RESEARCH COMMUNICATION

Knowledge, Attitudes, and Behaviour Regarding Breast Cancer Screening among Women from Different Socio-economic Regions in Southwest China: A Cross-sectional Study

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Abstract

Background: In most developed countries, breast cancer screening (BCS) is a well-established practice which is widely accepted by women. In contrast, national BCS projects in China were only launched in the last two years, so little is known about their public response. Methods: We surveyed 1,162 Chinese women from different socio-economic regions in Sichuan Province to assess participants' knowledge, attitudes, and behaviour regarding BCS. ANOVA/t-test, Chi-square test, SNK test, and covariance analyses were used to compare subgroups and a multinomial logistic regression model was adopted to examine factors associated with BCS attendance. Results: Statistically significant differences in scores of BCS knowledge were seen across regions. Most women from all four regions were interested in knowing the risk factors for (1,053, 90.6%) and means of prevention (912, 78.5%) of breast cancer. Eight hundred thirty-seven (72.0%) women expressed willingness to pay extra insurance fees when young in exchange for reimbursement for cancer screening when they reached the age at which screening is recommended. Approval of primary medical institutions was generally low. Regional socio-economic level, work status, and education were strong predictors of BCS attendance. Conclusion: To eliminate geographic disparities and raise the participation rate of BCS, future health education should be adjusted to local conditions and strengthened for women in under-developed regions. Incorporating BCS into a regular program of community-based prevention of chronic non-communicable diseases, and increasing medical insurance funds to cover BCS, especially in rural areas, may be effective means to increase BCS attendance.

Keywords: Breast cancer screening - knowledge - attitude - behaviour - medical insurance - China

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Introduction

Though China is a country with a low incidence of breast cancer (21.6/100,000, 2008) (Ferlay et al., 2008), recently the incidence has climbed rapidly, and the proportion of young women diagnosed with breast cancer has also increased (Sheng and Shao, 2005; National Office for Cancer Prevention and Control & National Central Cancer Registry, 2009). In the past decade, the incidence of breast cancer has increased by 3% per year in China (Wang, 2009), which is faster than the global rate of increase.

To detect breast cancer at an early and treatable stage through screening has been proved effectively to reduce mortality and better patients' quality of life (Zhao et al., 2008; American Cancer Society, 2009; Dai et al., 2009). In 1987, breast cancer screening (BCS) programs started in a few more developed cities in China, but it was not until 2008 that the Chinese government launched two national BCS projects. One covered 53 cities from 2008-2009; the other covers 200 rural areas from 2009-2011. Both projects target women aged 35-69. The free screenings begin with a clinical examination, followed by a medical imaging test (mammography or ultrasound) if suspected symptoms are seen. All positive or suspected cases identified through medical imaging are advised to undergo a biopsy test, but this test is not included in the free screening. Local governments publicized the screenings through such means as newspaper and television advertisements. But the two national BCS projects have had a relatively low BCS participation rate and high loss to follow-up. For example, during the urban BCS project, participation rates for screening in the urban areas of Chengdu and Mianyang in 2008 were 48.96% (10,111/20,650) and 52.09% (10,000/19,199), respectively. Similar outcomes of BCS projects have also been reported in other developing

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countries (Parsa et al., 2006). This may be due to regional socio-economic disparities and inadequate knowledge about BCS.

Women's knowledge and attitudes towards BCS are important predictors of their attendance behaviours (Morgan et al., 1995). Previously published studies in developing countries have focused on individual-level factors associated with knowledge and attitudes towards BCS, neglecting the effects of regional socio-economic factors (Parsa et al., 2006). One British study suggests that socio-economic deprivation and geographical access are factors influencing uptake of BCS (Maheswaran et al., 2006). We hypothesized that regional socio-economic factors also affect women's knowledge, attitudes, and behaviours towards BCS in developing countries.

Another predictor of attendance behaviour is insurance coverage of BCS, as several American studies have shown (Pickle and Su, 2002; Coughlin et al., 2004; Lian et al., 2008). But medical insurance in most developing countries, including China, does not cover cancer screening (CS) fees. We theorized that adding a small cost (10-20 yuan per year) to each woman's insurance costs in order to expand medical insurance coverage of regular CS might be feasible. However, any increase in premiums will increase the burden of insured people, so we asked women's feelings about extra medical insurance fees for expanding medical insurance coverage of CS.

Our study is the first on knowledge, attitudes, and behaviours towards BCS, as well as feelings about extra medical insurance fees for expanding medical insurance coverage of CS (e.g., for breast cancer), among Chinese women from different socio-economic regions in southwest China. We interviewed sampled participants of the two national BCS projects mentioned above from September 2009 to June 2010 in urban areas of Chengdu and Mianyang, a suburban area of Chengdu, and a rural area in Jianyang, Sichuan Province. We aimed to identify factors that may influence attendance behaviours of women in developing country, and provide evidence for future health education programs and policy making to promote BCS attendance.

Materials and Methods

Regions and Subjects

Sichuan Province is located in southwest China; it has an area of 485,000 square kilometres and a population of 88.152 million (at the end of 2007). In 2009, the provincial GDP was 1.4 trillion yuan, up 14.5% from the previous year. However, the per capita GDP was only 17,339 yuan (about US$2600) that year. In some remote ethnic minority districts, per capita GDPs were less than 10,000 yuan. (Statistics Bureau of Sichuan and Survey Office in Sichuan, 2010)

We carried out our study in several different socio-economic regions in Sichuan in order to discern regional-level effects on BCS attendance. Urban areas of Chengdu (per capita GDP: 50,419 yuan) and Mianyang (per capita GDP: 41,722 yuan) were chosen to represent developed urban and developing urban areas of southwest China. We used the outskirts of Chengdu (per capita GDP: 32,697 yuan) as our developing rural area, and the rural area of Jianyang (per capita GDP: 13,355 yuan) was used for our under-developed rural sample. (Statistics Bureau of Sichuan and Survey Office in Sichuan, 2010)

Eligible women were convenience-sampled from participants in these project spots in proportion to total eligible females from September 2009 to June 2010. Women who were 35-69 years old, had no breast cancer history, had resided in local communities for over three years, and were willing to participate in the interview were eligible for the study. Prior to data collection, the study protocol was approved by the Institutional Review Board at Sichuan University, and written informed consent was obtained from all participants.

Measures

A questionnaire on knowledge, attitudes, and behaviours towards BCS was designed through expert consultation and literature review. It consisted of three sections: (1) socio-demographic characteristics (including age, marital status, education, work status, insurance coverage, history of benign breast disease, and family history of breast cancer); (2) breast cancer and screening knowledge (including early diagnosis and treatment, clinical symptoms, screening methods, and risk factors for breast cancer); (3) attendance attitudes and behaviours (including reasons for and barriers to attending BCS, feelings about extra medical insurance fees for expanding medical insurance coverage of CS, and previous BCS attendance behaviours).

Breast cancer and screening knowledge was measured quantitatively, with each correct response worth one point. A maximum of 34 points could be obtained in this section. The section's components were: early diagnosis and treatment of breast cancer (nine points), clinical symptoms and screening methods of breast cancer (seven points), and risk factors for breast cancer (18 points). Participants with scores of 60% or higher were considered to be knowledgeable. The Cronbach's-α and split-half reliability of this segment respectively reached 0.832 and 0.828 ($P<0.01$) in a pilot study of 240 eligible women, which indicated high internal consistency of the items. Content validity was judged by 15 specialists, and the Kendall's concordance coefficient (w) was 0.765 ($P<0.05$), which demonstrated high consistency of evaluations.

Data Collection

All interviews were conducted face-to-face before BCS by trained investigators with medical backgrounds after gaining informed consent.

Statistical Analysis

Data were entered into EpiData 3.1 with dual entry verification, consistency, and logic error checking. Statistical analyses were performed by SPSS 18.0, with P-value<0.05 as the threshold of significance. Descriptive analyses were generated for all variables. The ANOVA/t-test was used to estimate statistical differences in total knowledge scores within different socio-demographic groups. The Chi-square test and Student-Newman-Keuls (SNK) test were conducted to compare differences in

levels of different types of knowledge, and in BCS attitudes, across different regions. Covariance analysis was used to evaluate the relationship between total knowledge scores and disparate regions, while controlling for education level, work status, and age. Multinomial logistic regression was performed to examine factors associated with BCS attendance, with "regular attending" as the reference group, attendance behaviours as the dependent variable, and selected socio-demographic characteristics as independent variables.

Results

A total of 1200 eligible women were approached, and 1162 (96.8%) completed the interview. Thirty-eight women were excluded from analyses because key information could not be obtained, usually because of poor comprehension of questionnaire contents or poor hearing. Those excluded came from under-developed rural (20 women, 52.6%), developing rural (14 women, 36.8%), and developing urban (four women, 10.5%) areas.

Table 1. Socio-demographic Characteristics and Differences in Total Knowledge Scores (N=1162)

Characteristics	Frequency (%)	X±SD	*F/t*-value	*P*-value	S
Age (years)			2.26	0.081	
35-40	244 (21.0)	24.8±5.38			
40-50	450 (38.7)	23.2±5.39			
50-60	348 (30.0)	24.3±5.55			
60-69	120 (10.3)	24.4±4.49			
Region*			31.5	<0.001	
Developed Urban	366 (31.5)	25.6±4.70			a
Developing Urban	326 (28.1)	24.5±4.66			a
Developing Rural	271 (23.3)	23.0±5.31			b
Under-developed Rural	199 (17.1)	18.3±5.76			c
Education			35.3	<0.001	
≤Primary School	221 (19.0)	20.0±5.73			a
Middle School	433 (37.3)	23.7±4.91			b
High School	314 (27.0)	25.1±4.58			c
≥College Degree r	194 (16.7)	27.4±4.08			d
Marital Status			0.32	0.571	
Married	1089 (93.7)	24.0±5.33			
Single	73 (6.3)	24.6±6.19			
Work Status			25.5	<0.001	
Manual Worker	621 (53.4)	22.8±5.38			a
Office Worker	352 (30.3)	26.5±4.38			b
Unemployed	189 (16.3)	23.1±5.48			a
Medical Insurance			4.58	0.033	
Yes	1091 (93.9)	24.1±5.24			
No	71 (6.1)	21.9±6.85			
History Benign Breast Disease			11.76	<0.001	
Yes	155 (13.3)	26.1±5.30			
No	1007 (86.7)	23.7±5.31			
Family History Breast Cancer			9.93	0.002	
Yes	44 (3.8)	27.8±4.18			
No	1118 (96.2)	23.8±5.35			

S=Student-Newman-Keuls test; *Regions were classified according to local socio-economic level; a, b, c, and d represent different subgroups for each variable; if the S values of two or more subgroups are followed by the same letter, there was no statistical significance between them; $P<0.05$ indicates statistically significant differences between subgroups

Socio-demographic Characteristics

The average age of the 1,162 participants was 47.5±8.6 years (range: 35-69 years). Six hundred ninety-two (59.6%) participants had resided in urban areas for over three years; the remaining 470 (40.4%) lived in rural areas. Most (1,089, 93.7%) respondents were married, and 973 (83.7%) were employed. Nine hundred forty-one (81.0%) women had at least a middle school education. Most (1091, 93.9%) women stated that they had at least one type of medical insurance. Of the interviewees, 155 (13.3%) reported a history of benign breast disease, and 44 (3.8%) had a family history of breast cancer (Table 1).

Knowledge of Breast Cancer and Screening

The average total BCS knowledge score among 1162 subjects was 24.0±5.37, with 826 (71.1%) women reaching the knowledgeable mark. The knowledgeable rate for early diagnosis and treatment was 69.4%, though only 25.5% of respondents agreed with the statement that breast cancer may occur in anyone. The knowledgeable rate for clinical symptoms and screening methods was just 27.8%. Half (574, 49.4%) of participants didn't know the early symptoms of breast cancer, and 928 (79.9%) did not know that mammography is highly accurate in detecting early breast cancers. The knowledgeable rate for risk factors was 89.1%, but only 29.9% of interviewees knew that "early menarche and late menopause" is a risk factor for breast cancer. Over half of participants correctly reported that "obesity" (788, 67.8%) and "late age at first birth" (722, 62.1%) were risk factors for breast cancer. Women from urban regions, those with more education, office workers, women with medical insurance, and women with a history of benign breast disease or a family history of breast cancer had significantly higher total knowledge scores than others (Table 1).

Analyses by Student-Newman-Keuls (SNK) test revealed that total and sectional knowledge scores in the under-developed rural area were significantly lower than those in the other three regions. The knowledgeable rate for clinical symptoms and screening methods was particularly low in the under-developed rural area compared with the other regions. Covariance analysis showed that total knowledge scores were still significantly different across regions when education, work status, and age were controlled for (Table 2).

Attitudes towards Breast Cancer Screening

Of the 1,162 participants, 1053 (90.6%) and 912 (78.5%) women were interested in learning more about breast cancer risk factors and prevention measures, respectively. Most women from all four regions expressed willingness to pay for part of BCS out of their own pockets, but 76.1% of respondents were only willing to pay a minimal fee (less than 10 yuan per year for one annual clinical examination). Apart from fees, 644 (55.4%) women stated that they had other misgivings about attending BCS. These participants cited "fear of detecting cancer" (167, 25.9%), "no symptoms=no need for screening" (160, 24.8%), "doctor may have insufficient expertise" (115, 17.9%), "bad attitude of doctor" (96, 14.9%), "no time" (86, 13.4%), "embarrassment during

Table 2. Differences in Knowledge Scores across Disparate Regions (N=1162)

Region	Total Score				Early Diagnosis and Treatment			Clinical Symptoms and Screening Methods			Risk Factors for Breast Cancer		
	Score X±SD	S	KR n (%)	Modified Mean*	Score X±SD	S	KR n (%)	Score X±SD	S	KR n (%)	Score X±SD	S	KR n (%)
DU	25.6 ± 4.70	a	316 (86.3)	25.1	6.90 ± 1.82	a	306 (83.6)	3.97 ± 1.76	a	145 (39.6)	14.7 ± 2.98	a	336 (91.8)
DGU	24.5 ± 4.66	a	255 (78.2)	24.7	6.29 ± 2.30	b	241 (73.9)	3.44 ± 1.72	b	97 (29.8)	14.8 ± 2.64	a	304 (93.3)
DGR	23.0 ± 5.31	b	184 (67.9)	23.6	5.95 ± 2.33	b	184 (67.9)	3.27 ± 1.84	b	70 (25.8)	13.8 ± 3.00	a	241 (88.9)
UDR	18.3 ± 5.76	c	71 (35.7)	19.9	5.15 ± 1.76	c	75 (37.7)	1.23 ± 1.42	c	11 (5.5)	12.0 ± 4.49	b	154 (77.4)
F (P)	31.46 (<0.001)	-	-	3.81 (0.010)	11.17 (<0.001)	-	-	34.70 (<0.001)	-	-	13.400 (<0.001)	-	-
χ^2	-	-	58.5 (<0.001)	-	-	-	44.262 (<0.001)	-	-	23.42 (<0.001)	-	-	12.09 (0.007)

S=Student-Newman-Keuls test; KR, Knowledgeable Residents; DU, Developed Urban; DGU, Developing Urban; * Covariance Analysis Model controlled for: age=47.50, education, and work status; a, b, and c, represent different subgroups for each variable; if the S values of two or more subgroups are followed by the same letter, there was no statistical significance between them; $P<0.05$ indicates a statistically significant difference between subgroups

Table 3. Attendance Attitudes Towards Breast Cancer Screening across Disparate Regions (N=1162)

Attitudes Items	Region n (%)				*Fisher*/χ^2	*P*
	Developed Urban N=366	Developing Urban N=326	Developing Rural N=271	Under-developed Rural N=199		
Willingness to Pay Some of the Cost of Screening					21.835 [a]	<0.0001
Maybe, Depending on Expense	362 (98.9)	312 (95.7)	258 (95.2)	173 (86.9)		
Unwilling	4 (1.1)	12 (3.7)	0	19 (9.6)		
No Money	0	2 (0.6)	13 (4.8)	7 (3.5)		
Choice of Medical Institutions for Regular BCS (multiple-choice)					116.529 [b]	<0.0001
Comprehensive Hospitals	242 (66.1)	157 (48.2)	100 (37.0)	161 (80.9)		
Women and Children's Hospitals	259 (70.8)	180 (55.2)	174 (64.2)	38 (19.1)		
Tumour Hospitals	62 (16.9)	217 (66.6)	110 (40.6)	38 (19.1)		
Community Health Service Centres or Township Hospitals	121 (33.1)	45 (13.8)	99 (36.5)	23 (11.6)		
Important Factors in Selecting Institution (multiple-choice)					17.664[b]	0.126
Convenience	201 (54.9)	113 (34.7)	114 (42.1)	41 (20.6)		
Doctor's Expertise	334 (91.3)	316 (96.9)	248 (91.5)	177 (88.9)		
Fees	211 (57.7)	211 (64.7)	155 (57.2)	94 (47.2)		
Hospital Service	238 (65.0)	188 (57.7)	153 (56.5)	68 (34.2)		

a represents *Fisher* exact probability value; b represents χ^2 value; $P<0.05$ indicates a statistically significant difference between subgroups.

examination" (55, 8.5%), and "no support from family" (4, 0.6%) as detriments to screening. We found that community health service centres and township hospitals were the least favoured choices for regular BCS among Chinese women, and doctors' expertise was regarded as the most important index (cited by 1075 participants, 92.5% of the sample) for selecting a medical institution. (Table 3).

Breast Cancer Screening Attendance Behaviours

Attendance behaviours were categorized as "regular attending" (at least once every two years since age 35), "irregular attending," and "never attended." Of the 1160 participants, 362 (31.2%) attended BCS regularly, 556 (47.9%) attended irregularly, and 242 (20.9%) never attended. Screening fees were paid by employers for 203 (56.1%) women who attended BCS regularly. Multinomial logistic regression was performed to examine factors associated with BCS attendance, with "regular attending" as the reference group. The odds of attending BCS regularly are positive associated with living in developed regions, with higher levels of education, and with non-manual employment. A history of benign breast disease was also associated with regular BCS attendance (Table 4). We didn't find relationships between age, marital status, or family history of breast cancer and BCS attendance behaviours.

Feelings about Extra Medical Insurance Fees for Expanding Medical Insurance Coverage of CS

When asked about medical insurance coverage of CS, 837 of 1162 (72.0%) participants expressed willingness to pay extra insurance fees when young (10-20 yuan per year) in exchange for reimbursement for CS (e.g., for breast cancer) when they reached the age at which screening is recommended. Only 186 (16.0%) women opposed this idea, giving the reason that they felt they did not need CS because they felt healthy. Another 139 (12%) interviewees did not express a clear opinion.

Discussion

In comparison with most developed countries,

Table 4. Multinomial Logistic Regression Analysis of Factors Associated with BCS Attendance (N=1162)

Attendance Behaviour	Factor	B	Wald	Sig.	OR	95% CI
Never Attended [a]	Region					
	Developed Urban [b]	0	-	-	1	-
	Under-developed Rural	2.486	12.277	<0.001	12.014	2.991~48.265
	Developing Rural	0.890	2.635	0.105	2.434	0.832~7.126
	Developing Urban	0.554	1.930	0.165	1.740	0.797~3.800
	Work Status					
	Office Worker [b]	0	-	-	1	-
	Unemployed or Full-time Homemaker	1.923	10.041	0.002	6.839	2.082~22.463
	Manual Worker	1.069	4.661	0.031	2.913	1.104~7.687
	Education					
	College Degree or Higher [b]	0	-	-	1	-
	Primary School or Lower	3.406	9.168	0.002	30.158	3.325~273.566
	Middle School	2.552	5.622	0.018	12.830	1.556~105.755
	High School	2.252	4.426	0.035	9.507	1.166~77.492
	History of Benign Breast Disease					
	Yes [b]	0	-	-	1	-
	No	1.281	3.986	0.046	3.599	1.024~12.653
	Breast Cancer Knowledge Level					
	Knowledgeable [b]	0	-	-	1	-
	Not Knowledgeable	1.322	11.383	0.001	3.750	1.740~8.081
Irregular Attendance [a]	Region					
	Developed Urban [b]	0	-	-	1	-
	Under-developed Rural	0.660	0.804	0.370	1.935	0.457~8.197
	Developing Rural	1.526	12.629	<0.001	4.601	1.983~10.676
	Developing Urban	0.763	7.267	0.007	2.144	1.231~3.732
	Work Status					
	Office Worker [b]	0	-	-	1	-
	Unemployed or Full-time Homemaker	1.351	9.612	0.002	3.860	1.643~9.065
	Manual Worker	0.665	4.921	0.027	1.945	1.081~3.500
	Education					
	College Degree or Higher [b]	0	-	-	1	-
	Primary School or Lower	1.396	7.073	0.008	4.041	1.444~11.309
	Middle School	0.974	6.011	0.014	2.648	1.216~5.767
	High School	0.849	5.362	0.021	2.337	1.139~4.793
	History of Benign Breast Disease					
	Yes [b]	0	-	-	1	-
	No	1.006	6.969	0.008	2.734	1.296~5.769

a presents "regular attending" as the reference group; b presents the reference group in subgroup; $P<0.05$ indicates a statistically significant difference between subgroups

national BCS projects in China started late and had a low participation rate. Studies of factors associated with BCS attendance may help in formulating effective ways to raise the participation rate. Our research found differences in knowledge, attitudes, and behaviours towards BCS among Chinese women in different socio-economic regions. Regional factors, particularly local socio-economic level, encompass diverse factors, such as socio-demographic differences (in income, education, work status, etc.), human resources and screening equipment, self-evaluation of health status, health-related behaviours, and societal support (Lian et al., 2008). Our findings about knowledge, attitudes, and feelings about BCS among Chinese women may be applicable to other developing countries.

While most participants in our study met our criteria for being considered knowledgeable about BCS, we found an uneven level of knowledge, and many misunderstandings. We found education levels, employment types, history of benign breast disease, and family history of breast cancer were associated with level of knowledge, which is consistent with previously published studies on Chinese women (Yu et al., 2001; Yu et al., 2002; Chua et al., 2005; Luo et al., 2006; Chen et al., 2007; Zhao et al., 2008). Socio-economic factors also appear to affect women's BCS knowledge level. Regional socio-economic factors have, to some degree, restricted the comprehensive implementation of local health education programs. Women in under-developed rural areas therefore have little opportunity to learn of the benefits of BCS and perceive the risk for breast cancer. We found that most women were interested in knowing more about breast cancer risk factors and prevention measures, which points to the feasibility of health education programs. Therefore, future health education should be adjusted to local conditions and targeted to disadvantaged regions. In developed regions with high levels of knowledge, we should emphasize increasing knowledge about clinical symptoms and the benefits of screening, eliminating misunderstandings, and cultivating the habit of breast self-examination; in poorer regions with low levels of knowledge, we should concentrate on general knowledge related to BCS, and on dispelling concerns about BCS attendance.

Most women from all four regions were interested in BCS and related knowledge, and were willing to pay for

part of BCS out of their own pockets, but only if the burden were minimal. This implies that, in China, mammography may not be the primary method of BCS as it is in most developed countries, because of low willingness-to-pay of women and low ability-to-pay of government. Thus, there is a need for other cost-effective screening solutions. Interestingly, our study found that women's main misgivings about BCS were fear of detecting cancer and the belief that screening was not needed in the absence of symptoms, rather than lack of time or embarrassment during the examination. This is contrary to the findings of previous American studies of ethnic and overseas Chinese women (Sadler et al., 2000; Wu et al., 2005; 2006).

Regional socio-economic factors also influence BCS attendance behaviours. Women at the under-developed rural site were more likely than women from the developed urban to have never undergone BCS. With the development of the regional economy, the odds of attending BCS can be expected to increase (Emily et al., 2002; Benjamins et al., 2004; Dailey et al., 2007; Coughlin et al., 2008). Further research is needed to identify effective methods of reducing socio-economic inequality in uptake of BCS.

Present BCS programs in China have a low participation rate (Parsa et al., 2006; Tan et al., 2007; Zuo et al., 2009; Hou and Liang, 2010). The most recent China Mammary Gland Disease Research Report reveals that just five percent of Chinese women in the age range recommended for breast examination perform such examinations regularly (China Population Association, 2010). Although governments at all levels and public health institutions made vigorous efforts to encourage participation in the national BCS program, only half of the targeted population attended BCS in 2008-2009 in Sichuan Province. Along with lack of awareness, lack of payment capacity clearly can hinder BCS participation. The widespread adoption of BCS in the United States shows that the combination of health insurance coverage and government assistance for uninsured women can effectively promote regular BCS use and diminish health disparities across regions, but such insurance coverage is not yet available in China. We found that most women expressed willingness to pay extra insurance fees when young (10-20 yuan per year) in exchange for reimbursement for CS (e.g., for breast cancer) when they reach the age at which screening is recommended. However, further studies are needed to determine whether such coverage is economically feasible.

Approval of primary medical institutions was generally low in our study. Doctors' expertise was regarded as the most important factor for selecting a medical institution, and community health service centres and township hospitals were the least-favoured choice for regular BCS among women we surveyed, especially at the under-developed rural site. In the course of health service, many problems arose in primary medical institutions, such as insufficient compensation from the government, lack of human resources and equipment, and low community utilization (Chen, 2009). However, these institutions are well-positioned to benefit local populations in the long run through community-based comprehensive prevention and treatment for chronic non-communicable diseases (CND) (e.g., hypertension and diabetes). It has been suggested that incorporating BCS into a regular program of community-based comprehensive prevention of CND should be a major goal of Chinese BCS projects. To accomplish this, the government would need to invest more money, equipment, and doctor training in primary medical intuitions. In addition, a comprehensive referral system should be established to better diagnose and follow up with breast cancer-positive patients. In this way, trust in primary medical institutions can be gradually increased, contributing to the sustainable development of BCS.

Our research only focused on the knowledge, attitudes, and behaviors of women undergoing screening. The results of this study should be interpreted with caution because of its relatively small sample size, limited research areas, and convenience sample. Further studies with large sample size and long-term follow-up at multiple centres are needed to devise cost-effective screening solutions that consider buyers, sellers, and the system at the same time.

In conclusion, Dong Zhiwei, secretary general of the Chinese Cancer Research Fund, has suggested that one problem of Chinese cancer screening projects is a lack of long-term public health policies to guarantee sustainable development (Don et al., 2008). Strengthening health education for women in under-developed regions, incorporating BCS into a regular program of community-based comprehensive prevention of CND, and increasing medical insurance funds to cover BCS, especially in rural areas, may be effective means of raising the rate of participation in BCS.

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