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Abstract

Background Numerous studies have shown that the majority of women overestimate both their own risk and the populations' risk of developing breast cancer. A number of factors have been found to correlate with perceived risk. **Methods** This paper reports on a telephone survey of a nationally representative sample of approximately 3,000 Australian women aged 30 to 69 years, conducted in 2007, and compares the findings with those of a similar survey conducted in 2003. **Results** There was a clear tendency for respondents to overestimate the proportion of women who will develop breast cancer during their lifetime. Approximately half the respondents perceived themselves as being at the same risk of developing breast cancer as other women their age; older respondents were more likely to perceive themselves to be at a lower than average risk. Family history was recognized as a risk factor for breast cancer, although there was evident confusion in relation to risk from paternal family history. It was also evident that the association between age and risk status is poorly understood, and misconceptions of breast cancer risk factors identified in the previous survey persisted in 2007. **Conclusion** Overall, these results suggest that there remains an educational challenge if we seek to increase the accuracy of women's perceptions of their risk for developing breast cancer, primarily in relation to the significance of age and family history as breast cancer risk factors.

Keywords

risk, breast, perceptions, factors, developing, cancer, australian, women

Disciplines

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Australian Women's Perceptions of Breast Cancer Risk Factors and the Risk of Developing Breast Cancer

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Abstract

Background

Numerous studies have shown that the majority of women overestimate both their own risk and the populations' risk of developing breast cancer. A number of factors have been found to correlate with perceived risk.

Methods

This paper reports on a telephone survey of a nationally representative sample of approximately 3,000 Australian women aged 30 to 69 years, conducted in 2007, and compares the findings with those of a similar survey conducted in 2003.

Results

There was a clear tendency for respondents to overestimate the proportion of women who will develop breast cancer during their lifetime. Approximately half the respondents perceived themselves as being at the same risk of developing breast cancer as other women their age; older respondents were more likely to perceive themselves to be at a lower than average risk. Family history was recognized as a risk factor for breast cancer, although there was evident confusion in relation to risk from paternal family history. It was also evident that

the association between age and risk status is poorly understood, and misconceptions of breast cancer risk factors identified in the previous survey persisted in 2007.

Conclusion

Overall, these results suggest that there remains an educational challenge if we seek to increase the accuracy of women's perceptions of their risk for developing breast cancer, primarily in relation to the significance of age and family history as breast cancer risk factors.

Introduction

Women's Perceptions of Breast Cancer risk

Numerous studies have shown that the majority of women overestimate both their own risk and the populations' risk of developing breast cancer (Buxton et al., 2003, Davids et al., 2004 and Smith et al., 1996). As hypothesized by many health behavior change models, some research supports the position that there is a positive association between risk perception and screening behavior; that is, the greater a woman's perceived risk, the more likely she is to comply with screening recommendations (Champion, 1999, Clemow et al., 2000, Hay et al., 2005, Lipkus et al., 2001 and Moser et al., 2007). However, it has also been argued that excessively overestimated perceptions of risk may deter some women from undergoing recommended screening (e.g., Calvocoressi et al., 2004 and Kash et al., 1995), including among women with a family history of breast cancer (Lerman et al., 1993 and Wong, 2009).

It could be argued that public health campaigns focus on increasing women's awareness of breast cancer risk factors and thereby increasing their self-perceived risk. However, because a significant proportion of women currently overestimate their breast cancer risk, it might be more useful to see the goal of risk communication as helping women *more accurately* understand their risk (Bottorff et al., 2004 and Vernon, 1999). This approach is further justified on the basis of both theory and research which suggests that if the risk (i.e., perceived susceptibility) is too high and the condition involved (e.g., breast cancer) is perceived as being very serious, the woman might be less likely to take the recommended actions as a result of a high level of fear (Ruiter et al., 2004 and Witte, 1994).

Predictors/Correlates of Women's Risk Perceptions

There is considerable evidence in the literature that younger women (i.e., those below the recommended age for mammographic screening) have the highest levels of perceived risk of breast cancer, despite being at the lowest actual risk (Alexander et al., 1996, Facione, 2002 and Yavan et al., 2010). However, there is also some evidence of a curvilinear pattern of risk perception, with lowest levels of risk perception among those aged 50 to 64 years (Polednak et al., 1991 and Smith et al., 1996).

It is generally agreed that women who are more knowledgeable about breast cancer risk factors, screening recommendations, and mammography are more likely to be screened (Pearlman et al., 1999 and Rimer et al., 2002). The limited research on the impact of education status on risk perception suggests a positive association between education level and accuracy of risk perceptions (Black et al., 1995 and Facione, 2002). There is also considerable evidence supporting a positive association between family history of breast cancer and increased levels of perceived risk (Lipkus et al., 1996 and Polednak et al., 1991).

Several other factors have been found to contribute to increased perceptions of breast cancer risk, including having had a prior benign breast symptom (Facione, 2002, Lipkus et al., 1996 and McQueen et al., 2008) and a range of physiological (e.g., general health) and psychological (e.g., stress) factors (Lipkus et al., 2001).

Research Questions

The purpose of the current study was to examine awareness of breast cancer risk factors and perceived risk levels of breast cancer among a population-based sample of Australian women, to see whether these changed over a 4-year period, and to identify the demographic correlates of risk perceptions. We also sought to examine the reasons given by women for their perceived risk levels.

Methodology

The 2007 Breast and Ovarian Health Survey was conducted from October to December 2007. The 2007 sample design replicated the main features of the 1996 and 2003 surveys, which have been described previously (Barratt et al., 1997, Paul et al., 1999 and Villanueva et al., 2008). The study protocol was approved by the university's Human Research Ethics Committee.

Phone numbers were selected from the electronic telephone directory. For each successful phone call, a woman was selected randomly from those women in the household aged 30 to 69 years, using the last birthday method (Lavrakas, Stasny, & Harpuder, 2000). The sample was stratified by state or territory, plus a second stratification to separate capital cities from the rest of the state or territory (with the exception of Canberra/ACT owing to the extremely small number of ACT residents that do not live in Canberra). Sample sizes were set for each stratum to allow production of estimates for states and area type and state-by-state

comparisons. Details of the sample weighting methodology have been reported elsewhere (Villanueva et al., 2008). Estimates have been calculated using the survey weights. All statistical analyses, except reporting of demographic characteristics, were undertaken using the survey weights.

More than 26,000 telephone numbers were attempted, and at least five call attempts were made to selected telephone numbers. Only respondents who reported in a screening question that they had never had breast cancer were included in the survey.

Survey Instrument

The survey included a series of questions in relation to women's perceptions of population breast cancer risk, their own perceived comparative risk, their perceptions of breast cancer risk factors, and the factors that influenced their comparative risk perceptions.

Respondents were asked "How many women do you think will get breast cancer in their lifetime?" and were offered four answers (not rotated): 1 in 5, 1 in 8, 1 in 14, or 1 in 20 (in the 2003 survey, they were offered six answers: 1 in 5, 1 in 8, 1 in 11, 1 in 13, 1 in 16, or 1 in 20). The accepted incidence of breast cancer has risen to 1 in 8 since the last survey period (where it was 1 in 11 in 2003; Australian Institute of Health and Welfare and the National Breast Cancer Centre [NBCC], 2006). The "1 in 11" option, which was widely publicized, was therefore removed from the 2007 survey to effectively force women to choose between 1 in 8 and 1 in 14, with the aim to determine whether women could estimate lifetime risk in a "ball park" range, rather than testing their ability to exactly estimate this number.

Respondents were asked, "Compared to other women your age, what do you think the chances are that you might get breast cancer at some time in the future?" and responded by selecting one of the following five categories (with the order alternated; i.e., first to last, then last to first): a lot higher, a little higher, about the same, a little lower, or a lot lower.

Respondents were asked the question, “What do you think are the two biggest risk factors for developing breast cancer?” to assess recall of breast cancer risk factors (unprompted). They were then given the following instruction: “I’m going to read you a list of possible risk factors for breast cancer. For each one, tell me if you think it is a big risk, a small risk, or no risk,” and were read a list of 15 possible risk factors in random order. Finally, they were asked, “What is the *main* reason for you thinking your chances of getting breast cancer are (specific response the person gave)?” This question was also asked in 2003 and differences in responses were compared using Z-tests of proportions.

Finally, they were asked a series of demographic questions (such as age, income, education level) and whether any members of their family had ever been diagnosed with breast cancer and, if so, what relation this person(s) was to the respondent.

Results

Sample Demographics

The response rate in 2007 was 32% (35% in 2003); that is, of the eligible households that were identified 32% resulted in a completed interview. A total of 3005 women aged between 30 and 69 years were surveyed in 2007; the demographic characteristics of the sample are displayed in Table 1. Over three quarters of the respondents were married or in a de facto relationship and the majority reported having children. Approximately three quarters of respondents were born in Australia. There was a smaller proportion of respondents born in the United Kingdom (9.7%), New Zealand (2.7%), South Africa (0.8%), United States (0.7%), and Germany (0.7%). The remaining countries (<20 respondents each) represented a wide range of locations across most continents. Because one of the inclusion criteria for the survey was being sufficiently fluent in English, this sample consists predominantly of those for whom English is a first language, and underrepresents groups in which English is not the

first language. Fewer than 2% described themselves as being Aboriginal or Torres Strait Islander. Of the respondents, 44.5% reported completion of high school as their highest level of education, and a similar proportion had completed a tertiary degree or a certificate or diploma (50.1%). About two thirds of the sample was employed either full or part time (63.7%).

Table 1. Demographic Characteristics of the Samples in 2003 and 2007

	2003	2007	<i>p</i>-Value
Age (yrs), mean (SD)	47.58 (10.18)	49.25 (10.65)	<.001
Marital status			.920
Married/de facto	77.3	77.4	
Other	22.7	22.6	
Had children			.215
Yes	85.4	86.5	
No	14.6	13.5	
Country of birth			.027
Australia	73.1	75.6	
Other	26.9	24.4	
Aboriginal/Torres Strait Islander			.844
Yes	1.5	1.5	
No	98.5	98.5	
Employment status			.033
Full time	32.4	32.8	
Part time	31.0	31.5	
Not in paid work	22.0	23.6	
Retired	14.6	12.1	
Perceived risk of breast cancer			.017
A lot higher	4.9	6.1	
A little higher	15.7	16.4	
About the same	53.5	49.5	
A little lower	16.2	17.6	
A lot lower	9.7	10.5	

Data are presented as percentages unless indicated otherwise.

A total of 2,995 respondents completed the survey in 2003. Table 1 displays the demographic characteristics of the sample in 2003 as well as differences between the 2003 and 2007 samples. Although the samples were similar on most variables, the 2007 sample was significantly older ($t = 6.21$; $p < .001$), were more likely to be born in Australia ($\chi^2 = 4.86$; $p = .027$) and were less likely to be retired ($\chi^2 = 8.71$; $p = .033$).

Approximately one third of respondents reported having a family member diagnosed with breast cancer ($n = 980$; 32.6%). Respondents were most likely to have an aunt with breast cancer (25.7%), which was also the most common relative in 2003 (28.1%), followed by grandmother and mother (20.1% each) and sister (9.0%). However, we cannot distinguish between those with “blood” relatives or other relatives with breast cancer.¹

Perceptions of Population Breast Cancer Risk

One third of the respondents (33.1%) correctly estimated the number of women who will develop breast cancer (1 in 8). Slightly fewer than half (47.8%) overestimated this number, with the remainder either underestimating (17.3%) or unable to provide an estimate. Those women who reported that one or more members of their family had been diagnosed with breast cancer were more likely to overestimate the incidence of breast cancer (50.9% compared with 46.2%; $\chi^2 = 21.785$; $p < .001$). There was a significant difference in the responses to this question between the three age groups of respondents (30–39, 40–49, and 50–59 years; $\chi^2 = 18.651$; $p = .017$; Table 2). Given the difference in response categories, it was not considered meaningful to compare results between 2003 and 2007 for this variable.

Table 2. Respondents' Estimates of the Proportion of Women Who Will Develop Breast Cancer by Age Group and Self-Reported Family History of Respondents (2007 Sample)

	1 in 5	1 in 8	1 in 14	1 in 20	Cannot Say	Total
Age group, yrs						
30–39	46.8%	36.8%	8.9%	6.8%	0.7%	100.0%
40–49	46.9%	33.0%	9.8%	8.6%	1.8%	100.0%
50–69	49.0%	30.7%	9.3%	8.3%	2.6%	100.0%
Family history						
Yes	50.9%	32.0%	10.4%	5.0%	1.6%	100.0%
No	46.2%	33.6%	8.8%	9.4%	1.9%	100.0%

Perceived Own Comparative Risk of Developing Breast Cancer

Approximately half of the respondents (49.5%) perceived themselves as being at “about the same” risk of breast cancer as other women their age. More respondents indicated that they perceived themselves as being at a reduced risk rather than an elevated risk (28.1% vs. 22.5%). A similar trend was observed in 2003 (Table 1), but there were some differences ($\chi^2 = 12.03$; $p = .017$). In particular, respondents in 2007 were more likely to indicate an increased risk (22.5% vs. 20.6%), less likely to indicate the same risk (49.5% vs. 53.5%), and more likely to indicate a lower risk (28.1% vs. 25.9%).

In 2007, there was also a significant association between age and perceived risk, with females aged 30 to 39 more likely to perceive a higher risk (25.8%) compared with those aged 40 to 49 years (22.9%) and 50 to 69 years (20.1%; $\chi^2 = 65.22$; $p < .001$). This trend was also observed in 2003 ($\chi^2 = 42.47$; $p < .001$), and suggests that younger women as a group have heightened perceptions of risk. It is important to note that the question asked was “Compared with other women your age,” so respondent age is not associated with the “correct” response to this question.

Respondents were dichotomized by household income (gross income <\$481 per week compared with >\$481 per week); those in the lower income group more likely to perceive

themselves as being at a greater risk of developing breast cancer ($\chi^2 = 11.405$; $p = .003$). There were no significant differences by residential location (urban vs. non-urban), Aboriginal and Torres Strait Islander (ATSI) status, education (no post-secondary, trade/diploma, tertiary), whether respondents had children,² or marital status (“single” vs. “partnered”).

Backward stepwise multiple regression was performed to identify factors independently associated with perceived susceptibility to breast cancer. The dependent variables entered into the model were ATSI status (ATSI, non-ATSI), employment status (employed, not employed), country of birth (Australia, overseas), marital status (single, partnered), number of children (≤ 3 , > 3), education level (i.e., high school or less, tertiary qualification/trade), and age in years. The best fitting model indicated that a combination of age, country of birth, and education level significantly predicted perceived susceptibility to breast cancer ($F_{3, 2585} = 16.525$; $p < .001$; $R^2 = 0.02$). In particular, lower age ($\beta = 0.012$; $p < .001$) and higher education level ($\beta = 0.121$; $p = .002$) significantly predicted a higher perceived risk of breast cancer; there was evidence of a weak association between country of birth and perceived susceptibility but this was not significant ($\beta = 0.080$; $p = .075$). Using the same approach for the 2003 data, lower age, being born overseas, being single, and being ATSI were significantly associated with higher perceived risk of breast cancer ($F_{4, 2742} = 18.909$; $p < .001$; $R^2 = 0.027$).

Perceptions of Breast Cancer Risk Factors

As shown in Table 3, 36.2% of respondents identified a family history of breast cancer (on the mother’s or father’s side) as a risk factor. The other commonly identified risk factors included smoking (14.9%), being overweight (5.7%), poor diet (5.6%), and other health-

impairing behaviors such as alcohol consumption and low exercise (5.4%). Furthermore, 14.8% of respondents did not identify any risk factors.

Table 3. Respondents' Perceptions of the Main Risk Factor for Breast Cancer (2007 Sample)

	30–39 Years	40–49 Years	50–69 Years	Total
Family history	587 (36.4)	611 (37.3)	856 (35.3)	2056 (36.2)
Smoking	269 (16.7)	250 (15.3)	328 (13.5)	847 (14.9)
Other health behaviors	91 (5.7)	92 (5.6)	125 (5.2)	309 (5.4)
Overweight	61 (3.8)	87 (5.3)	174 (7.2)	322 (5.7)
Diet	94 (5.8)	96 (5.9)	129 (5.3)	320 (5.6)
Getting older	56 (3.5)	57 (3.5)	40 (1.6)	152 (2.7)
Stress	25 (1.5)	50 (3.1)	76 (3.1)	151 (2.7)
Other reason	261 (16.2)	172 (10.6)	178 (7.3)	682 (12.0)
Cannot say	167 (10.4)	219 (13.4)	462 (19.0)	841 (14.8)

Figures in parenthesis indicate percent.

Importantly, the biggest risk factors for breast cancer, being female and ageing (or “getting older”) were not spontaneously mentioned by the majority of respondents. None of the respondents mentioned gender (“being a woman”), although it is possible that this was an underlying assumption that they felt did not need to be articulated. “Age” constituted only 2.7% of responses to this (unprompted) question; again, it is possible that respondents were considering the question based on their own risk (with age as a given) rather than the risk for all women. Further, a considerable number of the responses given by women were factors that are not supported by research, including a bump or knock to the breasts, smoking, stress, or use of underarm deodorant or antiperspirants; and 4.8% of women (i.e., approximately 1 in 8) could not name more than one risk factor for breast cancer.

The risk factors identified across age groups are also shown in Table 3. Z-Tests of proportions were performed to compare responses between the age groups. Because three comparisons were performed for each risk factor, statistical significance was determined by a

p -value < .017. Fewer women aged 50 to 69 years identified smoking ($Z = 2.756$; $p = .006$) and getting older ($Z = 3.638$; $p < .001$) as risk factors compared with those aged 30 to 39 years; fewer females aged 50 to 69 years also identified getting older as a risk factor compared with those aged 40 to 49 years ($Z = 3.686$; $p < .001$). Finally, more females aged 50 to 69 years identified stress as a risk factor compared with those aged 30 to 39 years ($Z = 3.051$; $p = .002$) and those aged 40 to 49 years ($Z = 2.748$; $p = .006$).

The results for nine of the most common/relevant risk factors from the prompted list of “possible” risk factors are shown in Table 4.

Table 4. Respondents’ Prompted Perceptions of Possible “Risk Factors” for Breast Cancer

	2003	2007	χ^2	p -Value
Mothers side: 1 relative			120.31	<.001
No risk	3.0	0.8		
Small risk	17.7	10.0		
Big risk	79.3	89.2		
Mother’s side: >1 relative			45.67	<.001
No risk	2.8	0.8		
Small risk	8.3	6.3		
Big risk	88.9	92.9		
Father’s side: 1 relative			103.012	<.001
No risk	15.5	7.6		
Small risk	56.0	65.8		
Big risk	28.4	26.6		
Father’s side: >1 relative			93.99	<.001
No risk	12.5	5.9		
Small risk	45.7	43.4		
Big risk	41.8	50.7		
Smoking			23.71	<.001
No risk	7.8	4.7		
Small risk	24.6	25.8		
Big risk	67.7	69.5		
Taking HRT			53.09	<.001
No risk	4.8	5.7		
Small risk	41.8	50.7		
Big risk	53.4	43.6		
Oral contraceptive pill			16.41	<.001

	2003	2007	χ^2	p-Value
No risk	11.0	10.7		
Small risk	56.6	61.5		
Big risk	32.5	27.8		
Getting older			12.52	.002
No risk	10.9	8.2		
Small risk	37.2	37.9		
Big risk	51.9	53.8		
Overweight			121.04	<.001
No risk	23.4	14.5		
Small risk	47.5	44.8		
Big risk	29.0	40.7		

Abbreviation: HRT, hormone replacement therapy.

Consistent with results from the previous unprompted question, having a relative on the mother's side with breast cancer was seen by almost all respondents as being a big risk (a relative, 89.2%; more than one relative, 92.9%). Consistent with findings from the unprompted question and 2003 survey findings, there was a definite difference in perceptions of the risk of a history of breast cancer in the mother's versus the father's family (89.0% vs. 26.6% identifying "a relative" on the mother's or father's side, respectively, as a big risk).

Approximately two thirds of respondents (69.5%) believed that smoking posed a "big risk" for the development of breast cancer. However, there is currently no strong evidence to support an association between smoking and breast cancer (NBCC, 2006). In the previous (unprompted) question, only 2.7% of respondents identified getting older as a "big" risk factor for breast cancer. However, results from this (prompted) question indicate that slightly more than half (53.8%) of respondents recognize getting older as a major risk factor for breast cancer when prompted. However, 37.9% of respondents rated getting older as a "small risk" for breast cancer, and 8.2% as "no risk."

Other factors that more than one third of the respondents identified as being "big risks" were stress, being overweight, and taking hormone replacement therapy (HRT). The former is not

supported by current evidence and the latter two have been found to be modest risks for breast cancer (NBCC, 2006).

As shown in Table 4, people in 2007 were significantly more likely to rate history of breast cancer on the mother's or father's side as a big risk factor for breast cancer compared with those in 2003. In addition, people in 2007 were significantly more likely to identify smoking and getting older as big risk factors, but were less likely to indicate that taking HRT or the oral contraceptive pill were big risk factors. HRT and the oral contraceptive pill have been found to be modest risk factors (NBCC, 2006). Awareness of the importance of exercise remains low, with 56.6% identifying lack of exercise as a small risk and 22.1% as no risk.

Analysis of the remaining factors indicated that many respondents correctly rated abortion (48.6%), use of underarm deodorant (39.4%), and a bump or knock to the breasts (23.1%) as "no risk" (data not shown). However, when we consider both "big" and "small" risk perceptions, we find that 73% see a bump or knock, 54.8% use of underarm deodorant as conferring a risk, and 89.6% "stress" as risk factors for breast cancer.

Association Between Perceptions of Risk and Perceptions of Risk Factors

Perceived higher than average risk

The most frequently cited main reason given for higher than average personal risk perceptions was family history of breast cancer (61.1% in 2007 vs. 59.6% in 2003; $p > .05$) followed by age (8.5% in 2007 vs. 5.1% in 2003; $p = .016$), a perception that the condition was so common (4.3% in 2007 vs. 3.2% in 2003; $p > .05$) and unhealthy lifestyle behaviors (3.5% in 2007 vs. 1.7% in 2003; $p > .05$). When the two main reasons were combined, the most common correlates of higher than average personal risk included family history (68.0% in 2007 vs. 72.7% in 2003; $p > .05$), age (12.9% in 2007 vs. 9.5% in 2003; $p > .05$), unhealthy lifestyle behaviors (9.0% in 2007 vs. 4.4% in 2003; $p < .001$), and a perception that

the condition is so common (5.6% in 2007 vs. 7.6% in 2003; $p > .05$). Finally, when all of the reasons given were summed (Table 5), 68.6% indicated family history (73.8% in 2003; $p = .040$), 13.7% indicated an unhealthy lifestyle (7.3% in 2003; $p < .001$), 13.5% indicated age (10.4% in 2003; $p > .05$), and 7.7% indicated smoking (11.6% in 2003; $p = .017$).

Table 5. All Named Reasons for Estimated Own Comparative Risk

	Lower Risk			Average Risk			Higher Risk		
	2003	2007	p^*	2003	2007	p^*	2003	2007	p^*
Family history	7.5	9.4	.171	12.6	12.3	.803	73.8	68.6	.040
No family history	68.6	63.6	.034	47.6	28.9	<.001	8.8	1.8	<.001
Smoking	1.0	1.1	.849	1.2	1.9	.114	11.6	7.7	.017
It is so common	4.7	0.7	<.001	31.6	25.6	<.001	8.0	5.6	.085
Stress	6.8	4.5	.044	2.5	2.4	.857	5.3	4.3	.401
Age	4.9	4.8	.928	7.3	5.3	.023	10.4	13.5	.087
Healthy lifestyle	84.7	93.8	<.001	35.0	36.3	.453	11.4	2.6	<.001
Unhealthy lifestyle	3.9	3.4	.596	4.1	6.0	.016	7.3	13.7	<.001
Hormone replacement therapy	5.4	2.2	<.001	4.8	1.6	<.001	6.1	3.9	.069
Contraceptive pill	4.4	2.2	.013	3.3	2.3	.093	4.2	3.0	.107
Regular checkups	21.3	21.5	.920	8.0	7.8	.841	0.9	2.4	.037
Other reason	21.2	22.3	.589	19.0	23.2	.004	30.5	28.2	.363

* p -Value derived from a Z-test of proportions.

Perceived average risk

The most common first-mentioned reason given by women who believed that they have an average chance of developing breast cancer was that they do not have a family history of

breast cancer (24.5% in 2007 vs. 40.2% in 2003; $p < .001$). This was followed by a perception that it is so common (21.5% in 2007 vs. 21.6% in 2003; $p > .05$), with 7.7% also indicating that it was because they believed they lived a healthy lifestyle (4.8% in 2003; $p < .001$). In terms of the combined first and second reasons, 27.9% indicated it was because they had no family history (46.5% in 2003; $p < .001$), 24.9% indicated that it was so common (30.2% in 2003; $p < .001$), and 22.9% indicated that it was because they led a healthy lifestyle (18.3% in 2003; $p < .001$). When all reasons were combined (Table 5), the most common reasons were having a healthy lifestyle (36.3% in 2007 vs. 35.0% in 2003; $p > .05$), no family history (28.9% in 2007 vs. 47.6% in 2003; $p < .001$), and because it is so common (25.6% in 2007 vs. 31.6% in 2003; $p < .001$).

Perceived lower than average risk

Virtually all of these respondents (96.9% in 2007 and 96.7% in 2003) were able to identify at least one reason for their being at lower than average risk. The primary driver of respondents' main perception of themselves being at lower than average risk of breast cancer was again the absence of a family history (54.2% in 2007 vs. 53.1% in 2003; $p > .05$) followed by healthy lifestyle (17.0% in 2007 vs. 15.7% in 2003; $p > .05$) and regular checkups (9.8% in 2007 vs. 8.2% in 2003; $p > .05$). When the first two reasons were combined, 61.8% indicated no family history (66.5% in 2003; $p = .049$), 58.4% indicated a healthy lifestyle (27.4% in 2003; $p < .001$) and 17.3% indicated regular check-ups (8.2% in 2003; $p < .001$). When all reasons were combined, 93.8% indicated a healthy lifestyle (84.7% in 2003; $p < .001$), 63.6% indicated the absence of family history (68.6% in 2003; $p = .034$), and 21.5% indicated regular checkups (21.3% in 2003; $p > .05$).

Respondents were asked "Compared with 5 years ago do you think your chances of developing breast cancer are now?", with the following response options read out (order

rotated): higher, the same, or lower (this question was not asked in 2003). More than half of respondents (51.6%) thought that their risk of developing breast cancer was about the same as it was 5 years ago; more than one third (38.7%) thought that it was higher and 9.2% thought that it was lower. Objectively, even disregarding any other risk factors, the association between advancing age and breast cancer risk means that the correct answer for all respondents would be “higher,” which again suggests that many women have insufficient comprehension of the influence of ageing on breast cancer risk.

Discussion

We used nationally representative samples of approximately 3,000 women aged 30 to 69 years in 2003 and 2007 to examine Australian women’s perceptions of their risk of developing breast cancer, the reasons underlying their perception of risk level, and the demographic correlates of risk level.

In both 2003 and 2007, there was a clear tendency for respondents to overestimate the proportion of women who will develop breast cancer, with “one in five” being the most frequent response. Interestingly, women with a family history of breast cancer were significantly more likely to overestimate the population risk of breast cancer; this may be because of their heightened sense of risk (i.e., they may have interpreted the question in terms of personal risk), or the increased salience of the condition may lead them to perceive it as more common.

Approximately half of respondents (53.4% in 2003 and 49.5% in 2007) perceived themselves as being at “about the same” risk of breast cancer as other women their age. In both time periods, a greater proportion perceived themselves to be at a little or a lot lower risk than perceived themselves to be at a little or a lot higher risk. However, there was a decrease in the percentage perceiving themselves as “about the same risk” in 2007 compared with 2003. This

suggests that more women are forming an opinion about their personal risk status, although it is not possible to tell from these data whether this is an accurate and informed opinion.

Interestingly, respondents in the youngest age group were more likely to believe that they have a higher risk of breast cancer than respondents in the middle or the oldest age group, suggesting that younger women as a group have heightened perceptions of risk. It is unclear why this is the case, other than the possibility that the younger women who agreed to participate in this research did so more often than older respondents because of a prior interest in breast cancer or, perhaps more likely (and supported by the literature in this area), that the media focus on young women with breast cancer increases risk perceptions in this age group (Jones, 2004). More than half of respondents (51.6%) thought that their risk of developing breast cancer was about the same as it was 5 years ago and almost 1 in 10 that it was lower, further supporting that many women have an insufficient comprehension of the influence of ageing on breast cancer risk.

There were a number of significant differences in respondents' perceptions of risk factors for breast cancer between 2003 and 2007. Respondents in 2007 were more likely to report that having one or more relatives on the mother's side with breast cancer, getting older, smoking and being overweight were "big risks" for breast cancer; the increase in awareness of lifestyle risk factors is potentially important if this translates to behavior change to reduce risk (although future research would need to examine whether this occurs). Conversely, respondents in 2007 were less likely to report that taking HRT or the oral contraceptive pill were "big risks." There seemed to be some confusion in relation to the role of paternal family history, with a decrease in those perceiving a big risk if a relative on the father's side had breast cancer but an increase in the case of more than one relative.

The most frequently cited reason respondents noted for their perception that they were at higher than average risk was having a family history of breast cancer; among the other

reasons cited were being a smoker and having lumpy breasts. Having a family history of breast cancer among first-degree relatives is a major risk factor that would certainly place a woman in a higher than average risk category. However, being a smoker and having lumpy breasts does not have any appreciable impact on breast cancer risk status. How high the woman's actual risk for breast cancer is depends on her age (risk rises with age) and the presence of other known risk factors. In essence, it seems that the presence of a family history of breast cancer is the factor that women use to determine whether they are in a higher than average risk category. A notable change between the two surveys was an increase in those attributing higher risk to "unhealthy lifestyle."

It seems that the large proportion of women who indicated they were at average risk because breast cancer is common are operating under the assumption that they are similar to most women and thus are at "average" risk for developing breast cancer. Whether they are truly in the average risk category depends on their status with regard to the other known risk factors. This could be a group that would benefit from participating in some type of risk assessment activity. It was noteworthy that there was a significant reduction between 2003 and 2007 in the proportion identifying "no family history" or "it is so common" as the reason for perceiving themselves to be at average risk.

The primary driver of respondents' perceptions of themselves being at lower than average risk of breast cancer was again the absence of a family history, having regular checkups, and being a nonsmoker. Although not having a family history of breast cancer is essential for a woman to be considered to be at lower than average risk, the evidence on smoking is inconclusive. The NBCC's 2006 Summary of Risk Factors for Breast Cancer concluded that environmental tobacco smoke is a modest risk factor for breast cancer, and having regular checkups clearly has no impact on the risk of cancer occurring (although it does have a substantial impact on treatment and outcomes). However, to be in a lower than average risk

category also requires the woman to not have other known risk factors (e.g., nulliparity, postmenopausal HRT use, postmenopausal obesity, history of benign breast disease). This finding that perceived risk is strongly associated with presence (or absence) of family history of breast cancer is consistent with a number of studies that have reported a positive association between family history of breast cancer and increased levels of perceived risk. In relation to low perceived risk, previous studies have found that, among women who perceived their risk as below average, heredity (i.e., absence of family history of breast cancer) was the key risk-decreasing factor (Humpel and Jones, 2004 and Lipkus et al., 1996). Consistent with the findings for higher perceived risk, there was an increase between 2003 and 2007 in those who attributed lower perceived risk to a “healthy lifestyle.”

We found no differences in perceived risk as a function of residential location (urban vs. non-urban). We did find some demographic factors associated with perceived risk levels. However, regression analysis indicated that all of these factors combined (including age) predicted less than 3% of the variance in risk perceptions, suggesting that other factors are more important to a woman when she is subjectively estimating her risk of breast cancer.

It is important to interpret our findings with some caution given aspects of the sample. Although the sampling procedures used are consistent with those used in national health surveys, only 32% of the eligible households that were identified in 2007 and 35% of eligible households in 2003 resulted in a completed interview. Because we do not know how the responding and non-responding households differ, we cannot be sure that the data-producing sample is representative of the total eligible population. It is possible that women with a family history of breast cancer, or with a greater interest in breast cancer risk factors, were more likely to respond to the survey, which may limit the extent to which this sample is representative of Australian women. As with previous surveys, for logistical reasons

respondents were only considered eligible if they were sufficiently fluent in English, making this one of the most prominent sources of selection bias.

In conclusion, we found that women overestimated the incidence of breast cancer in the population, but the majority perceived themselves as at average or lower than average risk. Results from this study suggest that much remains to be understood about how breast cancer risk perceptions are formed and their subsequent impact on behaviors. Our data suggest that the dominant factor in determining a perceived level of risk is family history—either its presence or absence. Further, the results suggest that increasing age may not be as important as it should be in determining a perceived level of risk. Women identified a range of risk and protective factors, including some for which there is evidence of an association (such as weight, exercise, and HRT), some for which there is no strong evidence to support an association (such as smoking and stress levels), and some for which there is no evidence of an association (such as positive attitudes). Finally, our results indicate that other breast cancer risk and protective factors seem to play a relatively minor role in determining perceived risk level for breast cancer.

It is clear that a number of misperceptions about breast cancer risk continue to influence women's perceptions. For example, many women report that they are “protected” by factors for which there is no evidence (such as having a positive attitude and low levels of stress). Similarly, there is an evident misperception that regular checkups³ (which may include mammographic screening and/or or clinical or self-examination) reduces the risk of developing breast cancer.

Overall, these results suggest that there remains an educational challenge if our goal is to have a significant percentage of women with an accurate perception of their risk for developing breast cancer. The greatest challenges relate to having women understand the significance of age and family history as breast cancer risk factors. However, it is

encouraging to note increasing awareness between 2003 and 2007 of the role of modifiable lifestyle behaviors in breast cancer risk, suggesting a possible target for social marketing campaigns to reduce behavioral risk factors. If we develop a more comprehensive understanding of the sources that women use to develop their risk perceptions, it will be possible to develop focused, or tailored, educational interventions that will result in the woman being more likely to engage in appropriate screening and preventive behaviors.

¹ Although we can reasonably assume that, for the majority, “mother” and “sister” are blood relatives, we cannot rule out the possibility of step relationships or adoption; this is even more complex with relationships such as “aunt” (the most common response), because this may or may not be a blood relative.

² In 2003, women who had children perceived themselves as being less vulnerable to breast cancer (Pearson's $\chi^2 = 15.79$, $p = .003$), however this was not the case in 2007.

³ The term “regular checkups” was the wording used by women in the unprompted question regarding reasons for perceived lower than average risk.

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