literacy was significantly associated with ever being screened (OR 2.92) and mammogram adherence in the last year (OR 2.3) and in the last 2 years (OR 1.7)
Palmer, et al., 2005	Convenience (N=200) Mean age: 60 years	Cross-sectional Interviewer survey Spanish only	Self-report specific month and year of last mammogram.  Adherence defined as having a mammogram in last 2 years.	38% reported mammogram screening adherence  Significant association between self-efficacy (OR 2.1), decisional balance (OR 2.51), and mammogram adherence

				Having insurance associated with mammogram adherence (OR 3.58) and regular source of care (OR 1.98)
Sheppard, et al., 2008	Consecutive (N=99) and Convenience (N=67) Mean age: 51.2 years	Cross-sectional Computer-assisted survey	Self-report mammogram in last 2 years. Non-adherent defined as no mammogram or most recent mammogram longer than 2 years.	89% of women had at least one mammogram and 73% had a recent mammogram Trust and communication associated with satisfaction ( $p<.001$ ). Perceived racism and discrimination negatively associated with satisfaction ( $p<.001$ ). High satisfaction in a health-care relationship was a significant predictor of recent mammogram ( $p<.001$ ). Age ( $p<.05$ ), education ( $p<.05$ ), and insurance ( $p<.001$ ) associated with adherence to recent mammogram.
Teran, et al., 2007	Random (N=112; Latina women n= 72) Latina age range: 41 to > 70 years	Cross-sectional Telephone survey	Self-report timing of most recent mammogram	68.1% of Latinas had a mammogram in the past year Latinas had significantly higher fatalism and religious influence on medical decisions, more embarrassed to have breast exams and worried about breast cancer Major barrier for Latinas "distorted familism" No significant association with Theory of Planned Behavior constructs In Latinas: high familism (AOR 2.39), low fatalism (AOR 0.51), and clinical breast exam (AOR 4.46) were significantly associated with having a recent mammogram