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## Perceived and objective breast cancer risk assessment in Chilean women living in an underserved area

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### Abstract

**Background**—Breast cancer is the most frequently diagnosed malignancy among Chilean women and an increasingly significant public health threat. This study assessed the accuracy of breast cancer risk perception among underserved, Chilean women.

**Methods**—Women aged 50 to 70 years, with no mammogram during the last two years, were randomly selected from a community clinic registry in Santiago, Chile (n=500). Perceived risk was measured using three methods: absolute risk, comparative risk and numerical risk. Risk comprehension was measured by comparing women's perceived and objective risk estimates. Multivariate logistic regression was used to assess overestimation of perceived risk.

**Results**—Women at high risk of breast cancer were more likely than average risk women to perceive themselves at high or higher risk, using absolute and comparative risk approaches ( $p < 0.001$ ). The majority of participants (67%) overestimated their breast cancer risk, based on risk comprehension; although, participants achieved higher accuracy with comparative risk (40%) and absolute risk (31.6%) methods. [Age, breast cancer knowledge and Breast Cancer Risk Assessment Tool (BCRAT) 5-year risk were significantly associated ( $p < 0.01$ ) with accuracy of perceived risk].

**Conclusion**—Chilean women residing in an underserved community may not accurately assess their breast cancer risk, though risk perception and level of accuracy differed between perceived risk measures. Comparative and absolute risk methods may better reflect women's interpretation and accuracy of risk perception.

**Impact**—Improving our understanding of Chilean women's perceptions of developing breast cancer may lead to the development of culturally relevant efforts to reduce the breast cancer burden in this population.

### Keywords

Hispanic; Latina; Breast Cancer; Risk perception; Risk comprehension

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**Conflicts of Interest:** None

## Introduction

The burden of breast cancer in Chile has grown significantly. Currently, it represents the most frequently diagnosed cancer among women in Chile (1). The risk of developing breast cancer for Chilean women, approximately 3%–3.5% (2, 3), is less than the risk observed for all United States (US) women combined (12.3%) and US Latinas (9.7%) (4). Yet, the mortality-to-incidence ratio (MIR), a measure that approximates case-fatality rates, is approximately 29.8% in Chile, far greater than the 18.8% MIR reported for the US (5). Though new health policies directed at combating breast cancer and improving access to mammography were incorporated in 2005, increasing mammography access for women who are 50 years of age and older (6), data on mammography rates in some pilot areas of Chile suggested rates following program implementation were still as low 12% (7). Consequently, while increasing mammography access was an important step for Chile, other factors may also be important for breast cancer prevention efforts.

Perceived risk of disease, theoretically, is an important motivator of health behaviors to prevent, detect and control cancer (8), as it is assumed that aligning an individual's perceived and actual risk of developing breast cancer, leading to a more realistic perceived risk, will motivate such behavior (8, 9). Although limited, the evidence among Latinas suggests perceived breast cancer risk may not be associated with screening behavior (10, 11). Nevertheless, it is important to better understand risk perception among this population, since the motivation for protective behaviors may be in the underlying meaning of risk appraisal (8).

Given the gap in literature about breast cancer risk perception in South American women, the goal of our study was to explore breast cancer risk perceptions and accuracy of perceived breast cancer risk among underserved Chilean women, age 50 to 70 years, in Santiago, Chile. We were interested in assessing risk perception using absolute risk, comparative risk, and numeric risk approaches, as well as the factors previously shown to be associated with breast cancer risk perception (9, 10, 12, 13). The information provided in this study may contribute to better inform health policy makers on how to deliver preventive messages to improve breast cancer prevention.

## Materials and Methods

### Setting and Study Population

This study was conducted in El Castillo Oriente, Santiago, Chile, where the majority of residents were registered to receive free health care services at the university primary care clinic, including free screening mammography for women 50 to 70 years old (14). Women 50 to 70 years of age registered at the university primary clinic, who had not received a mammogram within the last two years, were eligible. Women with a previous breast cancer diagnosis were excluded. Using electronic medical records, eligible women were randomly selected and invited to participate. Among the 540 women invited, 12 refused to participate and 28 had a change of address/no contact, for a final sample of 500 women. Women who agreed to participate were asked to provide informed consent; consenting participants were interviewed in-person in the clinic.

### Instrument

Trained interviewers administered a structured questionnaire, including questions on sociodemographic factors, health behaviors, reproductive health, health care practices, and breast cancer prevention beliefs, attitudes, and practices. The questionnaire was developed from previous research and written at a low literacy level (15).

## Key Measures

**Sociodemographics and breast cancer knowledge**—Participant information was collected on race/ethnicity, education, marital status, family monthly income and occupation. We measured breast cancer knowledge using five items, on a 5-point Likert scale, related to breast cancer etiology, risk factors, screening and prognosis (15, 16). Knowledge score was calculated as the percentage of correct responses.

**Breast Cancer Risk Assessment Tool (BCRAT) risk**—The National Cancer Institute's BCRAT, also known as the Gail Model (17), was used to calculate participants' five-year and lifetime risk of developing invasive breast cancer. Among the BCRAT risk factors, only information on atypical hyperplasia was unavailable. Evidence suggests the BCRAT may underestimate absolute risk of invasive breast cancer in US Latinas (18).

**Perceived breast cancer risk**—Perceived risk of breast cancer was measured using three items: *absolute risk* - "How would you classify your probability of developing breast cancer?" (5-point Likert scale: 1-"Very low" to 5-"Very high"); *comparative risk* - "In general, how would you classify your risk of developing breast cancer compared to a woman who is about your age?" (7-point Likert scale: 1-"Much lower," to 7-"Much higher"); and *numeric risk* - "What level of risk do you think you have for developing breast cancer during your lifetime?" (Scale from 0% (No possibility of developing breast cancer) to 100% (I will develop breast cancer either way)) (15). We categorized responses as follows: *absolute risk* (Low: "Very low/low; Average: "Not low or high," and High: "high/Very high") and *comparative risk* (Lower: "Much lower/Lower/A little lower;" Equal: "About the same" and Higher: "Much higher/Higher/A little higher").

**Risk comprehension and accuracy of perceived absolute and comparative risk**—Risk comprehension was measured using participants' perceived numeric risk and BCRAT estimates (10, 19, 20). Risk comprehension was calculated as the difference ( $d$ ) between participants' perceived numeric risk and BCRAT lifetime risk ( $d = \text{perceived numeric risk} - \text{BCRAT risk}$ ). Risk comprehension categories were defined as *accurate*:  $d \pm 10$ , *underestimate*:  $-10 < d$ , and *overestimate*:  $d > 10$  (10, 19, 20).

Absolute risk, comparative risk and BCRAT five-year risk estimates were used to measure accuracy of perceived risk. Perceived absolute risk categories were defined as: *accurate*, if women with BCRAT five-year risk  $\geq 1.67$  responded as "High" or women with BCRAT five-year risk  $< 1.67$  responded as "Low" or "Average"; *underestimate*, women with BCRAT five-year risk  $\geq 1.67$  selected "Low" or "Average"; and *overestimate*, if women with BCRAT five-year risk  $< 1.67$  selected "High." Categories for perceived comparative risk were defined similarly: *accurate*, if women with BCRAT five-year risk  $\geq 1.67$  responded as "Higher" or women with BCRAT five-year risk  $< 1.67$  responded to as "Lower" or "Equal"; *underestimate*, if women with BCRAT five-year risk  $\geq 1.67$  selected "Lower" or "Equal"; and *overestimate*, if women with BCRAT five-year risk  $< 1.67$  selected "Higher."

## Statistical analysis

Descriptive statistics were used to assess participants' sociodemographic, breast cancer knowledge, and BCRAT risk factors. Pearson's chi-square and Fisher's exact tests were used to assess for associations between BCRAT risk category and perceived risk estimates. Multivariate logistic regression analyses were performed to examine factors associated with risk comprehension and accuracy of perceived risk, including ethnicity/indigeneity, education, age, and breast cancer knowledge. A significance level of  $p < .05$  was used for all statistical analyses.

## Results

### Sample characteristics

Participants' sociodemographic, breast cancer knowledge and BCRAT characteristics are shown in Table 1. The majority of participants were White or Mestizo with low education and low socioeconomic status. The mean age of participants was approximately 57 years old, with the majority giving first live birth at age less than 20 years, and having no family history of breast cancer or personal history of breast biopsy. Participants' mean BCRAT five-year and lifetime risk estimates were approximately 0.8% and 5.0%, respectively.

### Perceived risk of developing breast cancer

Table 2 shows the distribution of perceived absolute and comparative risk, by BCRAT risk category. Women at high risk of breast cancer were significantly more likely than average risk women to consider themselves to be at high risk, based on perceived absolute risk ( $p<0.001$ ). Similar results were observed for perceived comparative risk, although a greater proportion of women at average risk considered themselves to be at equal or higher risk of breast cancer relative to a woman of the same age. Among all participants, the mean perceived numeric risk was 33.2% (s.e.=1.3).

### Risk comprehension and accuracy of perceived absolute and comparative risk

A greater proportion of average risk women accurately estimated their breast cancer risk based on perceived absolute risk (86.3%) and comparative risk (77.5%) compared to high risk women (52.6% and 57.9%, respectively) (Table 2). Two-thirds of participants (67%) overestimated their risk of developing breast cancer, based on risk comprehension.

### Factors associated with overestimation risk

Table 3 shows results of multivariate regression analyses, which indicate that younger age and higher BCRAT five-year risk were significantly associated with overestimation of perceived absolute risk (OR=0.90 [95% CI=0.84–0.96] ( $p<0.01$ ) and OR=6.95 [95% CI=3.20–15.11] ( $p<0.01$ ) respectively). Higher breast cancer knowledge was significantly associated with lower odds of overestimating comparative risk (OR=0.72 [95% CI=0.57–0.91] ( $p<0.01$ )). None of the variables included in the multivariate regression were found to be significantly associated with the risk comprehension.

## Discussion

To our knowledge, our study is among the first to evaluate perceived and objective breast cancer risk, as well as factors associated with overestimating breast cancer risk among women in South America. The study included women from different ethnicity groups and used a strong methodology applying three different risk perception measures and BCRAT lifetime risk rather than 5-year risk.

Our results indicate that 67% of Chilean women overestimated their lifetime risk of breast cancer, based on risk comprehension estimates. These findings support the results of Graves *et al* (10), who reported that the majority of Latinas (81%) overestimated their breast cancer risk. Consequently, as seen in other studies (20, 21), Latinas may have inaccurate perceptions of breast cancer risk, tending to overestimate, when asked to put a numerical value on their lifetime risk of developing breast cancer.

However, previous studies have also shown that individuals' perceived risk varies depending on the method used and corresponding response format (8, 22), suggesting participants may overestimate breast cancer risk when using numeric risk, yet are more

accurate when using comparative or absolute risk (10, 22). Our study supports these findings, showing that while participants overestimated risk using a numerical approach, fewer women, overall, considered themselves to be at high or higher risk of developing breast cancer based on absolute and comparative risk. Accordingly, using a numeric, open-ended scale to elicit perceived risk may present a difficult challenge to participants; furthermore, comparative and absolute perceived risk measures, often based on categorical or ordinal responses, may allow individuals to place risk in a context of familiar and more intuitive events (22, 23). Therefore, comparative and absolute risk methods may better reflect women's interpretation of risk of developing breast cancer (24) and capture the accuracy of women's risk perception.

Prior studies assessing breast cancer risk perception suggest age, race/ethnicity, family history, knowledge, cancer worry, and education may be related to perceived breast cancer risk (9, 12). Among studies with Latinas, younger age (10, 13), higher breast cancer knowledge (12), and higher BCRAT 5-year risk scores or certain BCRAT risk factors (i.e. family history) (12, 13) were significantly associated with overestimation or higher perceived risk. Our findings support and add to this literature indicating that younger age, increased breast cancer knowledge, and higher BCRAT risk scores were significantly associated with overestimation of breast cancer risk among Chilean women.

### Limitations

This study also has some limitations. First, our study was composed of underserved, Chilean women aged 50 to 70 years, who were registered at a primary care clinic; hence, our results are most generalizable to a similar population. Second, given that our sample included women who did not adhere with mammogram screening recommendations, their risk perception may differ from women who receive mammograms regularly. However, the limited evidence available in Chile shows that this represents a minority group. Third, we did not measure mammogram adherence and, therefore, were unable to assess how participants' risk perceptions were related to mammogram utilization.

### Conclusion

In conclusion, this study shows that Chilean women living in an underserved community in Santiago may, as with many US Latinas, overestimate their risk of developing breast cancer. Importantly, the method used to measure perceived risk appears to affect women's responses and, therefore, accuracy of risk perception. While evidence on the impact of perceived risk on cancer prevention efforts among Latinas is limited, these findings improve our understanding of how Latina's appraise risk and factors associated with overestimating breast cancer risk. Further studies of how Latina's risk perception is associated with breast cancer prevention and control behaviors may lead to effective interventions that reduce the burden of breast cancer in this population.

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**Table 1**

Distribution of sociodemographic and breast cancer risk factors

Characteristic	Total Sample (n=500)	
	N	%
<i>Sociodemographic factors</i>		
Ethnicity		
White	228	45.6
Mestizo	229	45.8
Indigenous	43	8.6
Educational Attainment, years completed		
No schooling	43	8.6
1–7	287	57.4
8	58	11.6
9–11	64	12.8
12	48	9.6
Marital Status		
Single	77	15.4
Married	254	50.8
Living with partner	33	6.6
Separated/Divorced	63	12.6
Widowed	73	14.6
Occupation		
Homemaker/Informal Job	367	73.4
Housemaid/House Assistant	46	9.2
Merchant	38	7.6
Student/Other	49	9.8
Monthly Household Family Income, US dollars		
<206.4	281	56.2
206.4	219	43.8
	<i>Mean [95% CI]</i>	
<i>Knowledge Score</i>	2.2 [2.1, 2.3]	
<i>BCRAT risk factors</i>		
Age, years	57.1 [56.7, 57.6]	
Age at Menarche, years	N	%
< 12	64	12.8
12–13	232	46.4
14	202	40.4
Age at First Birth, years		
< 20	234	46.8
20–24	171	34.2
25–29/Nulliparous	80	16.0
30	15	3.0
Number of 1st Degree Relatives with Breast Cancer		



Characteristic	Total Sample (n=500)	
0	463	92.6
1	33	6.6
2	4	0.8
Number of Breast Biopsies		
0	490	98.0
1	9	1.8
2	1	0.2
<i>Mean [95% CI]</i>		
<i>BCRAT five-year risk of breast cancer</i>	0.82 [0.78, 0.86]	
<i>BCRAT Lifetime risk of breast cancer</i>	5.08 [4.87, 5.28]	

Notes: 95% CI=95% Confidence Interval, BCRAT=Breast Cancer Risk Assessment Tool. All estimates are based on participants who have a valid (non-missing) response to each variable.

**Table 2**Distribution and accuracy of perceived risk by breast cancer risk category<sup>a</sup>

Characteristic	Average risk (n=481)	High risk (n=19)	Total sample (n=500)
	n (%)	n (%)	n (%)
Perceived Absolute Risk <sup>b</sup>			
Low risk	267 (55.5)	4 (21.1) **	271 (54.2)
Average risk	148 (30.8)	5 (26.3)	153 (30.6)
High risk	66 (13.7)	10 (52.6)	76 (15.2)
Overestimate	66 (13.7)	n/a	66 (13.2)
Accurate	415 (86.3)	10 (52.6)	425 (85.0)
Underestimate	n/a	9 (47.4)	9 (1.8)
Perceived Comparative Risk <sup>b</sup>			
Lower risk	184 (38.3)	4 (21.1) **	188 (37.6)
Equal risk	189 (39.3)	4 (21.1)	193 (38.6)
Higher risk	108 (22.4)	11 (57.9)	119 (23.8)
Overestimate	108 (22.5)	n/a	108 (21.6)
Accurate	373 (77.5)	11 (57.9)	384 (76.8)
Underestimate	n/a	8 (42.1)	8 (1.6)
	Mean (s.e.)	Mean (s.e.)	Mean (s.e.)
Perceived Numeric Risk (%) <sup>c</sup>	33.1 (1.3)	70.0 (20.0)	33.2 (1.3)
Risk Comprehension <sup>d</sup>			
Overestimate	n/a	n/a	335 (67.0)
Accurate			163 (32.6)
Underestimate			2 (0.4)

Notes: s.e. = standard error; n.a. = not applicable.

<sup>a</sup>Participants' breast cancer risk category based on the National Cancer Institute's Breast Cancer Risk Assessment Tool (BCRAT).<sup>b</sup>For Perceived Absolute Risk and Perceived Comparative Risk, participants were categorized based on their BCRAT 5-year absolute risk of developing breast cancer, with high risk defined as BCRAT five-year risk  $\geq 1.67\%$  (n=19) and average as BCRAT five-year risk  $< 1.67\%$  (n=481). For both absolute and comparative risk estimates, women at high risk of breast cancer could not overestimate their risk and women at average risk could not underestimate their risk, since the BCRAT only categorizes as high risk or average risk; accordingly, these categories were not applicable for analysis.<sup>c</sup>For Perceived Numeric Risk, participants were categorized based on their BCRAT lifetime absolute risk of developing breast cancer, with high risk defined as BCRAT lifetime risk  $\geq 20\%$  (n=2) and average risk as BCRAT lifetime risk  $< 20\%$  (n=498); the BCRAT lifetime risk estimate was used to categorize participants, since the question on numeric risk asked women about their perceived risk of developing breast cancer over their lifetime.<sup>d</sup>Since the BCRAT lifetime absolute risk was used in calculating risk estimate, we did not stratify by BCRAT lifetime absolute risk estimate and present the risk comprehension for the entire study sample.

\*\* p&lt;0.01. All estimates are based on participants who have a valid (non-missing) response to each variable.

**Table 3**

Factors associated with overestimation of breast cancer risk

Characteristic	Absolute Risk <sup>a</sup>	Comparative Risk <sup>a</sup>	Risk Comprehension <sup>a,b</sup>
	(n=500)	(n=500)	(n=500)
	OR [95% CI]	OR [95% CI]	OR [95% CI]
Race/ethnicity			
White	Ref.	Ref.	Ref.
Mestizo	0.83 [0.48, 1.42]	1.01 [0.64, 1.61]	0.87 [0.59, 1.29]
Indigenous	1.06 [0.42, 2.68]	1.91 [0.93, 3.93]	0.80 [0.40, 1.60]
Age, years	0.90 [0.84, 0.96]**	1.01 [0.96, 1.05]	0.99 [0.96, 1.03]
Education, years completed	1.12 [0.89, 1.42]	0.95 [0.77, 1.17]	1.00 [0.84, 1.20]
Breast Cancer Knowledge	0.95 [0.73, 1.23]	0.72 [0.57, 0.91]**	1.21 [0.99, 1.46]
BCRAT five-year risk	6.95 [3.20, 15.11]**	0.90 [0.51, 1.59]	n/a

Notes: n/a = not applicable; OR = odds ratio.

<sup>a</sup>All estimates based on multivariate logistic regression adjusted for race/ethnicity, education, age, and breast cancer knowledge;<sup>b</sup>The logistic model for risk comprehension did not include participants' BCRAT risk as a covariate, since the risk comprehension estimate includes BCRAT lifetime risk in its calculation;

\* p&lt;0.05;

\*\* p&lt;0.01. All estimates are based on participants who have a valid (non-missing) response to each variable.