Published in final edited form as:

J Racial Ethn Health Disparities. 2017 April ; 4(2): 123–133. doi:10.1007/s40615-016-0209-0.

Psychological outcomes after a false positive mammogram: Preliminary evidence for ethnic differences across time

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Abstract

Adverse psychological consequences of screening mammography are well-documented for women who receive a false positive result. Little is however known about ethnic differences. To address this gap, we examine distress associated with an abnormal mammogram (*results-related distress*) and perceived lifetime risk of breast cancer (*perceived risk*) among Latinas and Non-Latina White (NLW) women 3 months after receipt of a false positive result. A sample of 28 Latina and 27 NLW women who received an initial abnormal mammogram result and later a definitive non-cancer diagnosis were recruited for this descriptive, longitudinal study. Women were interviewed twice: within 30 days and 3 months after a false positive result. Questionnaires included standard socio-demographic questions, the Impact of Events Scale-Revised, and two perceived breast cancer risk items. All participants experienced decreased distress three months after the initial results. Latinas experienced higher levels of distress, $F(1,45) = 4.58$, $p = 0.04$, and had a significant increase in perceived breast cancer risk over time, $F(1,45) = 3.99$, $p = 0.05$. Larger population-based studies are necessary to confirm ethnic differences in mental health consequences of false positive results. Given cultural emphases concerning respect for authority figures, healthcare professionals may be particularly helpful in working with Latinas to mitigate distress and clarify accurate perceptions of breast cancer risk through evidence-based practice.

Keywords

breast cancer; risk; distress; abnormal mammogram; Latinas

Introduction

Despite ongoing controversies regarding age to initiate mammography use and high rates of indolent breast cancer diagnoses [1–5], mammography remains the most evidence-based screening tool for breast cancer [6, 7]. Simultaneously, false positive results are an

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Compliance with Ethical Standards

The authors have no conflicts to disclose. Research involved human participants. All content and procedures were approved by the Fred Hutchinson Cancer Research Center's Institutional Review Board.

important, common public health problem economically and psychologically [8–13]. False positive results comprise approximately 11% of screening mammogram results [9, 10]. Women's cumulative risk of receiving a false positive result can equal 43–49% over the span of 9–10 years [14] or even greater [15]. In addition to immediate adverse psychological consequences [11], a false positive mammogram result can have lasting effects after a definitive non-cancer diagnosis, including overestimated perceived risk of breast cancer and elevated distress associated with the experience [16–20].

Elevated levels of adverse breast cancer-specific psychological outcomes after a false positive screening result are important to address. First, false positive results appear to be more strongly associated with breast cancer-specific measures of distress than general measures of mental health. For example, a recent meta-analysis documented a pooled effect size of a false positive result to be 0.22 (95%CI = 0.18–0.27) for breast cancer-specific anxiety and 0.03 (95%CI = 0.00–0.07) for general anxiety [16]. The long-term impacts of false positive results for well-being also appear to be stronger for breast cancer-specific psychological consequences, lasting as long as three years after receipt of a definitive non-cancer diagnosis [12, 13, 19]. Second, receipt of false mammography has been associated with greater non-recommended early breast cancer detection behaviors, including breast self-exams [8, 16], potentially due to elevated breast cancer-specific adverse psychological consequences. Finally, receipt of a false positive result also appears to affect utilization of screening mammography, including under-, and over-utilization in different European and North American subpopulations [12, 16, 21–24].

While previous research has documented if and how breast cancer-specific and general adverse psychological consequences change by time [16–18], the majority of studies has focused on the abnormal mammogram experiences of non-Latina White women (NLW). Little work has thus been able to assess racial/ethnic differences. Such information is warranted, given the large body of literature documenting greater adverse psychological consequences and well-being for Latina women who are diagnosed with breast cancer relative to NLWs [25–28]. In response to this gap, we recently examined ethnic differences in breast cancer-specific adverse consequences within 30 days of receiving an abnormal mammogram result among NLW and Latinas [29, 30]. Latinas appeared to experience worse breast cancer-specific distress relative to NLW counterparts [29, 30]. Our previous research included a significant proportion of Latina and NLW women who had not received a definitive diagnosis.

The current study adds to our and others' previous work by assessing ethnic differences among women who have received a definitive non-cancer diagnosis. We hypothesize that Latinas with false positive results may experience worse distress associated with an abnormal mammogram experience (*results-related distress*) and perceived lifetime risk of breast cancer (*perceived risk*) relative to NLW counterparts. Notably, this is in contrast to research documenting positive general mental health outcomes among Latinos, and, unacculturated immigrants of Mexican descent in particular [31]. Our postulations do however align with theory and evidence regarding disparities in mental health among Latina and NLW breast cancer patients and survivors [32]. Indeed, our hypotheses are rooted in psychological social stress models and multilevel public health theories [32–35], wherein the

disproportionate experiences Latinas face in traumatic contexts are due to fewer universal resources at intrapersonal, interpersonal, and societal levels as well as exposure to unique risk factors, including racial/ethnic discrimination, stressors associated with social disadvantage, and cultural-specific stressors. Some factors specifically highlighted in the traumatic context of abnormal mammograms for Latinas [33, 34] include limited English proficiency, greater socioeconomic disadvantage, lower health literacy, or inadequate patient-provider communication [36–40] as well as higher levels of cancer fatalism¹ relative to NLWs [36, 42].

There are multiple manners in which ethnic disparities in results-related distress and perceived risk can manifest. First, there may be interactive effects of ethnicity and time on psychological consequences. NLW women may experience reduced results-related distress across time after receipt of a definitive non-cancer diagnosis following their abnormal mammogram. Latina counterparts may conversely not experience a reduction in results-related distress across time, due to greater cancer fatalism and lower comprehension of diagnostic results. Such findings would align with longitudinal research that has found: 1) the psychological impact of false positive results attenuates with time among NLWs [13, 43] and 2) Latina breast cancer patients and survivors experience greater increase in distress over time relative to NLW counterparts [44]. Alternatively, ethnic disparities in psychological consequences may not be related to time. Latinas may experience worse adverse psychological consequences relative to NLWs across different time points, despite comparable time-dependent decreases in consequences. This would align with other longitudinal research suggesting time-independent worse breast cancer-specific mental health among Latina patients and survivors relative to NLWs [45]. Examining these two different types of effects has important implications for intervention development for Latinas who receive false positive results. For example, these data may help to inform when to initiate programs and to target specific factors to improve the accuracy of women's risk perceptions and decrease results-related distress. Our data may also provide a useful estimate about the optimal duration of such program efforts.

Current study

The current study was a preliminary step toward understanding and addressing the influence of a false positive mammogram for adverse psychological outcomes across ethnicity. As described above, we found Latinas experience worse results-related distress than NLWs within 30 days of receiving an abnormal result from this sample [29, 30]. In the current study, we expanded our efforts and examined interactive and independent effects of time and ethnicity on results-related distress and perceived breast cancer risk among Latinas and Non-Latina White (NLW) women within 30 days (T1) and 3 months (T2) after receipt of a false positive mammogram result.

¹Cancer fatalism can be defined as the perception that whether one is diagnosed with cancer is determined by fate and that death is inevitable after a diagnosis [41].

Materials and Methods

Procedures

Recruitment—The current study was a part of a larger mixed method pilot project addressing longitudinal differences in the abnormal mammogram experience among Latina and NLW women living in Western Washington State [29, 30, 37]. The Institutional Review Board at the Fred Hutchinson Cancer Research Center approved all research activities. The study sites included two mobile mammography services (Site A, Site B) and a community hospital with a radiology department from which the remainder were recruited (Site C). From September 2012 to May 2013, we employed a two-step recruitment process: 1) at the point of the screening mammography appointment/prior to receipt of abnormal mammography results; and 2) after receipt of abnormal mammography results. First, clinic staff approached all women receiving screening mammography and described the study. Women who indicated interest during their initial screening mammography appointment and who subsequently received an abnormal screening result from that appointment were contacted by researchers within 7 days of receiving communication about the abnormal result. Second, we mailed all women who had undergone screening mammography and had received an abnormal screening result, an introductory letter and a study brochure within 7 days of receiving mailed communication about the abnormal result. Interested women contacted researchers. All eligible women were thus recruited twice, but this approach minimized staff burden in recruiting women at multiple time points.

Eligibility for participants included: self-identification as Hispanic/Latina/Chicana or as European American/Caucasian/White; age of 40–74 years old; receipt of an abnormal mammogram result within the last month; and no prior personal history of breast cancer. The current work had additional criteria: completion of both interviews and a definitive non-cancer diagnosis by three months post-initial abnormal finding. All components of the initial 25–35 minute interviews were administered within 30 days of receiving mailed communication about the abnormal result (T1). Three months after receipt of their results, women were re-contacted by researchers for a second 25–35 minute interview (T2). At the point of the second interview, all women had a confirmed non-diagnosis of cancer. All materials were administered in the participants' preferred language, English or Spanish.

For those who preferred to participate in person, staff administered questionnaires to participants after they assisted participants with completion of informed consent and HIPAA forms. For those who preferred to participate by telephone, staff administered questionnaires after obtaining verbal consent. Staff subsequently mailed participants informed consent forms, HIPAA forms, and stamped envelopes, which participants completed and returned by mail. For those who preferred to participate by mail, staff sent all materials (informed consent forms, HIPAA forms, questionnaires, return envelopes) by mail. Participants self-administered questionnaires, after completing informed consent and HIPAA forms. They subsequently returned all materials by mail to staff. All forms were identical for all participants, regardless of whether they supplied answers by telephone, in-person, or mail.

Measures

Socio-demographic variables: During T1, standard socio-demographic questions were used to collect data on ethnicity (“What is your race/ethnicity?”), age (“What is your current age?”), education (“What is the highest level of education that you have completed?”), personal annual income (“Approximately what was your personal annual income last year? (All the income you received before tax deduction?”), insurance status (“What type of insurance do you have?”), language preference (e.g., “What language(s) do you regularly speak on an everyday basis? What language(s) do you usually speak with your friends?”), and nationality (“What is your and your family’s country of origin?”).

Breast healthcare utilization: Breast healthcare utilization history was ascertained from self-report and electronic medical records. For all women, self-report data were used concerning the number of screening mammograms in the past five years (not including the current abnormal screening result) and discussion with a primary care provider about the current abnormal result. For breast healthcare utilization concerning the current abnormal screening result, we used electronic medical record data for 51 women who completed HIPAA forms and self-report data for 4 women who did not complete HIPAA forms. Variables included the number of days from receiving the initial screening mammogram result to a definitive non-cancer diagnosis as well as the type of diagnostic procedures women received (no appointment; mammogram; ultrasound; biopsy).

Study process variables: Study process variables were ascertained from study records that could potentially differ by ethnicity and be associated with changes in results-related distress and perceived breast cancer risk. First, we noted the site where women received the initial screening mammogram (Sites A, B, C). Second, we noted when women agreed to participate initially (prior versus after receipt of abnormal mammography results). Third, we noted if women had received a definitive non-cancer diagnosis before participating in T1, based on self-report (yes/no). Finally, we noted the mode of the interview, based on participants’ preferences (phone, mail, in person).

Results-related distress: During T1 and T2, we administered the 5-item adverse emotional consequences subscale from the Psychological Consequences Questionnaire (e.g., “As a result of thoughts about your abnormal mammogram result, have you been unhappy or distressed? Been scared and panicky?”) [29, 46]. Response categories were a 4-point Likert scale (0 = Not at all to 3 = Quite a bit). Reliability for this measure as measured by Cronbach’s alpha for T1 interviews was 0.88 (English: 0.88; Spanish: 0.83) and 0.89 for T2 interviews (English: 0.87, Spanish: 0.92). Appendix 1 contains more detailed information about psychometric analyses for this sample. Similar to previous research [29, 46], a 1-factor solution appeared to best fit the data across both T1 and T2 for participants completing questionnaires in English and Spanish. A change variable was also created as the difference in results-related distress across time points (calculated as T2 minus T1). Positive values thus indicate an increase in results-related distress from T1 to T2; a zero value indicates equivalent amounts of results-related distress from T1 to T2; and negative values indicate a decrease in results-related distress from T1 to T2.

Perceived risk: During T1 and T2, two items were used to measure perceived lifetime risk for breast cancer (“What percentage of risk do you believe you have of developing breast cancer someday”; “What is your risk compared to a woman your age?”). Response categories included respectively 0–100% and a 5-point Likert scales (0 = Much lower to 5 = Much higher). A review of frequency distributions suggested responses to both scores should be recalculated into 3-point scales. Reliability for this measure as measured by Cronbach’s alpha for T1 interviews was 0.78 (English: 0.88; Spanish: 0.73) and 0.64 for T2 interviews (English: 0.73, Spanish: 0.60). Appendix 1 contains more detailed information about psychometric analyses for this sample. A 1-factor solution appeared to best fit the data across both T1 and T2 for participants completing questionnaires in English and Spanish. Means were calculated and Z-transformed (Range: 1–3). Positive values thus indicate a greater gain in perceived risk from T1 to T2; a zero value indicates equivalent amounts of perceived risk from T1 to T2; and negative values indicate a decrease in perceived risk from T1 to T2. A change variable was also created as the difference in perceived risk across time points (calculated as T2 minus T1). Positive values thus indicate an increase in perceived risk from T1 to T2; a zero value indicates equivalent amounts of perceived risk from T1 to T2; and negative values indicate a decrease in perceived risk from T1 to T2.

Analysis plan

We identified covariates from extant literature as well as analyses of associations within our sample. Previous literature suggests that age, socioeconomic status, and days to a definitive non-cancer diagnosis may impact adverse breast cancer-specific psychological outcomes. Regarding our own sample, we first assessed associations between potential covariate variables within theoretical domains (socio-demographic, breast healthcare utilization, and study process variables). This assessment relied on bivariate analyses (e.g., Pearson’s correlations, Spearman’s rho, analyses of variance, chi-square tests; Appendix 2). Second, we conducted bivariate analyses examining if socio-demographic, breast healthcare utilization and study process variables differed across ethnicity, using analyses of variance and chi-square tests. Finally, we examined if socio-demographic, breast healthcare utilization, and study process variables were associated with outcomes (i.e., changes in results-related distress and perceived risk) using Pearson’s correlations, analyses of variance, and chi-square tests.

Subsequently, one repeated measures multivariate analysis of covariance was conducted to examine main and interactive effects by ethnicity (Latina, NLW) and time (T1, T2) in results-related distress and perceived risk. We first reported ethnicity x time interactive effects. If there were significant interactions, changes in breast cancer-specific psychological consequences across time were compared through separate repeated measures analyses of variances for each ethnic group. If interaction effects were not significant, main effects of time and ethnicity were reported.

Results

Table 1 depicts socio-demographic, breast healthcare utilization, and study process variables by ethnicity. We first sought to assess relationships between potential covariates (Appendix

2). With regard to socio-demographic factors, income was associated with education ($p = 0.003$), insurance status ($p = 0.02$), language preference ($p = 0.001$), and nationality ($p < 0.0001$). Insurance status was associated with language preference ($p < 0.0001$) and nationality ($p = 0.001$). Further, preferred language and nationality exhibited a strong association ($p < 0.0001$). Breast healthcare utilization and study process variables were not associated with one another, except that there was a non-significant association between communicating with one's primary care provider about the result and days to a definitive non-cancer diagnosis ($p = 0.06$).

Next, we conducted analyses to identify ethnic differences in socioeconomic position, acculturation, breast healthcare utilization variables, and study process variables. Latina and NLW participants significantly differed in insurance status ($p = 0.02$), income ($p = 0.005$), preferred language ($p < 0.0001$), country of birth ($p < 0.0001$), and site where they received the initial screening mammogram ($p = 0.003$). We next examined how these variables related to changes in results-related distress and perceived risk across time. Findings suggested no significant associations with socio-demographic ($ps = 0.13$ – 0.94), breast healthcare utilization ($ps = 0.27$ – 0.94), or study process variables ($ps = 0.20$ – 0.99), with the exception of preferred language. Women who preferred English ($M = -0.16$, $SD = 0.86$) had lower changes in risk perception relative to women who preferred Spanish, $M = 0.43$, $SD = 0.73$, $F(1, 34) = 4.26$; $p = .05$. Given these findings and extant research, we included the following variables as covariates: age, income, education, insurance status, and days to a definitive non-cancer diagnosis. We did not include preferred language, country of birth, and site wherein women receiving initial screening mammograms, given the substantial associations with ethnicity (e.g., English as preferred for 100% of NLWs versus 61% of Latinas).

Table 2 provides means, standard errors, and outcomes from a repeated measure analysis of covariance. Regarding results-related distress, there was no significant interaction of ethnicity and time, but there were significant main effects. First, there was a marginal effect of time ($p = 0.09$), wherein both Latina and NLW women appeared to experience slightly reduced results-related distress between 30 days (T1) and 3 months of receiving the abnormal mammogram results (T2). There were also significant ethnic differences across time, wherein Latinas reported greater results-related distress relative to NLW counterparts across both time points ($p = 0.04$).

With regard to perceived risk, there was a significant ethnicity x time interaction ($p = 0.05$). Given this, we do not report main effects for this outcome nor conduct analyses of covariance at separate time points. Instead, changes in perceived risk across time were examined for ethnic groups separately through repeated measures of analyses of covariance, including covariates described above. NLW women did not experience a change in perceived risk across time ($p = 0.71$), but Latinas experienced a significant increase in perceived risk ($p = 0.003$).

Discussion

This study provides important data concerning ethnic differences among women in terms of longitudinal psychological consequences following a false positive mammogram result.

While distress was diminished across time, Latinas consistently reported significantly more distress than NLW counterparts. Furthermore, our small pilot study suggests there may be interactive effects, wherein there may be increased perceived risk among Latinas across three months of receiving abnormal mammogram results, but not NLW women. This work is timely, given the growing body of literature documenting ethnic disparities in diagnostic resolution [49, 50] and our recent results concerning short-term distress following an abnormal mammogram result [29, 30]. Altogether, this growing body of evidence suggests there are multiple unmet psychological needs Latinas experience after receipt of an abnormal screening result.

Notably, the majority of work to date concerning racial/ethnic differences in mental health in the context of breast cancer has focused on patients and survivors [25–28]. The current study suggests that Latinas may suffer to a greater extent during cancer-related experiences across time, even after receiving a definitive non-cancer diagnosis. Previously, we had assessed ethnic differences in distress among women whose cancer status was not necessarily known [29, 30]. Our findings add that ethnic differences may persist as long as 3 months after receipt of a non-cancer diagnosis, despite marginally significant time-dependent decreases in distress among both Latinas and NLWs. Given this, interventions may be most beneficial for Latinas if initiated soon after receipt of abnormal mammogram results and if continued for at least a few months after a definitive non-cancer diagnosis. Notably, our sample size was small and thus our analyses may have been underpowered to detect interactive effects that may not have been found for results-related distress. Future research is warranted to confirm our findings.

The current study also contributed interesting preliminary results concerning the effects of false positive results for breast cancer risk perception across ethnicity. Among general populations, Latinas perceive themselves to be at lower risk for breast cancer relative to NLW women [37–40]. Previous research has suggested this underestimation of risk is due to low awareness and misconception of risk factors (e.g., cancer as God's punishment) [55–58]. Our work suggests that one cancer-related experience may change Latinas' perceptions about their susceptibility to breast cancer relative to NLW counterparts. This change further appears to occur after initially receiving abnormal mammogram experience. Future work with larger sample sizes is warranted to confirm these intriguing findings. In addition, a premise of this study has been that increased perceived risk is an overestimation – and thus potentially a risk factor in conjunction with other adverse breast cancer-specific psychological consequences for overutilization or underutilization of early breast cancer detection practices [12, 24, 22, 19]. Objective risk was not however measured to confirm that increased perceived risk was an overestimation. Future research assessing both perceived and objective risk is needed for confirmation.

Limitations

This pilot study had several limitations. A small, convenience-based sample of women was used. Future, larger, population-based samples are warranted to confirm the generalizability of our findings. Nonetheless, our study is among the first of studies to assess ethnic disparities among women who have received false positive mammography results. This work

thus justifies the need for such future studies to support our findings' generalizability. Women in our sample were relatively young when compared to current guidelines by the U.S. Preventive Services Task Force [2, 3], although they met those set by American Cancer Society and the National Comprehensive Cancer Network at the time of the study [4, 5]. Crude sensitivity analyses among the 14 NLW and 12 Latina participants who were within 50–64 years old however suggested comparable findings (data not shown). Our survey instruments did not include questions concerning medical homes and access to a regular source of care (e.g., clinic, doctor), which may have influenced ethnic differences in long-term psychological outcomes. Nonetheless, we did collect data regarding whether participants communicated with primary care providers about results; we did not find this communication be associated with our outcomes of interest. We did not collect information on lifetime history of abnormal mammogram results experiences, which could have influenced distress levels. Future research is warranted to examine this possibility. Our measures generally exhibited adequate reliability according to conventions about Cronbach's alphas [59, 60], with the exception for perceived risk at T2. This appeared to be due to item performance at T2 among participants who completed questionnaires in Spanish. While Nunnally [60] suggested values >0.60 were sufficient for our type of study, future work is warranted with other instruments of risk perception to confirm our finding. Our study focused only on breast cancer-specific outcomes, but false positive mammograms can also influence broader mental health outcomes and generalized anxiety in particular [16]. Nonetheless, we would note previous literature has suggested these effects are relatively smaller and do not persist as long relative to breast cancer-specific outcomes [16, 19, 12]. This research has focused on the experiences of Latinas; similar patterns may emerge for other populations of immigrant women and should be explored. Relatedly, our sample was diverse in terms of nationalities represented among Latina participants – nonetheless, due to small sample sizes, we were unable to assess subgroup differences in outcomes. Such information is warranted, given Latina populations are not heterogeneous with regard to mental health outcomes [31]. Ethnic differences emerged in terms of socioeconomic status, site of care and acculturation characteristics. Of these factors, we were only able to adjust for socioeconomic status due to the substantial overlap between ethnicity, site of care, and acculturation characteristics. Future, larger studies are necessary to compare the relative contributions of socioeconomic status, site of care, and acculturation characteristics as well as their potential interactive effects with ethnicity for long-term psychological outcomes.

Implications for future research and practice

These preliminary findings suggest Latinas may be a vulnerable population of women for long-term negative psychological consequences after a false positive mammogram. There are three major venues for future research. First, further research with larger samples is needed to confirm these findings. Samples should include sufficient variation in socioeconomic status, sites of care, and acculturation factors. Second, research is warranted to examine if differences in adverse psychological consequences result in disparities in subsequent early detection practices. Indeed, adverse psychological consequences may lead to under- or over-utilization of screening mammography. On the one hand, potentially increased perceived risk and greater results-related distress after an abnormal result may lead to perceptions of breast cancer screening as a priority and thus greater adherence to

recommended screening [52, 61]. Conversely, women's potentially increased perceived risk may be overestimated after an abnormal result and result in greater, unwarranted cancer worry [62]. Worry from receipt of a false positive result may result in worse subsequent adherence to guidelines promoting early breast cancer detection and, consequently, worse breast cancer morbidity (e.g., late stage diagnosis, fewer treatment options, poorer quality of life). It is worthwhile to note, as well, that these relationships (i.e., receipt of false positive result and subsequent screening) have been shown to differ by subpopulation within Europe and North America; findings may thus differ among Latinas and further by different Latina subpopulations [12, 16, 21–24]. Third, research is warranted to understand which factors contribute to differences in adverse psychological consequences, including poorer comprehension of care, cancer fatalism, and avoidant coping strategies [29, 36–40, 42, 43].

If confirmed, our and future research may elucidate the need to address psychological factors among Latinas in clinical settings when discussing a definitive non-cancer diagnosis after an abnormal screening result and subsequent steps for future early breast cancer detection. Healthcare professionals appear to be pivotal for women undergoing the abnormal mammogram experience [28]. Indeed, a recent study demonstrated that support from healthcare professionals reduces anxiety among women undergoing the abnormal mammogram experience more so than other members of their social network [63]. Nonetheless, it should be noted that randomized controlled trials which have assessed the impact of psychosocial support by healthcare professionals have not demonstrated effectiveness in reducing adverse psychological consequences after a false-positive result [64]. Such work highlights the need for future detailed study to understand the type of psychosocial support that may be needed and could be provided by healthcare professionals to mitigate consequences.

Healthcare professionals may, nonetheless, be particularly effective in meeting the psychological needs of Latina patients, given sociocultural emphases on the expertise of healthcare professionals and other authority figures and the importance of following their advice and suggestions [65]. Healthcare professionals may thus be ideally suited stakeholders for mitigating ethnic disparities in longitudinal adverse psychological outcomes from false-positive mammography results. They further can be integral points in prevention care with regard to elucidating the need for repeat mammography as well as informing Latina patients about evidence-based practices for obtaining accurate breast cancer risk estimates (e.g., genetic testing). Nonetheless, there is a growing body of literature concerning inadequate patient-provider communication during the abnormal mammogram experience for Latinas due to language and health literacy barriers [66–68, 38]. Such inadequate communication may underlie the disparities in distress and risk perception documented in the current study. There may be a need to examine first how to improve communication in order to improve well-being for this marginalized population effectively in clinical practice.

Conclusions

Our work provides preliminary evidence concerning the vulnerability of Latinas, relative to NLW counterparts, who receive an abnormal mammogram result with regard to long-term

results-related distress and perceived risk. These disparities are important to address, given this population experiences worse breast cancer morbidity, including a greater likelihood of late stage diagnoses and worse quality of life [69, 32]. Indeed, worse breast cancer morbidity may occur, in part, due to greater breast cancer-specific psychological consequences during previous mammography experiences and subsequent effects on Latinas' early detection behaviors. To assess if this is the case, we have highlighted several opportunities for researchers and practitioners to characterize ethnic differences in the false positive result experience.

Acknowledgments

Funding statement.

This work was supported by the National Cancer Institute under grant numbers P50CA148143 and R25CA92408. Y.M. was also supported by the University of Illinois Cancer Center and University of Illinois-Chicago Center for Research on Women and Gender.

We thank Noah Espinoza and Blair Beadnell for their technical assistance with this project.

References

1. Miller A, Wall C, Baines C, Sun P, To T, Narod S. Twenty-five year follow-up for breast cancer incidence and mortality of the Canadian National Breast Screening Study: randomised screening trial. *Bmj*. 2014; 348:g366. [PubMed: 24519768]
2. USPSTF. Screening for breast cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2009; 151(10):716–26. [PubMed: 19920272]
3. USPSTF. Screening for breast cancer: topic page. 2013.
4. American Cancer Society. Detailed guide: breast cancer. 2012.
5. Bevers T, Anderson B, Bonaccio E, Buys S, Daly M, Dempsey P, et al. NCCN clinical practice guidelines in oncology: breast cancer screening and diagnosis. *Journal of National Comprehensive Cancer Network*. 2009; 7:1060–96.
6. Nelson, H., Tyne, N., Naik, A., Bougatsos, C., Chan, B., Humphrey, L. Screening for breast cancer: systematic evidence review update for the US Preventive Services. Rockville, MD: Agency for Healthcare Research and Quality; 2009.
7. Gotzsche P, Jorgensen K. Screening for breast cancer with mammography. *Cochrane Database Systematic Reviews*. 2013:CD001877.
8. Brewer N, Salz T, Lillie S. Systematic Review: The long-term effects of false-positive mammograms. *Annals of Internal Medicine*. 2007; 146(7):502–10. DOI: 10.7326/0003-4819-146-7-200704030-00006 [PubMed: 17404352]
9. Lafata J, Simpkins J, Lamerato L, Poisson L, Divine G, Johnson C. The economic impact of false-positive cancer screens. *Cancer Epidemiology Biomarkers and Prevention*. 2004; 13:2126–32.
10. Lidbrink E, Elvng J, Frisell J, Jonsson E. Neglected aspects of false positive findings of mammography in breast cancer screening: analysis of false positive cases from the Stockholm Trial. *British Medical Journal*. 1996; 312:273–6. [PubMed: 8611781]
11. Brett J, Bankhead C, Henderson B, Watson E, Austoker J. The psychological impact of mammographic screening: A systematic review. *Psycho-Oncology*. 2005; 14:917–38. [PubMed: 15786514]
12. Bond M, Pavey K, Welch C, Cooper R, Garside S, Dean S, et al. Systematic review of the psychologic consequences of false-positive screening mammograms. *Health Technology Assessment*. 2013; 17:1–6. [PubMed: 23540978]
13. Brodersen J, Volkert D. Long-term psychosocial consequences of false-positive screening mammography. *Annals of Family Medicine*. 2013; 11:106–15. [PubMed: 23508596]

14. Christiansen C, Wang F, Barton M, Krueuter W, Elmore J, Gelfand A, et al. Predicting the cumulative risk of false-positive mammograms. *Journal of National Cancer Institute*. 2000; 92:1657–66.
15. Hubbard R, Kerlikowske K, Flowers C, Yankaskas B, ZHu W, Miglioretti D. Cumulative probability of false-positive recall or biopsy recommendation after 10 years of screening mammography: a cohort study. *Annals of Internal Medicine*. 2011; 155:481–92. [PubMed: 22007042]
16. Salz T, Richman A, Brewer N. Meta-analyses of the effects of false-positive mammograms on generic and specific psychosocial outcomes. *Psycho-Oncology*. 2010; 19:1026–34. [PubMed: 20882572]
17. Jatoti I, Zhu K, Shah M, Lawrence W. Psychological distress in US women who have experienced false-positive mammograms. *Breast Cancer Research and Treatment*. 2006; 100:191–200. [PubMed: 16773439]
18. Hafslund B, Espehaug B, Nortvedt M. Effects of false-positive results in a breast screening program on anxiety, depression, and health-related quality of life). *Cancer Nursing*. 2012; 35:E26–E35. [PubMed: 22067696]
19. Aro A, Absetz S, van Elderen T, van der Ploeg E, van der Kamp L. False-positive findings in mammography screening induces short-term distress - breast cancer-specific concern prevails longer. *European Journal of Cancer*. 2000; 36:1089–97. [PubMed: 10854941]
20. Thomson M, Siminoff L. Perspectives on mammography after receipt of secondary screening owing to a false positive. *Women's Health Issues*. 2015; 25:128–33. [PubMed: 25648490]
21. Salz T, DeFrank J, Brewer N. False positive mammograms in Europe: do they affect reattendance? *Breast Cancer Research and Treatment*. 2011; 127:229–31. [PubMed: 21052828]
22. DeFrank J, Rimer B, Bowling J, Earp J, Breslau E, Brewer N. Influence of false-positive mammography results on subsequent screening: do physician recommendations buffer negative effects? *Journal of Medical Screening*. 2012; 19:35–41. [PubMed: 22438505]
23. Tosteson A, Fryback D, Hammond C, Hanna L, Grove M, Brown M, et al. Consequences of false-positive screening mammograms. *JAMA Internal Medicine*. 2014; 174:954–61. [PubMed: 24756610]
24. Chamot E, Charvet A, Perneger T. Overuse of mammography during the first round of an organized breast cancer screening programme. *Journal of Evaluation in Clinical Practice*. 2009; 15:620–5. [PubMed: 19522725]
25. Bickell NA, Wang JJ, Oluwole S, Schrag D, Godfrey H, Hiotis K, et al. Missed opportunities: Racial disparities in adjuvant breast cancer treatment. *Journal of Clinical Oncology*. 2006; 24(9): 1357–62. DOI: 10.1200/jco.2005.04.5799 [PubMed: 16549830]
26. Fedewa SA, Ward EM, Stewart AK, Edge SB. Delays in adjuvant chemotherapy treatment among patients with breast cancer are more likely in African American and Hispanic populations: a national cohort study 2004–2006. *Journal of Clinical Oncology*. 2010; 28(27):4135–41. DOI: 10.1200/jco.2009.27.2427 [PubMed: 20697082]
27. Ashing-Giwa K, Padilla G, Bohorquez D, Tejero J, Garcia M. Understanding the breast cancer experience of Latina women. *Journal of Psychosocial Oncology*. 2006; 24(3):19–52. DOI: 10.1300/J077v24n03_02 [PubMed: 17088240]
28. Janz N, Mujahid M, Hawley S, Griggs J, Alderman A, Hamilton A, et al. Racial/ethnic differences in quality of life after diagnosis of breast cancer. *J Cancer Survivorship*. 2009; 3:212–22.
29. Molina Y, Beresford S, Espinoza N, Thompson B. Psychological distress, social withdrawal, and coping following receipt of an abnormal mammogram among Latina and non-Latina White women: A mediation model. *Oncology Nursing Forum*. 2014; 41:523–32.
30. Molina Y, Beresford S, Hayes Constant T, Thompson B. Conversations about abnormal mammogram results on distress and timely follow-up across ethnicity. *Journal of Cancer Education*. Published online.
31. Alegria M, Cnino G, Shrout P, Woo M, Duan N, Villa D, et al. Prevalence of mental illness in immigrant and non-immigrant US Latino groups. *American Journal of Psychiatry*. 2008; 165:359–69. [PubMed: 18245178]

32. Yanez B, Thompson E, Stanton A. Quality of life among Latina breast cancer patients: a systematic review of the literature. *J Cancer Surviv.* 2011; 5:191–207. [PubMed: 21274649]
33. Taplin SH, Yabroff KR, Zapka J. A multilevel research perspective on cancer care delivery: the example of follow-up to an abnormal mammogram. *Cancer Epidemiology, Biomarkers and Prevention.* 2012; 21(10):1709–15. DOI: 10.1158/1055-9965.epi-12-0265
34. Zapka J, Taplin S, Price R, Cranos C, Yabroff R. Factors in quality care - the case of follow-up to abnormal cancer screening tests - problems in the steps and interfaces of care. *Journal of National Cancer Institute Monographs.* 2010; 2010(40):58–71. DOI: 10.1093/jncimonographs/lgq009
35. Warnecke R, Oh A, Breen N, Gehlert S, Paskett E, Tucker K, et al. Approaching health disparities from a population perspective: the National Institutes of Health Centers for Population Health and Health Disparities. *American Journal of Public Health.* 2008; 98:1608–15.
36. Austin LT, Ahmad F, McNally M-J, Stewart DE. Breast and cervical screening in Hispanic women: a literature review using the Health Belief Model. *Women's Health Issues.* 2002; 12:122–9. [PubMed: 12015184]
37. Molina Y, Hohl S, Ko L, Rodriguez E, Thompson B, Beresford S. Understanding the patient-provider communication needs of Latina and non-Latina White women following an abnormal mammogram. *Journal of Cancer Education.* 2014; 29:781–9. [PubMed: 24748097]
38. Karliner L, Kaplan C, Juarbe T, Pasick R, Pérez-Stable E. Poor patient comprehension of abnormal mammography results. *Journal of General Internal Medicine.* 2005; 20(5):432–7. DOI: 10.1111/j.1525-1497.2005.40281.x [PubMed: 15963167]
39. Moy B, Park ER, Feibelman S, Chaing S, Weissman JS. Barriers to repeat mammography: cultural perspectives of African-American, Asian, and Hispanic women. *Psycho-Oncology.* 2006; 15:623–34. [PubMed: 16304623]
40. Shelton R, Goldman R, Emmons K, Sorenson G, Allen J. An investigation into the social context of low-income, urban Black and Latina women: implications for adherence to recommended health behaviors. *Health Education Behavior.* 2011; 38:471–481. [PubMed: 21856885]
41. De Los Monteros K, Gallo L. The relevance of fatalism in the study of Latinas' cancer screening behavior: a systematic review of the literature. *International Journal of Behavioral Medicine.* 2011; 18:310–8. [PubMed: 20953916]
42. Espinosa de los Monteros K, Gallo L. The relevance of fatalism in the study of Latinas' cancer screening behavior: a systematic review of the literature. *International Journal of Behavioral Medicine.* 2011; 18:310–8. [PubMed: 20953916]
43. Heckman B, Fisher E, Monsees B, Merbaum M, Ristvedt S, Bishop C. Coping and anxiety in women recalled for additional diagnostic procedures following an abnormal screening mammogram. *Health psychology.* 2004; 23(1):42–8. DOI: 10.1037/0278-6133.23.1.42 [PubMed: 14756602]
44. Culver J, Arena P, Antoni M, Carver C. Coping and distress among women under treatment for early stage breast cancer: comparing African Americans, Hispanics and non-Hispanic Whites. *Psycho-Oncology.* 2002; 11(6):495–504. DOI: 10.1002/pon.615 [PubMed: 12476431]
45. Carver CS, Smith R, Petronis V, Antoni M. Quality of life among long-term survivors of breast cancer: different types of antecedents predict different classes of outcomes. *Psycho-Oncology.* 2006; 15:749–58. [PubMed: 16304622]
46. Cockburn J, De Luise T, Hurley S, Clover K. Development and validation of the PCQ: a questionnaire to measure the psychological consequences of screening mammography. *Social science & medicine.* 1992; 34(10):1129–34. [PubMed: 1641674]
47. Barton M, Morley D, Moore S, Allen J, Kleinman K, Emmons K, et al. Decreasing women's anxieties after abnormal mammograms: a controlled trial. *Journal of the National Cancer Institute.* 2004; 96(7):529–38. DOI: 10.1093/jnci/djh083 [PubMed: 15069115]
48. Keyzer-Dekker C, De Vries J, van Esch L, Ernst M, Nieuwenhuijzen G, Roukema J, et al. Anxiety after an abnormal screening mammogram is a serious problem. *The Breast.* 2012; 21:83–8. [PubMed: 21924905]
49. Ashing-Giwa K, Gonzalez P, Lim J-W, Chung C, Paz B, Somlo G, et al. Diagnostic and therapeutic delays among a multiethnic sample of breast and cervical cancer survivors. *Cancer.* 2010; 116:3195–3204. [PubMed: 20564623]

50. Ramirez A, Pérez-Stable E, Penedo F, Talavera G, Carrillo J, Fernandez M, et al. Navigating Latinas with breast screen abnormalities to diagnosis. *Cancer*. 2013; 119(7):1298–305. DOI: 10.1002/cncr.27912 [PubMed: 23233265]
51. Gross CP, Filardo G, Singh HS, Freedman AN, Farrell MD. The relation between projected breast cancer risk, perceived cancer risk, and mammography use: Results from the National Health Interview Survey. *Journal of General Internal Medicine*. 2005; 21:158–64. [PubMed: 16390511]
52. Katapodi MC, Lee KA, Facione NC, Dodd MJ. Predictors of perceived breast cancer risk and the relation between perceived risk and breast cancer screening: a meta-analytic review. *Preventive medicine*. 2004; 38:388–402. [PubMed: 15020172]
53. Orom H, Kiviniemi M, Shavers V, Ross L, Underwood W. Perceived risk for breast cancer and its relationship to mammography in Blacks, Hispanics, and Whites. *Journal of Behavioral Medicine*. 2013; 36:466–76. [PubMed: 22772713]
54. Orom H, Kiviniemi MT, Underwood W, Ross L, Shavers VL. Perceived cancer risk: why is it lower among nonwhites than whites? *Cancer Epidemiology Biomarkers and Prevention*. 2010; 19:746–54.
55. Chavez LR, Hubbell FA, McMullen JM, Martinez RG, Mishra SI. Structure and meaning in models of breast and cervical cancer risk factors: a comparison of perceptions among Latinas, Anglo women, and physicians. *Medical Anthropology Quarterly*. 2009; 9:40–74. [PubMed: 7697550]
56. Ramirez AG, Suarez L, Laufman L, Barroso C, Chalela P. Hispanic women's breast and cervical knowledge, attitudes, and screening behaviors. *American Journal of Health Promotion*. 2000; 14:292–300. [PubMed: 11009855]
57. Schettino MR, Hernandez-Valero MA, Moguel R, Hajek RA, Jones LA. Assessing breast cancer knowledge, beliefs and misconceptions among Latinas in Houston, Texas. *Journal of Cancer Education*. 2006; 21:S42–S6. [PubMed: 17020501]
58. Niederdeppe J, Levy AG. Fatalistic beliefs about cancer prevention and three prevention behaviors. *Cancer Epidemiology Biomarkers and Prevention*. 2007; 16:998–1003.
59. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *International Journal of Medical Education*. 2011; 2:53–5. [PubMed: 28029643]
60. Nunnally, J. *Psychometric theory*. New York: McGraw-Hill; 1978.
61. Lipkus I, Halabi S, Strigo T, Rimer B. The impact of abnormal mammograms on psychosocial outcomes and subsequent screening. *Psycho-Oncology*. 2000; 9:402–10. [PubMed: 11038478]
62. McGregor B, Bowen D, Ankerst D, Andersen M, Yasui M, McTiernan A. Optimism, perceived risk of breast cancer, and cancer worry among a community-based sample of women. *Health Psychology*. 2004; 23:339–44. [PubMed: 15264969]
63. Pineault P. Breast cancer screening: Women's experiences of waiting for further testing. *Oncology Nursing Forum*. 2007; 34:847–54. [PubMed: 17723985]
64. Bowland L, Cockburn J, Cawson J, Anderson H, Moorehead S, Kenny M. Counselling interventions to address the psychological consequences of screening mammography: a randomised trial. *Patient Education and COunseling*. 2003; 49(2):189–98. [PubMed: 12566215]
65. Marin, G., Marin, BV. *Research with Hispanic populations*. Sage Publications; Newbury Park, CA: 1991.
66. Allen J, Shelton R, Harden E, Goldman R. Follow-up of abnormal screening mammograms among low-income ethnically diverse women: findings from a qualitative study. *Patient Education and Counseling*. 2008; 72:283–92. [PubMed: 18490127]
67. Mojica C, Bastani R. Receipt of diagnostic tests for breast cancer: validity of self-reports among low-income, mostly Latina, indigent women. *Evaluation and Health Profession*. 2010; 33:437–51.
68. Mojica C, Bastani R, Ponce N, Boscardin W. Latinas with abnormal breast findings: Patient predictors of timely diagnostic resolution. *Journal of Women's Health*. 2007; 16:1468–78.
69. Ooi SL, Martinez ME, Li CI. Disparities in breast cancer characteristics and outcomes by race/ethnicity. *Breast Cancer Research and Treatment*. 2011; 127:729–38. [PubMed: 21076864]

Appendix 1. Psychometric analyses for results-related distress and perceived risk

i

Scree plots, exploratory factor analysis, and parallel analysis suggested a 1 factor structure best fit the data for our sample, similar to other extant research using this 5-item subscale. Eigenvalues, factor loadings and Cronbach's alphas are reported below.

	Questionnaires Completed in English (n = 36)		Questionnaires Completed in Spanish (n = 19)	
	T1	T2	T1	T2
Eigenvalues				
	3.4, 0.7, 0.4	3.0, 0.9, 0.6	3.5, 0.9, 0.4	3.8, 0.5, 0.4
Factor Loadings				
As a result of thoughts about your abnormal mammogram result, have you...				
Been unhappy or distressed?	0.79	0.71	0.79	0.93
Been scared and panicky?	0.82	0.95	0.82	0.91
Felt nervous or strung-up?	0.79	0.91	0.79	0.81
Felt under strain?	0.65	0.60	0.65	0.77
Felt worried about the future?	0.84	0.93	0.84	0.94
Cronbach's Alphas				
	0.88	0.83	0.87	0.92

i

Scree plots, exploratory factor analysis, and parallel analysis suggested a 1 factor structure best fit the data for our sample, similar to other extant research using this 5-item subscale. Eigenvalues, factor loadings and Cronbach's alphas are reported below.

	Questionnaires Completed in English (n = 36)		Questionnaires Completed in Spanish (n = 19)	
	T1	T2	T1	T2
Eigenvalues				
	1.6, 0.4	1.2, 0.8	1.7, 0.3	1.4, 0.6
Factor Loadings				
What percentage of risk do you believe you have of developing breast cancer someday?	0.85	0.77	0.93	0.85
What is your risk compared to a woman your age?	0.85	0.77	0.93	0.85

Questionnaires Completed in English (n = 36)		Questionnaires Completed in Spanish (n = 19)	
T1	T2	T1	T2
Cronbach's Alphas			
0.88	0.73	0.73	0.60

Appendix 2. Associations between covariate domains

i

We conducted simple bivariate analyses (e.g., Pearson's correlations, Spearman's rho, chi-square tests) to assess the relationships of potential covariates to one another. P-values for these analyses are found in the table below; significant associations ($p < 0.05$) are marked in bold and marginal associations ($p < 0.10$) are italicized.

Bivariate Analysis						
Socio-demographic	Age	Income	Education	Insurance	Language	Nationality
Age	1	0.4	0.8	0.5	0.4	0.2
Income		1	0.003	0.02	0.001	<.0001
Education			1	0.79	<i>0.07</i>	0.16
Insurance status				1	<0.0001	0.001
Language					1	<0.0001
Nationality						1
Breast healthcare utilization	Number of screening mammograms	Spoke to primary care provider about result	Days to definitive non-cancer diagnosis	Type of diagnostic procedure		
Number of screening mammograms	1	0.25	0.93	0.42		
Spoke to primary care provider about result		1	<i>0.06</i>	0.50		
Days to definitive non-cancer diagnosis			1	0.91		
Type of diagnostic procedure				1		
Study process	Site of initial screening mammogram	Timing of decision to participate	Receipt of a definitive non-cancer diagnosis before T1	Interview mode		
Site of initial screening mammogram	1	0.67	0.04	0.41		
Timing of decision to participate		1	0.69	0.98		
Receipt of a definitive non-cancer diagnosis before T1			1	0.41		

Bivariate Analysis						
Socio-demographic	Age	Income	Education	Insurance	Language	Nationality
Interview mode				1		

Table 1

Socio-demographic, breast healthcare utilization, and study process characteristics by ethnicity (n= 55)

Variable	Range	Latina (n = 28) M (SD)	NLWs (n = 27) M (SD)
Age	40–68	48.43 (6.59)	50.73 (6.81)
# of screening mammograms in 5 years	0–6	2.68 (1.95)	3.20 (1.68)
Days to diagnosis ¹	0–86	31.17 (19.88)	28.52 (18.55)
		n (%)	n (%)
Country of birth ^{2***}			
USA		4 (14)	26 (96)
Mexico		18 (64)	0 (0)
Other		6 (21)	1 (4)
English-speaking ^{3***}		17 (61)	28 (100)
% Uninsured [*]		18 (64)	9 (33)
% High school ^{4±}		15 (54)	5 (19)
% Income of \$20,000 ^{**}		20 (71)	11 (41)
Discussion with primary care provider about result [±]		12 (43)	6 (22)
Diagnostic procedures following current abnormal result ⁵ :			
Diagnostic mammography		20 (71)	18 (67)
Ultrasounds		9 (32)	13 (48)
Biopsies		4 (14)	1 (4)
Receiving screening from Site A ^{**}		26 (93)	18 (67)
Agreed to participate before receipt of abnormal result		18 (64)	18 (67)
Received a definitive non-cancer diagnosis before T1		16 (57)	17 (63)
Telephone-based interviews		22 (79)	23 (85)

[±] $p < 0.10$,^{*} $p < 0.05$,^{**} $p < 0.01$,^{***} $p < 0.0001$.

Notes.

¹ Electronic medical record data were abstracted for the 20 NLWs and 24 Latinas who completed a HIPAA form.² Other countries of origin included Russia, El Salvador, Chile, Honduras, and Peru.³ Language preferences concern self-report; notably, all NLWs and 9 Latinas completed questionnaires and other study forms in English. The other 19 Latinas completed questionnaires and other study forms in Spanish.⁴ Variables were analyzed as continuous scores, but are presented dichotomously to facilitate interpretability.⁵ Diagnostic procedures are reported that were experienced after receiving the initial abnormal screening result that made women eligible for this study. Women often experienced more than one of these tests to resolve the abnormal mammogram.

Multivariate repeated measures analyses of covariance findings concerning breast cancer-specific adverse psychological consequences by time and ethnicity, adjusting for age, income, education, insurance status, and days to a definitive non-cancer diagnosis (n= 55)

Table 2

	Latinas (n = 28)		NLWs (n =27)		Main Effect Time	Main Effect Ethnicity	Interaction Ethnicity* Time
	T1 ¹ M (SE)	T2 ² M (SE)	T1 ¹ M (SE)	T2 ² M (SE)	F (1, 45)	F (1,45)	F (1,45)
Results-related distress	8.93 (1.05)	5.44 (0.85)	7.07 (1.05)	2.49 (0.85)	3.06 [±]	4.58 [*]	0.53
Perceived breast cancer risk	1.65 (0.15)	2.07 (0.14)	1.87 (0.15)	1.90 (0.14)	--	--	3.99 [*]

Notes.

¹ 30 days of the abnormal mammogram result.

² Three months after receipt of the initial abnormal mammogram result.

[±] $p < 0.10$

^{*} $p < 0.05$