Family/friend recommendations and mammography intentions: the roles of perceived mammography norms and support

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Abstract

Identifying factors that increase mammography use among Latinas is an important public health priority. Latinas are more likely to report mammography intentions and use, if a family member or friend recommends that they get a mammogram. Little is known about the mechanisms underlying the relationship between social interactions and mammography intentions. Theory suggests that family/friend recommendations increase perceived mammography norms (others believe a woman should obtain a mammogram) and support (others will help her obtain a mammogram), which in turn increase mammography intentions and use. We tested these hypotheses with data from the ¡Fortaleza Latina! study, a randomized controlled trial including 539 Latinas in Washington State. Women whose family/friend recommended they get a mammogram within the last year were more likely to report mammography intentions, norms and support. Perceived mammography norms mediated the relationship between family/friend recommendations and intentions, Mediated Effect = 0.38, 95% CI [0.20, 0.61], but not support, Mediated Effect = 0.002, 95% CI [−0.07, 0.07]. Our findings suggest perceived mammography norms are a potential mechanism underlying the effect of family/friend recommendations on mammography use among Latinas. Our findings make an important contribution to theory about the associations of social interactions, perceptions and health behaviors.

Introduction

Improving early detection of breast cancer among Latinas is a major public health priority in the United States (US). Breast cancer is the most common cancer type and the leading cause of cancer death among US-based Latinas [1]. Despite lower incidence of breast cancer relative to non-Latina Whites, Latinas are more likely to be diagnosed at later stages and to die within 5 years of diagnosis [2–6]. One major contributing factor to late stage breast cancer diagnosis among Latinas is low mammography use [7, 8]. Both researchers and public health practitioners have developed numerous interventions to promote intentions to obtain a mammogram (mammography intentions) and use among Latinas [9, 10]. Given the cultural emphases placed on strong and warm interpersonal relationships [11, 12], many interventions have targeted interpersonal processes and specifically communication of breast health information through local social contexts and in culturally relevant formats.
A recent review of different types of interventions to promote positive breast cancer-related outcomes among Latinas indicated 50% of interventions that have used communication with promotoras and 25% of interventions that have used communitywide communication and events to have increased screening behavior among Latinas [9]. Nonetheless, little is known about how these interpersonal processes and communication about mammography influences intention and use. Such work has direct implications for interventions as well as the state of the science, in that understanding which characteristics underlie the beneficial effects of communication, and social interactions specifically, may result in more refined, targeted interventions that focus on these types of psychological processes, including social perceptions. Mammography intentions and use among Latinas represent an ideal opportunity to develop and test frameworks concerning mechanisms underlying the influence of social interactions on health-related intentions and behaviors.

This study thus draws from multiple theoretical frameworks (Theory of Reasoned Action/Planned Behavior, Socio-Cognitive Theory, Stress and Coping, PRECEDE-PROCEED, Added Value Hypothesis [14–19]) to develop a testable model for examining pathways by which social interactions about health behaviors influence subsequent health-related agency and behaviors through social perceptions (Fig. 1). Our model posits that social interactions about health behaviors influence health behaviors and outcomes through influencing individuals’ social perceptions about health behaviors. To test this framework, this study uses recommendations from family members and friends to obtain a mammogram (family/friend recommendations) as a type of social interaction; perceiving that others expect one to obtain mammograms regularly (perceived mammography norms) and others will support one’s efforts to obtain a mammogram (perceived mammography support) as types of social perceptions about health behaviors; and mammography intentions as a proxy for a health behavior. Such work may facilitate the development and refinement of health behavior interventions and programs.

The majority of literature concerning recommendations and mammography intentions and use has focused on recommendations made by healthcare providers [20–22]. Nonetheless, qualitative and quantitative analyses have found family/friend recommendations to be associated with mammography intentions and use among US-based and international populations [23–28], with odds ratios ranging between 1.2 and 4.6. Among Latinas specifically, qualitative studies have highlighted family/friend recommendations as enabling factors for breast cancer screening practices, including mammography use [29–32]. Some quantitative research has found social network size or traditional attitudes about the importance of family to be generally positively associated with breast cancer screening practices among Latinas [33–36]. Garbers and Chiasson [37] further reported US-based Mexican and Dominican women who discussed breast cancer screening with family members and friends were more likely to report breast self-examinations (85 vs. 58%). Molina et al. [26] found women in Chile who received a family recommendation were more than four times as likely to report mammography intentions relative to women who had not. Notably, studies have not focused on potential mechanisms underlying these associations and specifically which, if any, social perceptions may be influenced by these social interactions.

One potential consequence of family/friend recommendations and mechanisms underlying family/friend recommendations to mammography intentions and use is perceived mammography norms. The Theory of Reasoned Action/Planned Behavior and Socio-Cognitive Theory propose that expectations of important social network members directly influence individuals’ intentions and behaviors, which in the case of Latinas may be the expectation to obtain mammograms regularly [14, 15]. Specifically, Latinas who receive family/friend recommendations may be more likely to perceive that family and friends expect them to obtain mammograms regularly, which may in turn influence their mammography intentions and use. Perceived mammography norms may be particularly relevant for mammography intentions and use among Latinas,
given the cultural emphasis placed on strong interpersonal relationships and maintaining harmony within one’s social network (e.g. simpatía, personalismo, familismo) [11, 38, 39]. Specifically, Latinas may be more likely to act in a socially desirable manner to maintain harmony and positive interactions within their social network. Qualitative studies have identified Latinas’ perceptions about their family members and friends’ expectations about mammography as important for mammography intentions and use [29, 40–42]. Quantitative studies including Latinas have further found perceived mammography norms to be positively associated with mammography use, with odds ratios ranging from 1.4 to 3.7 [43, 44]. Notably, this research has often assessed perceived mammography norms, but not simultaneously quantified the frequency of social interactions, such as family/friend recommendations, that may have influenced these perceptions. Such work may be helpful to understand if and which interactions lead to perceived mammography norms about mammography.

Another potential consequence of family/friend recommendations and mechanism underlying family/friend recommendations to mammography intentions and use is perceived mammography support [16–19]. The PRECEDE-PROCEED model has been used to conceptualize social support as an enabling factor or environmental characteristic that serves to facilitate individual actions toward a behavior [19]. Women who perceive that their family and friends will support them in their efforts to obtain mammograms may have greater self-efficacy and mammography intentions. The Stress and Coping approach contextualizes this effect of support as a buffer or coping resource in the face of a stressor. Perceived mammography support may be particularly helpful if women simultaneously perceive a number of barriers to mammography use [45]. Family and friends may thus be able to provide emotional support with regard to cancer worry and fatalism; informational support concerning breast cancer and available resources for mammography use; and instrumental support with regard to access issues (e.g. child support, transportation) [46, 47]. Relatedly, the Added Value Hypothesis indicates that social support may further be particularly helpful for disadvantaged groups [17]. Given this, increased perceived and experienced mammography support may be particularly necessary for Latinas, given they experience a disproportionate number of psychosocial, informational and logistic barriers related to mammography use [27,
Perceived general and mammography support has been tied to mammography intentions and use, but studies have largely had low representation of Latina participants [23, 28, 51–53]. Little research has directly quantified the effects of perceived support to mammography intentions and use among Latinas, although some work has used perceptions about family, social interactions (e.g. family/friend recommendations) and network size as proxies [33–35, 37]. The extant study that quantified experienced mammography support across different ethnic groups found that Latinas exhibited low levels of experienced mammography support relative to other women [54]. Notably, this study further found experienced mammography support to be tied to breast self-examinations, but not mammography use [54].

In conclusion, theory and empirical evidence provide support our conceptual model concerning the potential for social perceptions (perceived mammography norms, perceived mammography support) to mediate relationships between social interactions (family/friend recommendations) and health-related intentions and behaviors (mammography intentions). Yet, many quantitative studies have focused on either family/friend recommendations [26], perceived mammography norms [43, 44] or mammography support [54] in relation to Latinas’ mammography intentions and use and not the relationships between these constructs. Therefore, little is known about their relationships to one another and specifically if and which perceptions family/friend recommendations influence that subsequently affect mammography intentions. This study adds to existing literature by testing if: (i) family/friend recommendations influence social perceptions (perceived mammography norms and support) and mammography intention; and (ii) perceived mammography norms and support mediate the relationship between family/friend recommendation and mammography intentions. We test these hypotheses with baseline questionnaire data collected from a randomized controlled trial to increase mammography use among non-adherent Latinas residing in Washington State, ¡Fortaleza Latina! [13].

### Methods

#### Procedures

**Recruitment**

This study was a part of a larger multisite randomized controlled trial, ¡Fortaleza Latina!, to increase mammography use among a clinic-based sample of Latina residents in Western Washington State through the use of community health workers/promotoras (N = 539). The study involved partnerships among the Fred Hutchinson Cancer Research Center, University of Washington, Seattle Cancer Care Alliance and Sea Mar Community Health Centers. All procedures were approved by institutional review boards of the participating organizations. Recruitment and interview procedures have been reported elsewhere [13]. In brief, electronic medical records from four community health clinics were used to identify potential participations, using the following eligibility criteria: (i) self-identification as Hispanic or Latino; (ii) age 42–74 years; (iii) lack of mammogram within the past 2 years; and (iv) having received services from one of the four clinic sites within the past 5 years. The age eligibility criteria are discordant with current USPSTF guidelines, but are in accordance with guidelines by the American Cancer Society and the National Comprehensive Cancer Network [51, 52] and follow the Preventive Health Mandate of the Patient Protection and Affordable Care Act [53]. Further, the majority of women receiving mammography through community health clinics are clients of Washington State’s National Breast and Cervical Cancer Early Detection Program, which reimburses screening for women aged 40 years and older [54]. Community health clinic staff invited, screened and consented eligible patients to participate in the study through in-person visits. The period of data collection for baseline was 2011–2014. The participation rate from eligible women was 39%.

**Interviews**

After consent, ¡Fortaleza Latina! staff contacted participants through telephone or home visits to schedule/conduct in-person interviews. Participants
completed 30–45-min baseline questionnaires in their preferred language (English, Spanish). Subsequently, women were randomized to receive either the intervention or usual care. A follow-up questionnaire was then administered. Data were entered and housed at the Fred Hutchinson Cancer Research Center. This study only uses baseline survey data.

**Measures.** The main study relied on a socioecological framework for health disparities developed by Warnecke et al. [45]. This framework emphasizes the multiple levels of influences on health behaviors and outcomes. Survey items were selected from previous instruments addressing cancer screening in Latinas [26, 55–57]. Nonetheless, previous studies have not evaluated the psychometric properties of these items.

**Mammography intentions.** Participants indicated if they had thought or were thinking about getting a/another mammogram in the future (0 = No, 1 = Yes).

**Family/friend recommendations.** Women were asked if they had received recommendations to obtain or not obtain a mammogram within the past year by a family member/friend (0 = No/Did not receive family/friend recommendation, 1 = Yes/Received family/friend recommendation).

**Perceived mammography norms.** Participants were asked to respond to ‘My family thinks I should have regular mammograms’ and ‘Closest friends think I should have regular mammograms.’ Response categories for these statements were: 1 = Disagree, 2 = Neutral, and 3 = Agree. Variables were summed in order to indicate the overall amount of perceived mammography norms from women’s family and friends (range = 2–6). This variable was also recoded to 0 = Disagree/Neutral on either or both statements about family and friends or 1 = Agree to both statements about family and friends. Given the similarity in findings across these types of classifications, we report findings based on the dichotomous variable, which is easier for interpretability.

**Perceived mammography support.** We asked women to respond to the following statement: ‘I have friends and family that would support me in getting a mammogram.’ Women could respond 1 = Disagree, 2 = Neutral, or 3 = Agree. After initial examination of the frequency distribution, this variable was recoded to 0 = Disagree/Neutral and 1 = Agree.

**Sociodemographic and healthcare information.** Women were asked about their sociodemographic information, including age (‘What is your age?’; response categories: open ended), education (‘How many years of school have you completed?’; response categories: 4th grade or less, 5th–8th grade, 9th–12th grade, High School graduate/GED, Some college through associate degree, Bachelor’s degree), household income (‘What was the total combined income of your household in the past year, including income from all sources such as wages, salaries, social security or retirement benefits, help from relatives, and so forth?’; response categories: <$5K, $5K–9999K, $10K–14999, $15K–19999, $20K–29999, $30K–39999, $40–49999, $50K or above), country of origin (‘Where were you born?’; response categories: Mexico, United States, Guatemala, Puerto Rico, Other (Specify)) and most spoken language (‘What language would you say you speak most of the time?’; response categories: Spanish, English, Other (Specify)). Based on preliminary review of frequency distributions, country of origin and most spoken language were reclassified, respectively, as US-born and foreign-born as well as Spanish and English/other. Women were additionally asked about their healthcare information, including insurance status (‘Do you currently have health insurance coverage?’; response categories: No, Yes) and lifetime mammography history (‘Have you ever had a mammogram?’; response categories: No, Yes).

**Analysis**

For all analyses, a significance level of $P < 0.05$ was used to determine inclusion of variables in models. We provided descriptive statistics concerning sociodemographic characteristics as well as study variables. Simple bivariate analyses (Chi-square for nominal variables, analyses of variance for ordinal and continuous variables) were conducted to
identify potential covariates that differed among women who did and did not receive a family/friend recommendation to obtain a mammogram. We used multivariable models to test our hypotheses. We first performed a multivariable logistic regression to assess whether receiving a family/friend recommendation was associated with mammography intentions, after adjusting for covariates. Multivariable linear and logistic regressions were used to test if women who did and did not receive family/friend recommendations differed in perceived mammography norms and support. We used a SPSS macro which engages the Preacher & Hayes method to test whether present perceived mammography norms and support mediated the relationship between family/friend recommendations in the past and future mammography intentions [58, 59]. This bootstrap non-parametric method involves resampling from the dataset multiple times to generate a sampling distribution (5000 for this study) and is considered superior method relative to traditional mediation techniques for small to moderate sample sizes [58, 60]. We exponentiated unstandardized coefficients into adjusted odds ratios to facilitate interpretability of relationships between family/friend recommendation, mediators and mammography intentions. We determined the percentage mediated as a function of the indirect effect divided by the sum of the direct effect and the indirect effect ($\frac{ab}{ab+bc}$). For comparison, we also employed Sobel’s test to examine perceived mammography norms and support as mediators separately [61]. We used pairwise case deletions for respondents with missing data, as only a small proportion were missing for study variables of interest (<10%). This is considered a simple and adequate method for datasets with a limited amount of missing data [62].

## Results

Table I presents sociodemographic factors and study variables for women who did and did not receive a family/friend recommendation as well as significance values from bivariate analyses (Chi-square for nominal variables, analyses of variance for ordinal and continuous variables). Relative to women who received a family/friend recommendation, women who received no family/friend recommendation were more likely to have been born in the US (although few women in general were US-born [$n = 15$ total]), to be insured, and to have a lifetime history of mammogram use. Women who received no family/friend recommendation had completed fewer years of school than women who received a family/friend recommendation. Therefore, country of birth (US-born vs. foreign-born), insurance status (insured vs. not), lifetime history of mammogram use (yes vs. no) and education (years of school) were included as covariates in all subsequent analyses.

After adjusting for country of birth, insurance status, lifetime mammogram use and education, women who received a family/friend recommendation had greater odds of reporting intentions to obtain a mammogram in the future compared with women who did not receive a family/friend recommendation, $aOR = 2.6$ (95%CI [1.3, 5.2]), $P = 0.005$ (Table II). After adjusting for country of birth, insurance status, lifetime history of mammogram use and education, women who received a family/friend recommendation had greater odds of endorsing perceived norms from both family and friends than women who did not receive a family/friend recommendation, $aOR = 3.8$, 95%CI [2.4, 5.9], $P < 0.0001$ (Table II). That is, they were more likely to endorse the belief that both their family members and friends thought they should receive regular mammograms. After adjusting for country of birth, insurance status, lifetime history of mammogram use and education, women who received a family/friend recommendation had greater odds of reporting perceived mammography support than women who did not receive a family/friend recommendation, $aOR = 2.2$, 95%CI [1.1, 4.5], $P = 0.03$ (Table III). That is, they were more likely to agree to the statement that they had family members and friends who would support them in getting a mammogram.

We tested whether perceived mammography norms and support mediated the relationship of family/friend recommendations and mammography
intentions, after adjusting for country of birth, insurance status, lifetime history of mammogram use and education. When using the Preacher & Hayes method, there was evidence of full mediation (Fig. 2). Nonetheless, there were differences among the mediators. Specifically, perceived mammography norms, but not support, drove the model as the only significant mediator and accounted for 34% of the difference in mammography intentions by receipt of family/friend recommendation. Women who received a family/friend recommendation were more likely to report mammography intentions, because they had greater perceived mammography norms than women who did not receive a family/friend recommendation (Table II, Fig. 2). Similar patterns were found when employing the Sobel’s test, which also included country of birth, insurance status, lifetime history of mammogram use and education as covariates. When using this method, perceived mammography norms emerged as a significant mediator, \( Z = 2.94, P = 0.002 \), but not perceived mammography support, \( Z = 0.07, P = 0.47 \).

### Discussion

This study makes an important contribution to the literature. First, we tested the associations of multiple social interactions and perceptions that have been previously tied to mammography screening, including family/friend recommendations [26, 29, 30, 37], perceived mammography norms [40–44, 63] and mammography support [31, 54, 64]. We developed and tested a conceptual model that posits perceived mammography norms and support mediate the relationship between family/friend recommendations and mammography intentions, based in the principles of Theory of Planned Behavior/Reasoned Action [14], social support theories [46, 47] and extant supporting evidence [43, 44, 54]. Our study adds to a growing body of work demonstrating that family/friend recommendations can have beneficial effects on mammography intentions [26, 29, 30, 37]. Specifically, this study suggests family/friend recommendations are associated with increased perceived mammography norms and support. Further, our preliminary findings suggest that perceived mammography norms fully mediate the relationship between family/friend recommendations and mammography intentions.

Previous qualitative and quantitative efforts have examined perceived mammography norms and support in relation to mammography intentions and use

### Table I. Sociodemographic, healthcare and other study variables of interest by receipt of family/friend recommendations to obtain a mammogram

<table>
<thead>
<tr>
<th>Did not receive family/friend recommendation (( n = 354 ))</th>
<th>Received family/friend recommendation (( n = 184 ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SE)</td>
<td>M (SE)</td>
</tr>
<tr>
<td>Age</td>
<td>51.17 (7.70)</td>
</tr>
<tr>
<td>Country of birth**</td>
<td></td>
</tr>
<tr>
<td>US-born</td>
<td>4 (14)</td>
</tr>
<tr>
<td>Foreign-born</td>
<td>96 (339)</td>
</tr>
<tr>
<td>Prefers Spanish</td>
<td>96 (339)</td>
</tr>
<tr>
<td>Educationb</td>
<td></td>
</tr>
<tr>
<td>≤ 8th grade</td>
<td>64 (217)</td>
</tr>
<tr>
<td>9-HS degree</td>
<td>22 (75)</td>
</tr>
<tr>
<td>≥ Some college</td>
<td>14 (48)</td>
</tr>
<tr>
<td>&lt; Median household income ($15,000)**</td>
<td>49 (139)</td>
</tr>
<tr>
<td>Insured**</td>
<td>31 (111)</td>
</tr>
<tr>
<td>Lifetime history of mammography***</td>
<td>79 (280)</td>
</tr>
<tr>
<td>Mammography intentions**</td>
<td>86 (301)</td>
</tr>
<tr>
<td>Perceived mammography norms***</td>
<td></td>
</tr>
<tr>
<td>Disagree/neutral for either or both family and friends</td>
<td>48 (162)</td>
</tr>
<tr>
<td>Agree for both family and friends</td>
<td>52 (177)</td>
</tr>
<tr>
<td>Perceived mammography support*</td>
<td></td>
</tr>
<tr>
<td>Disagree/neutral</td>
<td>88 (307)</td>
</tr>
<tr>
<td>Agree</td>
<td></td>
</tr>
</tbody>
</table>

Notes. *Country of birth was analyzed as a three-group (Mexico, US and Other) and two-group variable (US- and foreign-born); findings were similar across these different categorizations. *Income and education was analyzed as continuous variables, but are presented dichotomously to facilitate interpretability. \( P < 0.05, **P < 0.01, ***P < 0.001 \) for bivariate analyses (Chi-square tests for nominal variables, analyses of variance for continuous and ordinal variables).
[31, 38, 40–42, 44, 46, 47, 54, 64], but little research to date has quantified how recommendations relate to these social perceptions. This study provides preliminary evidence that women who receive recommendations about mammography from their family and friends are more likely to perceive that their family and friends believe they should have mammograms regularly and that their family and friends would support them if they wanted to have a mammogram. Such work thus complements existing qualitative literature regarding the influence of perceived mammography norms on mammography screening among Latinas [40, 42, 44] through providing an estimate of the magnitude of its association with mammography intention as well as offering an important comparison of its association with health behavior intentions relatives to other types of social perception (i.e. social support). The current quantitative study thus adds to our knowledge concerning which social perceptions may be particularly predictive of mammography intentions and use as well as the beneficial effects of social interactions concerning health behaviors. Our findings may inform the design of future interventions, by underscoring the importance of social norms in women’s decision-making.

Our findings do not support previous studies that have shown a relationship between experienced mammography support and breast cancer screening [23, 28, 51–53]. Our findings may not align for two reasons. First, our study may not align with these findings, given we measured other, albeit related constructs (perceived mammography support and mammography intention). Other work assessing mammography support across different ethnic groups found mammography support to be associated with self- and clinical breast exams, but not mammography use [54]. Such work potentially indicates differential influences of mammography support across breast-related health behavior intentions and behaviors. Second, these studies have had relatively low representation of Latinas.

**Limitations and future directions for research**

This study has several limitations. First, the cross-sectional nature of this study does not allow us to confirm causal relations proposed in our conceptual model. The way in which questions were formatted does permit for some temporal sequencing, in that women reported receipt of a family/friend recommendation within the past year, current perceptions

<table>
<thead>
<tr>
<th>Table II. Multivariable regression models concerning the relationship of family/friend recommendation on mammography intentions, perceived mammography norms and perceived mammography support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Mammography intentions</td>
</tr>
<tr>
<td>Perceived mammography norms</td>
</tr>
<tr>
<td>Perceived mammography support</td>
</tr>
</tbody>
</table>

Notes. "Receipt of a family/friend recommendation within the last year was measured with a single item: ‘During the past year, did a friend or family member tell you to get a mammogram?’ Response categories for this item were: 0 = No, 1 = Yes. Women who had not received a family/friend recommendation were the referent group for all models. All logistic models included the following covariates, in addition to family/friend recommendation: country of birth (US-born vs. foreign-born), insurance status (insured vs. not), lifetime mammogram use (yes vs. no) and education (years of school). "Mammography intentions was measured by a single item: ‘Have you thought about getting a/another mammogram?’ Response categories for this item were: 0 = No, 1 = Yes. ‘Perceived mammography norms were measured as the sum of the following two items: ‘My family thinks I should have regular mammograms’ and ‘Closest friends think I should have regular mammograms.’ Response categories for each item were 1 = Disagree, 2 = Neutral, and 3 = Agree. Response categories were collapsed for interpretability and this variable was dichotomized such that 0 = Disagree/Neutral to one or both items and 1 = Agree to both items. ‘Perceived mammography support was measured with a single item: ‘I have friends and family that would support me in getting a mammogram.’ Response categories were collapsed, given frequency distributions, as 0 = Disagree/Neutral and 1 = Agree. *P < 0.05. **P < 0.01. ***P < 0.001.

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Table III. Mediation of family/friend recommendations on mammography intentions through perceived mammography norms and support

<table>
<thead>
<tr>
<th>Mediation effect (A*B)</th>
<th>Lower</th>
<th>Upper</th>
<th>Sobel’s test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived mammography norms</td>
<td>0.28</td>
<td>0.11</td>
<td>0.49</td>
</tr>
<tr>
<td>Perceived mammography support</td>
<td>0.02</td>
<td>-0.02</td>
<td>0.11</td>
</tr>
<tr>
<td>Total indirect</td>
<td>0.38</td>
<td>0.21</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Notes. aMediation analyses were conducted on a subset of women (N=496) who had complete data for predictor (family/friend recommendation – no family/friend recommendation as referent group), mediators (perceived mammography norms, perceived mammography support) and covariates [country of birth (US-born vs. foreign-born), insurance status (insured vs. not), lifetime mammogram use (yes vs. no), and education (years of school)]. bSlow000 resamples. cPerceived mammography norms were measured as the sum of the following two items: ‘My family thinks I should have regular mammograms’ and ‘Closest friends think I should have regular mammograms.’ Response categories for each item were 1 = Disagree, 2 = Neutral, and 3 = Agree. Response categories were collapsed for interpretability and this variable was dichotomized such that 0 = Disagree/Neutral to one or both items and 1 = Agree to both items. Women with disagree/neutral responses to one or both items were the referent group. dPerceived mammography support was measured with a single item: ‘I have friends and family that would support me in getting a mammogram.’ Response categories were collapsed, given frequency distributions, as 0 = Disagree/Neutral and 1 = Agree. Women with disagree/neutral responses were the referent group. *P < 0.05. **P < 0.01. ***P < 0.001.
about perceived mammography norms and support and intentions to obtain a mammogram in the future.

Second, a number of our constructs were operationalized by single items or 2-item measures and not previously evaluated for psychometric properties. There is a need for future studies that use multi-item reliable and valid scales to confirm our findings. Our current assessment did not allow us to examine different types of perceived mammography support concerning mammography use, which may differ in their potential as mediators. There is a need for more quantitative research to compare the relative potential of informational, emotional and instrumental support as mediators, as this may guide the type of interventions which incorporate family and friends in terms of knowledge-, emotional- and systemic-based barriers to mammography use within this population. Relatedly, our current assessment of family and friend recommendations did not allow us to determine which family members and friends discussed mammography screening with participants or the content of the recommendation. More work is needed to identify which family and friends and what type of support they may be explicitly offering, as this could certainly influence the perceptions of social support women have and consequently their mammography intention and use.

Third, several perspectives on social support (Stress and Coping, Added Value Hypothesis [16, 17]) frame the impact of social support in the context of a stressor. It may be that mammography support serves as a mediator and be associated with mammography intentions and use, but in specific contexts (moderated mediation). Our analyses did not test this type of association; future quantitative studies should address this gap. Fourth, our outcome in this study was intention to obtain a mammogram, but intentions do not necessarily reflect actual behaviors. Although mammography intention has been associated with mammography use [25, 65, 66], this relationship is not absolute [67]. This is especially true with regard to Latinas, wherein some studies have indicated intention to not necessarily be a good predictor of actual mammography use [44], potentially due to cultural norms and a heightened interest in social desirability to maintain harmony with interviewers and researchers [40]. Relatedly, our outcome was not framed within a specific time period. This is a limitation, given it does not allow for how intention may align with screening guidelines (e.g. mammogram within a year or two vs. ever). Future quantitative research is warranted that tests our conceptual model on a time-specific measure of intention and actual mammography use, including the influences of family/friend recommendations, perceived norms and support. Fifth, the measures used in this study, and those used in previous quantitative studies did not describe the content of the recommendations. More qualitative research is needed to characterize what is said when family/friend recommendations are given. Relatedly, more qualitative research concerning these relationships would also be helpful to understand the context or way in which social perceptions serve as mediators or mechanisms in associations of social factors and health. For example, more studies are needed that examine the content of family/friend recommendations as well as how mammography screening is recommended by family and friends. Such work may elucidate how family/friend recommendations may make mammography more socially acceptable, minimize taboos around mammography and address intrapersonal barriers to mammography among Latinas. Simultaneously, qualitative work would also be helpful to understand how family and friends became motivated to give their recommendations including the type of knowledge and information they have about breast health and screening.

Sixth, this study did not characterize the quality of relationships to families and friends; the relationships found in this study may differ if women feel burdened by or are not closely attached to their social network [51]. Seventh, the Preacher and Hayes method involves bootstrapping [58], which can result in slight inconsistency among replications with the same data as well as time intensive. Nonetheless, our findings were similar when using traditional mediation models (Sobel test). Finally, the study sample is composed of Latinas residing in Western Washington State who are patients of community health centers. Non-adherent Latinas not involved or connected with this healthcare system were thus unable to be
included in this study. The study sample was also predominantly Mexican and a substantial proportion were socioeconomically disadvantaged (e.g. low education, median income, lack of insurance). This population may thus not be generalizable to other groups of Latinas, especially those who are not connected to healthcare systems, are of different national descents within Latin America and are not socioeconomically disadvantaged. Future research with larger, more representative samples is thus necessary.

Conclusions and implications for interventions

In conclusion, this study provides important information concerning the role of family/friend recommendations for mammography intentions among Latinas. Our findings add to literature suggesting the benefits of family/friend recommendations in terms of perceived mammography norms and support. Further, this study is the first simultaneous examination of perceived mammography norms and support as potential pathways by which social interactions may influence subsequent health-related intentions and behaviors.

Our work implies that perceived mammography norms might be particularly useful to target in community-based interventions and activities to promote breast cancer screening among Latinas. This study focuses on the beneficial influences of family and friends in women’s health and thus interventions built from this work and our broader conceptual model may be best fit within the context of lay individuals from women’s social networks. For example, this study indicates the potential for train-the-trainer models, wherein interventionists may be best suited to train family and friends on how to discuss mammography best with women, including emphasizing social norms about its importance and benefits. Interventions promoting social capital and community capacity building also align with our model; this study suggests that these interventions may be particularly health-protective through amplification of efforts on social norms through word-of-mouth and media interactions between members of the community.

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Conflict of interest statement

None declared.

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