RESEARCH ARTICLE

Barriers to Breast and Cervical Cancer Screening in Singapore: a Mixed Methods Analysis

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Abstract

Background: In order to increase breast and cervical cancer screening uptake in Singapore, women's perceived barriers to screening need to be identified and overcome. Using data from both focus groups and surveys, we aimed to assess perceived barriers and motivations for breast and cervical cancer screening. Materials and Methods: We conducted 8 focus groups with 64 women, using thematic analysis to identify overarching themes related to women's attitudes towards screening. Based on recurring themes from focus groups, several hypotheses regarding potential barriers and motivations to screen were generated and tested through a national survey of 801 women aged 25-64. Results: Focus group participants had misconceptions related to screening, believing that the procedures were painful. Cost was an issue, as well as efficacy and fatalism. Conclusions: By identifying barriers to and motivators for screening through a mixed-method design that has both nuance and external validity, this study offers valuable suggestions to policymakers to improve breast and cervical cancer screening uptake in Singapore.

Keywords: Breast cancer - cervical cancer - screening - focus groups - fear - attitude - motivation

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Introduction

For women in Singapore, breast and cervical cancer are the first and tenth most common types of cancer (National Registry of Diseases Office, 2016). Given the benefits of preventative breast and cervical cancer screening (Vecchia et al., 1984; Kerlikowske et al., 1995), Singapore became the first Asian country to launch a population-based national breast cancer screening program called BreastScreen Singapore in 2002 (Wang, 2003). This was followed in 2004 by CervicalScreen Singapore, a national cervical cancer screening program (Yeoh et al., 2006).

BreastScreen Singapore targets women aged 50-69 to receive mammographic screening once every two years. Although the initial goal was 70% participation for women aged 50-64 by 2008 (Yeoh et al., 2006), coverage for mammographic screening was 39.6% in 2010 (Loy et al., 2015) and 35.7% in 2014 (Ministry of Health, 2015). CervicalScreen Singapore targets sexually active women aged 35-64 to have regular Pap smears. The initial goal was 80% coverage of targeted women by 2010 (Yeoh et al., 2006). In 2014, the coverage for Pap smears was 52.8% (Ministry of Health, 2015). Since neither program has met the target-screening rate, it is important to understand barriers to screening and methods for motivating more women to screen at the recommended intervals.

Past studies have found many barriers to breast and cervical cancer screening. These include underlying negative beliefs about cancer screening, fatalism, pain and embarrassment associated with screening procedure, lack of belief in personal susceptibility to cancer, low income, lack of health insurance, poor knowledge about screening, lack of physician recommendation to screen, lack of trust in physicians and hospitals, lack of social support, transportation issues, language barriers, and concerns about screening cost (Seow et al., 1995; Seow et al., 2000; Parsa et al., 2006; Schueler et al., 2008; Othman et al., 2009; Alexandraki and Mooradian, 2010; Hou et al., 2011; Donnelly et al., 2013; Donnelly et al., 2014; Khazaee-pool et al., 2014; Lee et al., 2014; Seetoh et al., 2014; Bayrami et al., 2015; Chaowawanit et al., 2016). This list of barriers is comprehensive but limited in several aspects. First, the role of emotions in preventing women from getting screened has not been investigated in detail. Some studies have reported that fear is an important barrier to screening (Azami-Aghdash et al., 2015; Driscoll, 2015). However, it is not clear what women fear specifically. This requires an in-depth qualitative exploration.

Second, almost all of the previous studies have been either qualitative or quantitative research. Though qualitative studies provide an in-depth understanding of complex nuances in attitudes towards cancer screening, they lack external validity as most of these studies are conducted using small purposive samples. Qualitative

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studies are also limited by their inability to statistically assess relationships between attitudes and behaviors. For instance, while a qualitative study could show that women are fearful of being diagnosed with cancer, a quantitative analysis is needed to assess the statistical association between fear and screening behavior to test whether this fear is a barrier to screening. Conversely, studies reporting only quantitative results from surveys fail to explore complex relationships in depth. A mixed-methods approach combining both qualitative and survey data can overcome this limitation since the qualitative research emphasizes a subjective-contextual approach while the quantitative research emphasizes an objective-generalized one. Such mixed-methods analysis can be a powerful method to gain greater understanding of human behaviors such as cancer screening. However, such studies are limited in number, especially in Asia.

To build on previous studies, we analyzed data from (qualitative) focus group discussions and a (quantitative) national survey in this paper. The aim of the focus groups was to explore attitudes towards breast and cervical cancer screening among women in Singapore, including perceived barriers and motivations to screen. Focus groups also generated hypotheses to be tested in the survey. The survey aimed to assess whether specific attitudes could be barriers or motivations to screen for breast and cervical cancer. Data collection occurred distinctly and sequentially with focus groups preceding the survey. The combined results provide greater insight than with one method alone. Findings can inform strategies to increase screening rates for breast and cervical cancer.

Materials and Methods

Data collection:

Focus groups: We conducted 8 focus groups of Singaporean women eligible for breast and cervical cancer screening services. Each focus group consisted of 7-9 participants who were recruited using purposive sampling to provide a range of demographic characteristics (age, marital status, and socio-economic position as measured through education and housing type). Recruitment was done through a third-party market research firm. Focus groups were held between August and September 2013 and were stratified by screening type (mammography or Pap smear), screening status (screener or non-screener), and language (English or Mandarin). Each lasted approximately 90 minutes. A trained female moderator facilitated each session using a discussion guide developed by the study investigators. All sessions were audio and video-recorded

The focus groups relied on a guide that was developed based on a literature review of women's utilization of breast and cervical cancer screening services. It addressed topics such as barriers to screening and interventions aimed at increasing screening rates. It also included open-ended questions inviting participant suggestions about ways to improve the screening programs. In addition, the focus groups encouraged women to voice how their emotions, such as fear, influenced their screening behavior. The discussions were transcribed ad verbatim and quality checked by the research team.

Surveys: We conducted and pooled the data of two nearly identical national surveys of attitudes towards breast and cervical cancer screening between September 2014 and June 2015. With a target sample size of 400 women aged 40-65 years for breast cancer screening and 400 women aged 25-65 years for cervical cancer screening. Two sampling frames of 1,000 households were randomly drawn from the national database of dwellings maintained by the Singapore Department of Statistics. The frames were constructed such that at least 1 resident met the age inclusion criteria of the respective surveys. However, as it was not possible to identify the gender of the resident(s) meeting the age inclusion criteria, 15% of the households were found not to have an eligible respondent. For households with multiple eligible respondents, one was randomly selected to participate in the survey. Among the 54% households that were both eligible and reachable, 46% agreed to take part in the surveys. In the remaining 31% of households, no household member could be contacted even after 4 attempts. We replaced these households by eligible neighbors until our target sample size was reached for each survey. A total of 801 women were interviewed face-to-face using computer-assisted interviewing. The survey included a series of multiple-choice questions about attitudes towards breast and cervical cancer screening followed by a discrete choice experiment the results of which will be reported elsewhere.

Data analysis: Analysis was done sequentially in the following order: focus group, survey and triangulation. Triangulation describes the process of interpreting findings from the quantitative and qualitative portions of the study together in the context of one another to gain a more complete picture of the study question.

Focus groups: Inductive coding was performed by 2 coders. The codes were then reconciled by a senior investigator and collated to form sub-themes and broad themes using thematic analysis after discussions with other team members. Representative quotes articulated during the focus groups were selected for each theme and sub-theme.

Surveys: Based on the recurring themes from the focus groups, we generated a list of potential barriers and motivations and framed these as hypotheses to be tested in the survey. The survey questionnaire included multiple-choice questions/statements to test these hypotheses.

To assess whether certain attitudes were barriers or motivations to screen, we stratified results by screening status. Screeners were defined as women who had screened at least once. We compared the proportion of screeners and non-screeners agreeing with the statement using the chi-square test. Analysis was done using STATA version 13.1.

Triangulation: Triangulation of results from the two sources was done during data interpretation. Finally, we summarized the unified findings and identified the uniqueness of both data sources.

Ethics approval for both components was obtained from the Institutional Review Board at the National University of Singapore.

Results

Focus groups: Table 1 includes demographic information for focus group participants. A total of 64 women participated in 8 focus groups.

Analysis of the focus groups yielded 7 broad themes that represent attitudes of women related to screening. Table 2 lists the themes along with sub-themes and supportive quotes. These themes are summarized below:

1. Fear of cancer diagnosis: Fear related to cancer diagnosis was deconstructed into 11 sub-categories. These included the fear that you will get cancer if you look for it, fear of disrupting the belief that they are ok, fear of poor quality of life related to cancer, fear of ineffective treatments, fear of side effects of treatment, fear of financial burden of treatment, fear of lifetime of medication, fear of losing confidence as a woman, fear of social stigma, fear of relapse, and fear of death.

2. Knowledge regarding screening: Focus group participants had misconceptions related to screening. For instance some thought that mammograms are harmful to their breasts. Women also seemed to lack awareness about the recommended age for initiation and frequency of screening. To motivate women to screen, focus group participants suggested increasing awareness regarding screening via mass-media and social channels.

3. Perceptions of screening procedure: Focus group participants believed that the screening procedure was painful and involved a loss of privacy. Some women cited involvement of male staff in the screening procedure and previous bad experiences personally or by friends and family as being deterrents to future screening. Therefore, participants suggested that messages encouraging women to screen should emphasize that screening is not painful or uncomfortable.

4. Direct and indirect costs of screening: Many focus group participants stated cost as a barrier to screening. For many women, especially those who were employed, screening had indirect costs such as the inconvenience involved in travelling to the location, difficulty in making an appointment, waiting times involved, and foregoing other potentially more essential health check-ups. Participants suggested making screening locations more accessible, combining breast and cervical cancer screening with regular health check-ups, reducing premiums for health insurance for screeners, reducing screening costs or making it free, and allowing them to pay for it from Medisave, a health saving account.

5. Perceived efficacy of screening: Some participants expressed concerns that screening is not able to detect cancers early.

6. Risk perception: Some focus group participants believed in fatalism. Some felt themselves to be at a low risk of cancer and felt no need to screen.

7. Appropriate cues to action: Many focus group participants said that they simply forgot to go for screening so reminders such as physician advice, mail reminders and polyclinics setting up appointments for them to screen would be helpful.

Surveys: The surveys built on the most prominent or novel results of the focus groups. Based on the results of the focus groups, we hypothesized that the following could be barriers to breast/cervical cancer screening: (a) lack of knowledge regarding age for initiation of screening, (b) lack of knowledge regarding frequency of screening, (c) not wanting to know about cancer diagnosis, (d) fear of financial burden of treatment, (e) fear of recurrence, (f) fear of unnecessary treatments, (g) fear that treatment for early breast/cervical cancer may be ineffective, (h) perception of pain during mammography, (i) fear of screening being carried out by a health care professional not of preferred gender, (j) fear that screening will not detect early stage breast/cervical cancer, and (k) perceived low risk of getting breast/cervical cancer. Based on focus groups, we also hypothesized that the following could motivate women to screen for breast/cervical cancer: (a) paid leave at work, (b) free screening, (c) lower premiums for those who screen, (d) screening cost covered by Medishield (a low-cost, high-deductible public health insurance scheme), and (e) appointments to screen set by polyclinics.

Table 1 includes demographic information for survey participants. 801 women responded to the survey. Of those, 533 had previously screened at least once for

Table 1. Demographics of Focus Groups and Survey Participants

	Focus groups (N=64)	Survey (N=801)
	n (%)	n. (%)
Responded to		
Breast cancer screening group/ survey	32 (50)	400 (49.9)
Cervical cancer screening group/ survey	32 (50)	401 (50.1)
Socio-demographic characteristics		
Age (breast cancer screening group/survey)		
40-49 years	7 (21.9)	151 (37.7)
50-59 years	19 (59.4)	170 (42.5)
60-65 years	6 (18.7)	79 (19.8)
Age (cervical cancer screening group/survey)		
25-34 years	6 (18.8)	110 (27.4)
35-46 years	8 (25)	140 (34.9)
47-55 years	10 (31.2)	84 (20.9)
56-65 years	8 (25)	67 (16.7)
Ethnicity		
Chinese	58 (90.6)	558 (69.7)
Malay	2 (3.1)	118 (14.7)
Indian	3 (4.7)	87 (10.9)
Others	1 (1.6)	38 (4.7)
Marital status		
Married	48 (75)	661 (82.5)
Widowed/divorced/separated/ never married	16 (25)	128 (16.0)
Prefer not to say	0 (0)	12 (1.5)
Highest educational attainment		
No formal education/primary, no. (%)	7 (10.9)	151 (18.9)
Secondary/vocational/ITE	29 (45.3)	317 (39.6)
JC/poly/diploma/university and above	28 (43.7)	333 (41.6)
Employment status		
Working full-time/part time	45 (70.3)	483 (60.3)
Homemaker/Retired/not working	19 (29.7)	318 (39.7)

Table 2. Findings from Focus Groups

Themes And Codes	Supportive Quotes
Fear of cancer diagnosis	
Fear that you will get it if you look for it	yah…some people would think in that way. Without checking, they are fine but after going for one, something bad will happen to them. So they don't want to check. (F3)
Fear of disrupting the belief that they are ok	If someone tells you that you can only live for so long then will you feel at peace? I rather not know, then I can live happily.(H4) You don't know whether the result will be good or bad. You don't know whether you will get it. Unless when the result comes, it states you are fine. Then you will be very happy. If you get breast cancer, you will be very sad. You will think if I knew I would be sad, I won't go for the test. And I will just die when the time comes. Why should I wait for that moment to come? It is a great suffering. (F5) Spending money to buy "worries". (G1)
Fear of death	Scared the lump is cancerous and you will have to wait to die. Scared of this. (F6)
Fear of poor quality of life with cancer	Actually it's more like all rounded you see, it actually affects everything around you. From your family, your personal, your work like, your social life, everything is affected. Ya... I mean you can used to be very active, but through certain treatment or operation whatever thing, your lifestyle have to change slightly a bit. it will affect your the loved ones, it'll affect your job, you know you may be in a very high up fast-paced job and because you have certain treatment uh uh uh medical treatment already, then what you do is you may have to switch jobs also. and then your company, employer and your boss may treat you very differently. (C6)
Fear of ineffective treatments	The worry if the treatment (for cancer) will be successful. What if its not. (A4)
Fear of side effects of treatment	So she told me the chemo is really bad... the treatment is really bad, the chemo is hell, her description is it's really in hell, no one can understand the kind of pain, (D5) I could feel that it is very painful. Apart from losing the breast, she has to suffer from other side effects of the treatments. She lost her hair and her eyebows. She felt that she was no longer like a woman. She felt really misereable. (E5)
Fear of financial burden of treatment	Each chemo can cost thousand odd dollars. Yes, you will become a burden to your family members. (F6)
Fear of lifetime of medication	Many are worried if they will have a relapse after their recovery. Must they still go for further follow- up sessions or Just take their medications only. (H8)
Fear of losing confidence as a woman (e.g. fear of not being able to marry, unable to give birth, losing spouse etc.)	If let's say you need to remove your breast, you're not a wholesome-whole lady. Correct, something is gone. (B4)
Fear of social stigma	Cancer is like a a taboo you know. When people know ah.. Somehow you feel. I mean, as a Indian I feel like she got cancer and everyone starts to stay away from you. Because they have this mentality its contagious. (A7)
Fear of relapse	You cant control it, it could relapse. That's one of the things that play a part- (C1) and the thing about cancer is it could come back again so it could be really costly. Yea you may relapse again so- (C1)
Motivation: Messages to emphasize that screening is a win-win situation and a negative test confers peace of mind.	Also I want to have a piece of mind after my screening. when we are unsure of our health condition, we want the doctor's advice to make us feel comfortable. (H8)
Motivation: Messages to encourage women to screen for the sake of their families	a lot of people say i rather die i don't want to give burden to my family right, so if you tell them about your health and all these things they say at most i die la, don't want to give burden to families and this kind but then you say do it for your family. you want to see your children grow up, do it for your family. i mean it's something that is very sharp and to tell you that if you love your family, do it. then maybe it may hit somebody say, ya, not for myself but for my family. (A3)
Motivation: Encourage screening with a friend or in a group	For first-timer, they may feel quite embarrassed or worried about how to go about it so if there's a friend accompany and encourage them, they will feel more at ease. Should there be any 'bad' report, there's still an experienced friend to give them some moral support. (H6)
Knowledge regarding screening	
Lack of knowledge regarding age for initiating screening	I think there is a range of age but I am not too sure about the exact range. (E3)
Lack of knowledge regarding screening frequency	But then I feel it's good to have one yearly. I don't know why some places like polyclinic they advise 3 years but quite worrying if 3 years so long (D2)
Misconceptions regarding side effects of screening	They said that mammogram will affect the tissues/cells in your breast. You may turn from "healthy" to "unhealthy". Ah… (F1)

Table 2 (continued). Findings from Focus Groups

Motivation: Increase awareness regarding screening through various mass-media and social channels; use celebrities and cancer survivors to increase awareness	Why not they educate the public about the symptoms so at least we would know when we should go. Because now Singapore actually we are very ignorant about this kind of thing. We know what is pap smear but the doctor never tell us what is the symptoms, at least to watch out for the symptoms before you go. (C2)
Perceptions of screening procedure	
Unpleasant past experience of self or others	Last time when they say you can go down for free uh… pap smear then I went. But it wasn't a very pleasant experience after that I didn't go anymore (C5)
Having an unsupportive or inexperienced doctor	I was so scared. I was so worried. I did not know what she was doing. If it is done by an experienced doctor, it will be very fast, about five minutes. And it will not be painful. It should not be painful. But when I met this female doctor, she kept touching here and there. She kept changing things. It became very uncomfortable. I became very scared. She said it was very difficult to take the... (G3)
Lack trust on the doctor	Sometimes doctors cannot be trusted (C2)
Fear of pain	Several years ago, many of my colleagues went for mammogram. I also wanted to go for one but two of my colleagues who had gone told me not to do so because it was extremely painful. Since they said so and I am not a very brave person, I didn't go in the end. I did not have the courage to accept it. (E7)
Preference for doctor to be of a certain gender	Must be female doctor. (A1) Yes because male is more empathetic. Female, alamak alittle bit you also cry or scream, you know that kind of thing. They not empathetic it's like all women can do it you can do it. Male is different they will be like, oh yes yes it's very painful, you know very empathetic (D5)
Motivation: Messages to emphasize that screening is not painful or uncomfortable	So there should be more promotion/campaign to explain to people that the procedure is not that painful. They won't compress your breast to become totally flat. (*laugh) Some people heard from their friends that it is very painful, then they decided not to go for screening. So they can have campaigns to educate people the importance of mammogram and tell them that it is not that painful. If not, they cannot come to a decision on it. (E1)
Direct and indirect costs of screening	
Inconvenient time	weekdays we can't go, and on saturdays it is pretty crowded.(A4)
Inconvenient location	Of course. We all want convenience. The moment you know that you have to transfer buses several times, you will find it very troublesome. (E5)
Difficulty in making appointments	Every time I don't find any appointment date suitable for me. You've to wait a for a few months, (A8)
Long waiting times	Yea, waiting for the appointment, and when you're there you still have to wait, yea correct. So I personally don't like to wait too long, yea, so that is the only reason that will stop me from going. If not I will love to go again. (A3)
Cost as a barrier	For me it's cost. If it is free, I'll be the first in the queue. (A7)
Do not trust quality of subsidized screening	I think if it's free one they will just roughly do. (A7) They will make a fast one because there is a long queue. (A6)
Motivation: Make screening locations more accessible	We are so busy. If you ask people to take leave to go for screening, they may not want to go. But if you bring the service to their doorstep, they have no more excuses. (E5)
Motivation: Combining breast and cervical cancer screening with other regular health check-ups	It will be good if it comes as a package at a discounted rate. The package can include screenings for other common cancers. It will attract me. (E1)
Motivation: reduce premiums for health insurance, reduce the cost of screening, free screening, make subsequent screening free, ability to use one's Medisave to offset cost of screening.	For myself, I have never done it before and I only let my gynae check for me. But if you give it to me free, I will try it. I won't mind the pain since it is free. (E7)
Perceived efficacy of screening	
Don't think that screening detects cancer at early stages	Yea. Because, I came across my friend, still go mammogram, but detect the breast cancer at the latest stage. And then, that's why I said then don't go for mammogram check la. (laughter). (A6) Mammogram I think it's not really very accurate. Because I think after you go for mammogram, sometimes also the person may detect they have breast cancer. I think it's not very accurate. (B3)
More effective option in ultra-sound	I feel this is Just a basic screening for minor cervical problems. But for major hidden cervical problem, an ultrasound is more effective than pap smear . So sometimes there may be fibroids at the cervix, so a normal pap smear cannot detect it but with an ultra sound such condition can be detected clearly. (H6)
Risk perception	
Fatalism	Yeah she said it's fated. No need to go. She even tell us not to go. (B1) Your life and death are predetermined. (F5)

Table 2 (continued). Findings from Focus Groups

Lack of perceived susceptibility to cancer	I have so many illness, I think there's is no space for it. (laughter) Im diabetic, I have rheumatism, I have crooked feet, I'm asthmatic, i drink, i smoke, I'm just enjoying life la, if it has to have come it'll come. I don't think so, touchwood la, because no family history. touch wood touch wood. (A7)
	To me I always think I'm less. Why must I go and think more negative things… then I stress myself. In a way you stress yourself the more you stress yourself the more you will get it. So I always think of positive (D6)
Appropriate cues to action	
Forget to go	I also can't remember I have to go for such checkups (laughter). I think because of work, too busy, then you just tend to forget. (A4)
Motivation: Provide cues to action, such as physician advice, mail reminders, insurance mandates	They should send reminding letters when the test is due. If not, you will not take it to heart. Your family members may not remind you too. But when you receive the letter, you will remember to go. (E6)

Table 3. Attitudes among Screeners and Non-screeners: Findings from the Survey

	TOTAL	By Screener type		p-value
	n(%)	Non-screened (N=268) n(%)	Screeners (N=533) n(%)	
Potential barriers				
Strongly Agree/Agree that I do not want to know that I have breast/cervical cancer	204 (25.5)	74 (27.6)	130 (24.4)	0.323
Strongly Agree/Agree that I am worried that I will not be able to cope up financially if diagnosed with breast/cervical cancer	603 (75.3)	206 (76.9)	397 (74.5)	0.461
Strongly Agree/Agree that I would worry of recurrence even after successful treatment	676 (84.4)	223 (83.2)	453 (85.0)	0.512
Strongly disagree/Disagree that early breast/cervical cancer diagnosis results in better survival chances	157 (19.6)	63 (23.5)	94 (17.6)	0.048
Strongly Agree/Agree that mammography/pap smear will lead to unnecessary cancer treatments[a]	218 (30.4)	72 (39.1)	146 (27.4)	0.003
Knowledge of correct age[1] at which mammography/pap smear begins	352 (43.9)	73 (27.2)	279 (52.4)	0.000
Knowledge of correct frequency[2] at which mammography/pap smears should be conducted	165 (20.6)	35 (13.0)	130 (24.4)	0.000
Perception of pain during mammography b	136 (34.0)	51 (35.4)	85 (33.2)	0.654
Will never get a pap smear if it is not done by a health care professional of my preferred gender[c]	70 (17.5)	28 (22.6)	42 (15.2)	0.071
Strongly disagree/Disagree that screening will detect early stage of breast/cervical cancer[a]	130 (18.1)	41 (22.3)	89 (16.7)	0.090
Perceived risk of getting breast or cervical cancer				
<10%	361 (45.1)	122 (45.5)	239 (44.8)	0.389
10-25%	180 (22.5)	53 (19.8)	127 (23.8)	
25-50%	140 (17.5)	54 (20.2)	86 (16.1)	
>50%	120 (15.0)	39 (14.6)	81 (15.2)	
Potential motivations				
Very likely/somewhat likely to undergo screening if it was free-of-charge[d]	457 (86.6)	179 (79.9)	278 (91.5)	0.000
Definitely/Likely to screen if polyclinic set appointment[d]	424 (80.3)	166 (74.1)	258 (84.9)	0.002
Definitely/Likely to go for screening if entire cost could be paid from Medishield[d]	420 (79.5)	164 (73.2)	256 (84.2)	0.002
Definitely/Likely to undergo regular mammography/ pap smear to pay less MediShield premiums[d]	398 (75.4)	149 (66.5)	249 (81.9)	0.000
Definitely/Likely to screen with paid leave at work[d]	274 (51.9)	109 (48.7)	165 (54.3)	0.202

[1] 40 and above for mammogram; 25 and above for pap smear, [2] Once in every 2 years for mammogram; at least once in every 3 years for pap smear, Asked only to breast cancer participants (Non-screeners=144; Screeners=256), [c] Asked only to cervical cancer participants (Non-screeners=124, Screeners=277), [d] Skipped for those who answered definitely would screen according to recommendation (Non-screeners=224, Screeners=304)

breast or cervical cancer. Participants were predominantly Chinese, married, had education beyond primary school, and were working at least part-time. Table 3 compares attitudes of screeners and non-screeners. Approximately a quarter of both screeners and non-screeners reported that they do not want to know if they have breast or cervical cancer. 75% of screeners and 77% of non-screeners worried about the financial burden of treatment. About 85% of screeners and 83% of non-screeners also worried about the recurrence of cancer. However, as screeners and non-screeners do not differ significantly in their attitudes, these worries do not appear to be barriers to screening. On the other hand, non-screeners (24%) were more likely than screeners (18%) to disagree/strongly disagree that

early diagnosis increases survival chances (p=0.048). Non-screeners (39%) were also more likely than screeners (27%) to believe that screening will result in unnecessary treatments (p=0.003), suggesting that these apprehensions regarding cancer treatments could be barriers to screening.

Knowledge of the correct age and frequency for screening was significantly (p<0.001) higher among screeners (52% for age and 24% for frequency) than non-screeners (27% for age and 13% for frequency. Approximately a third of both breast cancer screeners and non-screeners perceived mammography to be painful. Perception of pain during mammography was not found to be a barrier to screening. The healthcare professional's gender mattered for about 15% of non-screeners and 23% of screeners for cervical cancer. Consequently, reluctance to screen if the health care professional is not of preferred gender appeared to be a barrier to screening (p=0.07).

A higher proportion of non-screeners (22%) than screeners (17%) didn't think that screening would detect early stages of breast and cervical cancer (p=0.09), suggesting that the perceived low efficacy of screening may be a barrier to screening. On the other hand, screeners did not appear to perceive themselves to be at a higher risk of getting cancer than non-screeners, suggesting that low risk perception is not a barrier to screening.

Making screening free of charge is likely to result in the greatest uptake for screening (87% overall and 80% for non-screeners), followed by letting polyclinics to set screening appointments for women (80% overall and 74% for non-screeners), covering cost of screening through Medishield (80% overall and 73% for non-screeners) and lower Medishield premiums for those who screen (75% overall and 67% for non-screeners). Giving paid leave at work appears to be least effective strategy in increasing uptake of screening (52% overall and 49% for non-screeners).

Discussion

We used sequential focus groups and surveys to conduct an in-depth exploration of perceived barriers and motivations to breast and cervical cancer screening in Singapore. Findings from focus groups generated hypotheses to be tested in the surveys. Triangulated results from both sources are discussed below.

A prominent theme identified in focus groups was related to the role of emotions, particularly fear, in preventing women to screen. Fear has been identified in the past as being a barrier to screening (Seow et al., 1997; Lee et al., 2014; Chaowawanit et al., 2016). In this study, we identified two broad categories of fear: fear of the screening procedure and fear related to a cancer diagnosis. We further broke down the latter category into 11 sub-categories. We found that not all types of fear deter screening. Although prevalent, fear of financial burden of cancer treatments and cancer recurrence do not appear to be barriers to screening. Similarly, fear of the screening procedure also does not appear to be a barrier to screening. On the other hand, fear of unnecessary treatments, fear that treatment for early breast or cervical cancer may be ineffective, and fear that screening will not detect early stage breast or cervical cancer were found to be barriers in the survey. This adds nuance to our understanding of specific situations and outcomes that women are afraid of and may be barriers to screening. It also suggests that future interventions to improve screening rates should target specific fears that appear to lower uptake of screening. Including cancer survivors in future screening campaigns may also help to reduce such fears.

Surprisingly, about 24% of screeners expressed that they do not want to know that they have breast/cervical cancer. This may be because, by definition, screeners in our study include those who have screened at least once, thus lumping both regular and irregular screeners. It may also be that women who screen do so in order to confirm absence of breast/cervical cancer as a negative result confers peace of mind. Messages to motivate screening should thus emphasize the peace of mind that comes with screening negative. This may be helpful to those who are hesitant about knowing if they have breast or cervical cancer. This point was also articulated during the focus groups as a motivator and suggestion for screening.

Despite widespread screening programs and their corresponding social media campaigns, we found that only a minority of surveyed women were aware of the correct age of initiation and frequency for screening. Knowledge of the correct age and frequency for screening was higher among screeners than non-screeners. This could be either because those not aware are less likely to screen or because women who have screened at least once become more aware of screening guidelines due to contact with healthcare providers. Nevertheless, future campaigns should incorporate messages regarding age of initiation and frequency of screening to increase women's awareness about these aspects. Past research on the influence of small media materials such brochures in increasing screening uptake has been ambiguous (Hou et al., 2011; Lu et al., 2012; Sano et al., 2014), but studies conducted in Italy and the US suggest that mass media campaigns can be effective at increasing public awareness and compliance to cancer screening if they are frequent and targeted (Schroy Iii et al., 2008; Vito et al., 2014). Singaporean public health officials should take this information into consideration when planning the next cancer screening campaign, taking care to use effective, sustained mass media campaigns that address gaps in knowledge about screening.

Certain cultural beliefs were also found to influence attitudes towards screening and cancer diagnosis. Some Chinese women articulated fatalistic attitudes that could be barriers to screening since they believe that life and death are beyond their control. Past research on the relationship between fatalism and screening uptake mostly supports this claim, but is not definitive (Seow et al., 1995; Seow et al., 2000; Straughan and Seow, 2000). Some women also cited the social stigma of cancer, which is dependent on culture, as a possible barrier. We also found that having a provider of the patient's preferred gender affects screening uptake. This has also been significant in other Asian societies (Tsunematsu et al., 2013). Since subsidized patients in Singapore currently don't have the option of choosing the physician who performs their screening exam, measures to elicit and comply with

women's preferences for a female or male doctor should be considered. Attitudes such as fatalism, social stigma, and sensitivity towards a healthcare provider's gender are highly dependent on culture and show that cultural beliefs may be partly responsible for or exacerbate barriers to screening.

Addressing financial and logistic concerns for screening may also help improve screening uptake. For example, survey results showed that free screening, lower premiums and coverage of screening through Medishield could motivate more women to screen. Past studies have also shown measures such as reducing out-of-pocket costs for screening and keeping the screening process short to be effective both internationally (Masi et al., 2007) as well as in Asia (Tsunematsu et al., 2013). In fact, one study in Singapore identified cost reduction as more effective than physician reminder or tailored education in increasing screening (Seetoh et al., 2014). Efforts such as SG50 Cancer Screening's financial incentives have been made in Singapore, but they have been periodic and their results have not been evaluated. Based on study results and past literature, policymakers should consider more sustained, consistent measures such as lowering out-of-pocket costs for screening and changing guidelines to better ensure shorter waiting times.

Focus groups also suggested that cues to action can encourage screening behavior among women. Cues to action have also been found to be important in previous studies (Seow et al., 1998; Seow et al., 2000; Bonfill et al., 2001; Hou et al., 2011; Abdul Rashid et al., 2013). Such cues should be incorporated into national screening programs to increase uptake. This may take the form of physician advice and mail reminders. Studies among Chinese and Taiwanese in Asia and the US found groups that received materials such as videos and mail reminders had higher screening rates than control groups (Hou et al., 2011). In Singapore, a past study has found that a multi-pronged approach including physician advice and tailored messages to address attitudinal barriers was most likely to increase screening uptake (Seow et al., 2000). Another cue to action our survey indicated as potentially effective is appointments set by the polyclinics. Survey results showed that most women would screen if polyclinics set their screening appointment. This strategy changes the default, which currently is that the women are required to remember and schedule their appointment for screening. An asymmetrically paternalistic policy that changes this default by requiring that appointments be automatically scheduled for the next screening for all eligible women and that women will have to un-schedule the appointment to avoid screening, may increase screening uptake and warrants further study.(Loewenstein et al., 2007)

This study has many strengths. It used a unique mixed-method approach to identify women's attitudes towards breast and cervical cancer screening in Singapore. In doing so, the study has managed to elicit both complexity and nuance as well as assess statistical relationships between attitudes and screening behavior to establish external validity. The main limitation of this study is that due to time constraints in the survey, we were unable to quantitatively assess every sub-theme elicited during the focus groups. Secondly, during data collection for the survey, no household member could be contacted in a large proportion of households. This is typical of most household surveys conducted in Singapore (Finkelstein et al., 2015). To reach our target sample size, we replaced uncontactable households by eligible neighboring households. Given the many limitations of surveys as a tool for predicting real world behavior, future studies should test the hypotheses generated from this effort using an experimental approach and data on actual choices.

Despite these limitations, the study offers several valuable suggestions to policymakers in efforts to improve breast and cervical cancer screening uptake. Our study showed that reducing the costs of screening, having polyclinics set screening appointments, Medishield coverage for screening and lower insurance premiums for screeners can be effective motivators to increase screening uptake. Additionally, this study has shown the necessity of rethinking and tailoring public health messaging to increase knowledge about screening as well as to better address women's fears about screening in areas shown to be potential barriers. We found that many women are not knowledgeable about age and frequency of cancer screening, possibly because it is difficult to accurately process factual information when their specific fears surrounding cancer screening and its implications are not well addressed. The findings should prompt policymakers to consider researched methods such as more long-term mass media campaigns that will not only disseminate information, but also address specific fears we've identified as potential barriers.

In conclusion, results from focus groups found seven broad themes that represent attitudes of women related to screening. These include fear of cancer diagnosis, knowledge regarding screening, perceptions of screening procedure, direct and indirect costs of screening, perceived efficacy of screening, risk perception, and appropriate cues to action. These results generated hypotheses that were tested in a national survey of women ages 25- 64. Fear of unnecessary treatments, fear that treatment for early breast or cervical cancer may be ineffective, fear of screening procedure being carried out by a healthcare professional not of preferred gender, fear that screening will not detect early stage breast or cervical cancer and lack of knowledge regarding frequency and age for initiation of screening were found to barriers to screening.

Free screening, polyclinics setting screening appointments, having screening cost covered by Medishield, lowering premiums for those who screen and paid leave from work appear to be able to motivate women to undergo screening. These results can inform policymakers how to communicate and incentivize women to participate in breast and cervical cancer screening in the future.

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