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Original Article

Breast cancer knowledge and attitudes toward mammography as predictors of breast cancer preventive behavior in Kazakh, Korean, and Russian women in Kazakhstan

Askar Chukmaitov[1], Thomas T.H. Wan[2], Nir Menachemi[3], Cheryl Cashin[4]

[1] *Division of Health Affairs, Department of Family Medicine and Rural Health, Florida State University College of Medicine, Tallahassee*
[2] *College of Health and Public Affairs, University of Central Florida, Orlando*
[3] *Department of Health Care Organization and Policy, University of Alabama at Birmingham, Birmingham*
[4] *The National Institute of Mental Health, University of California, Berkeley, Berkeley*

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Summary

Objectives: To explore differences in breast cancer knowledge and attitudes toward mammography for women representing three ethnic groups (Kazakh, Korean, and Russian) and to determine how these factors affect breast cancer preventive practices in Almaty City, Kazakhstan.

Methods: A cross-sectional, descriptive study design was utilized. Face-to-face interviews were conducted with 500 women in Almaty City. A combination of descriptive (ANOVA) and multivariate analyses (structural equation modeling) was used to estimate differences in respondents' breast cancer knowledge, attitudes, and practices (KAP).

Results: Findings indicate that women may be influenced by their clinicians' advice to engage in breast cancer preventive practices. Multivariate models suggest that breast cancer knowledge and attitudes toward the effectiveness of mammography are significant determinants of breast cancer preventive practices among study participants.

Conclusions: Clinicians should encourage women to engage in breast cancer preventive practices. Clinical and public health interventions should be aimed at both women and healthcare providers to use mammography as a tool for early detection of breast cancer in Almaty City, Kazakhstan.

Key words: Breast cancer – KAP – Mammography – Prevention – Ethnic – Kazakhstan

Breast cancer remains one of the most common non-dermatological cancers in women around the globe.[1–10] Previous studies indicated that breast cancer ranks highest among cancers affecting women and accounted for 18–20% of incident cases in the former Soviet Union.[1, 11] Moreover, ethnic disparities exist in breast cancer preventive practices and mortality. One reason for this disparity is the insufficiency of mammography screening among minority women.[3, 12] Studies conducted in several countries that compared breast cancer knowledge, attitudes, and practices (KAP) found significant variations by ethnicity.[2, 5, 6, 8, 13–18] Although knowledge and attitudes may be only weakly related to actual behavior, prior studies indicated that insufficient knowledge and attitudes created barriers for breast cancer screening for some ethnic groups, which may be contributing to higher mortality rates in these groups.[3, 12]

The Health Belief Model (HBM) was often used as a conceptual model to select constructs and variables in studies that examined KAP.[6, 19] The HBM characterizes motivation to seek care as a process of choosing among alternative forms under conditions of uncertainty.[19, 20] The scientific literature suggested that the use of preventive services was contingent upon an individual's evaluation of the benefits of preventive care weighed against their perceived barriers and cost of taking action.[19, 20] These factors may be categorized as either internal or external. Internal factors are the perceptions of bodily status by individuals, whereas external factors are interpersonal interactions, knowledge about a given health condition, communication patterns with health providers, and resources, among other factors.[19, 20] An individual's effort to improve health is often expressed by that individual's health seeking behavior and use of preventive practices. These behaviors may in turn improve personal health outcomes. The HBM suggests that women with sufficient knowledge about the preventability

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of breast cancer and positive attitudes toward mammography may be more likely to seek preventive care.

The Republic of Kazakhstan is one of the most diverse countries of the former Soviet Union and is made up of more than 100 different ethnic groups. Among its 15.2 million citizens, Kazakhs account for 53.4 percent of the population and Russians make up an additional 33.7 percent. Koreans and other ethnic groups represent approximately 13 percent of the population. Despite an increase in the incidence of breast cancer (33.5 per 100 000 in 1998) and ethnic differences in the use of healthcare services in Kazakhstan[21, 22] no research has been conducted on breast cancer KAP in the country's multi-ethnic population. In this study, we applied the HBM to explore differences in breast cancer knowledge and attitudes toward mammography among Kazakh, Korean, and Russian women. Moreover, we examined how these factors affected women's breast cancer preventive practices in Almaty City, Kazakhstan.

Methods

Study population and interview sample

We used a cross-sectional, descriptive study design. A community survey of 500 women was conducted in November 2001, in Almaty City, Kazakhstan. A convenience sample was selected from a group of urban women in relatively good health and eligible for breast cancer preventive practices. Those selected met the following criteria: (1) lived in Almaty City for more than one year; (2) not an inpatient of a hospital at the time of the survey; and (3) 45 years of age or older. Our sample was stratified by ethnic group. Selection of Korean women was limited due to a relatively small Korean community in Almaty City. According to the 1999 Census, there were 19 090 Koreans living in Almaty City, which has a total population of approximately 1.2 million. In order to have a representative group, Korean women were over-sampled by actively reaching out to these women through community centers (e. g., the Korean performance art theater, markets, and other places of mass gathering). Kazakh and Russian women were conveniently sampled from different neighborhoods of Almaty city. We selected 252 Korean, 124 Kazakh, and 124 Russian women. We excluded 73 women with a history of breast disease from our empirical sample, which reduced the empirical sample to 427 women.

The study questionnaire

The survey booklet, containing a total of 110 questions, required approximately 40 minutes to complete through a personal interview. The questionnaire contained questions about demographic, social, economic, and cultural characteristics, preventive health attitudes, health function, knowledge about breast cancer, perceived barriers to mammography for breast cancer screening, health services use, and history of preventive care for breast cancer (i. e., breast examination by self, clinicians, or mammography). The interview questionnaire was translated into Russian because it is the most common language of inter-ethnic communication in Kazakhstan. To assess the validity of the translation, two bilingual physicians examined the conformity of meaning between each item of the English version of the questionnaire and its Russian translation. A bilingual faculty member from the Kazakhstan School of Public Health (KSPH) then back-translated the revised Russian version of the instrument to validate the translation. The survey was pre-tested with five interviewees to improve its reliability, face-validity, and cultural sensitivity. Faculty members of the KSPH were trained to conduct the interviews and to explain the purpose of the KAP study to the interviewees. The response rate was 100 % in this study. Human subject committee approval was obtained from the KSPH's Institutional Review Board.

Statistical analysis

Descriptive statistics were computed to compare socio-demographic characteristics, breast cancer preventive behavior, and the use of breast cancer preventive services among women in the whole sample. Univariate analyses of variances were conducted to estimate differences among this study's ethnic groups.

Structural equation modeling (SEM) was used to test the relationships between breast cancer knowledge and attitudes toward mammography and women's preventive practices, while controlling for socio-demographic characteristics and other control variables. The AMOS 4.0 software program was used to construct and to estimate the SEM.[27]

SEM uses confirmatory factor and path analyses for estimation of the measurement and covariance equation models. Briefly stated, the measurement model estimates the latent (unobserve) variables or hypothetical constructs from the observed variables.[28] On the other hand, the covariance equation model evaluates whether a proposed relationship between observable and unobservable variables is consistent with the actual patterns found in the empirical data. A covariance equation model also describes the amount of unexplained variances among the observable and latent variables.[28]

The degree of correspondence between the hypothesized models and the actual data are assessed with a goodness-of-fit (GOF) test that is reported as a chi-square statistic.[28] Criteria for the GOF test include a chi-square value with an associated *p*-value, a likelihood ratio, a goodness-of-fit index (GFI), an

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adjusted goodness-of-fit index (AGFI), a root-mean-square error of approximation (RMSEA), and Hoelter's critical N (CN). The fit indices range from 0 to 1 and measure the amount of variances and co-variances that are jointly accounted for by the model. Higher values (closer to one) typically are desirable. RMSEA measures the degree of model adequacy based on population discrepancy in relation to degrees of freedom. A RMSEA value less than 0.05 (or 0.08) is preferred (or acceptable). CN indicates the largest sample size for which one would accept a hypothesis that a model is correct. Usually, a CN equal to or greater than 200 is needed.

Dependent variable

We developed our measurement model for establishing the hypothetical (unobservable) endogenous (dependent) construct of Breast Cancer Preventive Practice (BCPP) to be used in our covariance equation model. The measurement model included five variables that were significant indicators of BCPP ($p < 0.05$) in a confirmatory factor analysis. Breast Self-Examination (SELFEXAM) was coded as a dichotomous variable equal to 1 if a woman performed a self-exam and 0 otherwise. Women were asked to report the number of times they performed BSE during the past year (TIMES) and this variable was measured continuously. Other dichotomous measures of BCPP were Clinical Breast Examination (CBE) performed by a physician (PHYEXAM), CBE performed by another healthcare provider (PROVIDER), and whether a woman has ever had mammography (MAMMOGRAM). The confirmatory factor analysis also revealed an extremely good fit of the BCPP measure with the actual data (chi-square = 3.38, df = 3, p = 0.38, AGFI = 0.98, RMSEA = 0.017, the Hoelter Index (CN) at 0.05 = 985).

Independent variables

Several key independent variables measured women's breast cancer knowledge and attitudes toward mammography. The score on the breast cancer knowledge test (SUMK) was measured continuously. It was constructed as the sum of correct answers to 16 true/false questions adapted from the comprehensive breast cancer knowledge test.[29] Thus, a maximum score that women could receive was 16, and higher scores indicated better knowledge of breast cancer. Previous studies indicated that women's knowledge of breast cancer etiology, symptoms, and prognosis was a significant predictor of their involvement in BCPP.[25, 26, 30]

In the covariance equation model, preventive attitudes towards mammography were measured by two hypothetical (unobservable) exogenous (independent) variables. We constructed a measurement model indicating how women's beliefs in effectiveness of mammography (ProScale) corresponded with observable variables. We adopted the decision balance scale on mammography[31] which included six questions measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The strength of agreement with statements such as "having a yearly mammogram will give me a feeling of control over my health" (PROSCALE1-PROSCALE6) reflected a woman's belief in the benefits of breast cancer screening. The measurement model, using the confirmatory factor analysis, demonstrated that the ProScale construct had a relatively good fit with our empirical data (Chi-square = 3.427; df's = 5; p = 0.63; AGFI's = 0.99; RMSEA = 0.00; the Hoelter Index's (CN) at 0.05 = 1377).

The measurement model representing a second measure of attitudes toward mammography (Attitude) reflected loadings of six variables (ATT1R-ATT6R) developed from the Attitude toward Breast Cancer Screening Scale. Sample questions included such items as "will having a mammogram change the chance of finding a lump before it can be felt?," or "will early detection of breast cancer change the chance of being cured?" Responses were measured and coded on a scale as: 3 (increase); 2 (no change); 1 (decrease); and 0 (unknown). The measurement model included six variables that were significant indicators of Attitude in our confirmatory factor analysis ($p < 0.05$). The model had a good fit with our empirical data (Chi-square = 1.56, df's = 1, p = 0.21, AGFI's = 0.97, RMSEA's = 0.036, the Hoelter Index's (CN) at 0.05 = 1047).

Several variables were used to control for socio-demographic differences and as (de)motivators of women's preventive behavior. They included women's age in years (AGE), the number of children (CHILDREN), total years of education (EDU); and an employment status (EMPLSTAT) as a proxy for a woman's resource base. A self-reported evaluation of general health status (GHSCORE) was represented by a score generated from the SF-12v2 Health Survey. Women's use of ethnic medicine and treatments (HERBS) was a measure that indicated an orientation toward alternative medicine and preventive care. Lastly, a binary variable (MDNONRECOM) was used to control for whether a respondent's primary clinician recommended mammography.

Results

Demographic characteristics of respondents are displayed in Tab. 1. Mean age was approximately 51 years, and the mean level of education was approximately 14 years. Almost two-thirds of respondents were married (65.2 %), and slightly more than two-thirds had either full- or part-time employment (68 %). The self-reported general health score was 33 (out of 100) and half of the sampled women (50.8 %) reported using

ethnic medicines or treatments. Lastly, there were 61 women (12.2%) who had a close female relative with a history of breast cancer.

Most of the women (82.57%) performed a breast self-exam an average of 9.5 times per year. About two-thirds of women (62.9%) had a CBE performed by a physician, while 52% received such an exam by another provider. Only 12.4% indicated that they had previously had a mammogram, with a mean of 2.3 times. The most common reasons for not having a mammogram were that "mammography was not recommended by their healthcare provider" (71.6%) and that the respondent "was not concerned about breast cancer" (16.36%).

The mean breast cancer knowledge score was 8.21 (out of 16). In general, women's attitudes towards mammography were positive. For example, 60% of respondents agreed that a mammogram would increase a chance of finding a lump before it could be felt, and 71% of women thought that early detection of breast cancer would increase a chance of being cured. Although women's belief in the helpfulness of mammography was positive, their decision to seek mammography was largely influenced by the advice of their health care provider. Overall, 74% of women stated that they would obtain a mammogram upon their physician's recommendation. Sixty-two percent of women suggested they would not pursue mammography if it was not recommended by their physician.

Next, the covariance structure model was constructed using the latent constructs and control variables (Fig. 1). Overall, the fit statistics of this covariance structure model showed that the proposed model had a moderate fit with the actual data (Tab. 2).

We postulated that greater breast cancer knowledge and positive attitudes toward mammography may have had a direct

Table 1 Descriptive statistics

Socio-demographic characteristics		
Mean age (SD)	51.30	(8.41)
Mean age of first pregnancy (SD)	22.39	(3.53)
Mean number of living children	2.02	(0.94)
Mean years of education	14.26	(3.11)
Mean general health score (SD)	33.30	(17.51)
Percent Married	65.20	
Employment Status		
Percent employed (full- or part-time)	68.00	
Percent retired	17.80	
Percent homemaker	10.60	
Percent unemployed	3.60	
Percent having a history of any breast diseases	14.60	
Percent having a close relative with a history of breast cancer	12.20	
Percent use of ethnic medicines, herbs, and foods (sometimes or more often)	50.80	
Percent trust in public health programs to enhance your health		
Don't know	6.01	
A little or no benefit	33.27	
Great or moderate benefit	60.52	
Percent trust in primary care as a solution for your community health		
Don't know	2.66	
A little or no benefit	25.62	
Great or moderate benefit	71.11	
Breast cancer preventive practice		
Percent Breast Self-Examination (BSE)	82.57	
mean number of BSE (SD)	9.52	(18.58)
Percent Clinical Breast Examination (CBE) performed by physician	62.85	
Percent CBE performed by other healthcare provider	52.00	

Breast cancer preventive practice		
Percent of women having had a CBE		
Recently (this or last year)	41.20	
Two years ego	9.40	
More than 3 years ago	49.40	
Percent having had a mammogram	12.35	
mean number of mammograms (SD)	2.27	(2.10)
Percent reasons for not having a mammogram		
not recommended by healthcare provider	71.59	
not concern about breast cancer	16.36	
language problem	1.82	
not enough money	1.82	
fear	1.59	
unavailable	1.14	
discomfort	0.45	
embarrassment	0.23	
other	0.45	
Predictors of breast cancer preventive behavior		
Mean sum of breast cancer knowledge (SD)	8.21	(2.63)
Percent Attitude		
Having a mammogram will increase the chance of finding a lump before it can be felt?	60.12	
Early detection of breast cancer will increase the chance of being cured?	71.34	
Will not have a mammogram if my doctor expressed even a little doubt about whether I really needed one	61.92	
More likely to obtain a mammogram if my doctor told me how important it was	74.15	
Having a yearly mammogram will give me a feeling of control over my health	59.32	

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influence on preventive practices. Estimated standardized parameters are presented in Tab. 2. As breast cancer knowledge score (SUMK) increases, we observed a statistically discernable increase in the use of breast cancer preventive practice (BCPP). Women's beliefs in the effectiveness of mammography (Proscale) were also positively associated with BCPP. Preventive attitudes showed no direct effect on women's breast cancer preventive practices.

The general health score had a significant inverse effect, which indicated that the women's perception of better health status resulted in lower use of BCPP. The use of ethnic therapy had a statistically discernable positive effect on BCPP, possibly indicating a higher value placed on preventive behavior.[32]

Variables showing differences between each of the ethnic groups are presented in Tab. 3. For example, Kazakh women (23%) had a higher history of breast disease than their Russian (16%) and Korean (10%) counterparts. More Russian women (70%) reported having a CBE performed by a physician than either Kazakh (65%) or Korean (58%) women. Kazakh women (22.3%) were more likely to report history of having a mammogram. Lastly, differences in attitudes regarding the importance of mammography existed (Tab. 3).

Because of ethnic differences presented in Tab. 3, we applied a multiple group SEM analysis. Although some direct relationships between knowledge, attitudes and BCPP were found for the Korean group, no such effects could be identified in the Kazakh and Russian groups. The fit statistics demonstrated a relatively poor match with the actual data for the latter ethnic groups in the multiple group SEM analysis. A lack of fit with data may be explained by the relatively small sample sizes in Kazakh and Russian sub-samples. Therefore, we did not report the specific SEM results by ethnic group.

Discussion

Our findings suggest that breast cancer knowledge and attitudes toward mammography were significant determinants of preventive practices among respondents of Almaty City. Women in our sample had fairly high general knowledge about breast cancer etiology, symptoms, and prognosis, which increased their breast cancer preventive practices. Our results also suggested that women generally believed in the effectiveness of mammography, and this belief had a positive effect on their overall BCPP. Nevertheless, mammography rates were low in all ethnic groups, and currently only SBE and CBE are widely used for early breast cancer detection in the studied sample. This finding may be explained by the limited physi-

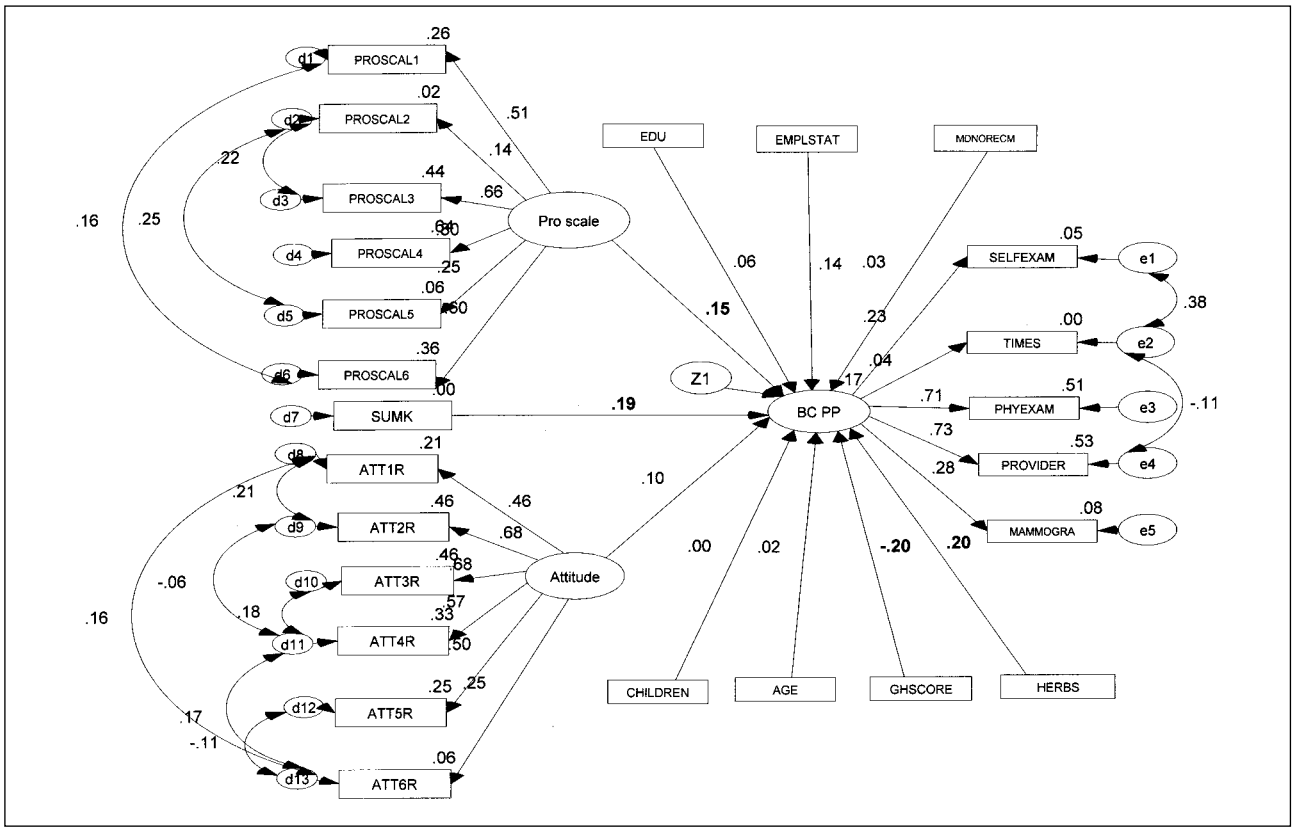

Figure 1 A covariance equation model for breast cancer preventive practices in three ethnic groups

Table 2 Structural relationships of breast cancer knowledge and attitudes toward mammography and breast cancer preventive practices in three ethnic groups

Predictor variables	Standardized Regression Coefficients for Breast Cancer Preventive Practices (BCPP)
Latent Variables	
Breast Cancer Knowledge (SUMK)	0.19*
Beliefs about Mammography (ProScale)	0.15*
Attitudes toward Mammography (Attitude)	–0.10
Control Variables	
General Health Status (GHSCORE)	–0.20*
Use of Ethnic Medicine (HERBS)	0.20*
Age (AGE)	0.02
Education (EDU)	0.06
Number of Children (CHILDREN)	0.00
Employment Status (EMPLSTAT)	0.14
Clinicians Recommendation of Mammography (MDNORECM)	0.03
Goodness of Fit Indices	
R-squared	0.17
Chi-square	951.44
DF	262
Probability	0.001
Chi-square Ratio	3.631
CFI	0.828
AGFI	0.787
RMSEA	0.079
Hoelter (0.05 level)	135

Note: * indicates p <0.05 level of statistical significance (two-tailed)

cal and financial access to mammography services among women in Almaty City. There are a relatively small number of mammography centers in Almaty City and women generally have to pay out-of-pocket for this service. Even though only about three percent of women indicated a lack of financial resources and physical access to mammography centers as barriers, we did not have direct measures of income, cost of mammography screening, or supply of these services. These categories have been identified as important determinants of mammography screening in previous research.[3,26,30,33–36]

Respondents to our survey suggested that their physicians did not recommend mammography and as such, a large number of women followed their advice. Given the current resource constraints in Kazakhstan, SBE and CBE may be viewed as more cost-effective breast cancer preventive practices by both healthcare providers and women. Over time, as resources become available, physicians in Kazakhstan will need to follow best practices and promote mammography as a way of preventing mortality and improving a well-being of female patients.[9, 37]

Several clinical and community public health interventions may be proposed to promote the early detection of breast cancer in Kazakhstan. These campaigns should be aimed at both women and healthcare providers because Kazakhstani women understand the importance of breast cancer preventive practices and are responsive to the advice of their healthcare providers. In addition, the financial and physical barriers to mammography should be addressed in order to increase utilization of mammography screening by Kazakhstani women.

The strengths of this study include its high response rate and the use of SEM as an analytical tool. SEM analysis provided a unique opportunity to measure unobservable, latent variables, and to use them in a multivariate model. However, several limitations should be considered. Because our study was confined to a single urban center, generalizability of our finding is limited. Self-response bias is also recognized as a potential limitation as with all cross-sectional studies. Lastly, cultural nuances in understanding and responding to the questionnaire may be an issue that was not fully resolved by the instrument's pre-testing and validation. For example, the low scores obtained on self-reported health status may be due to cultural differences among participants. Therefore, our findings should be interpreted with caution and a further exploration of ethnic differences in Kazakhstan is needed. Several improvements should be considered in future studies, including the recruiting of more subjects by randomly selecting participants from geographically diverse areas of the country, and including additional measures of external characteristics (e. g., family attitudes) and economic factors in statistical models.

In conclusion, knowing that breast cancer knowledge and attitudes toward mammography have a positive influence on women's decision to seek BCPP may be useful in developing clinical- and community-based public health screening programs. Moreover, these public health programs may be integrated into the larger health reform initiative to improve efficiency, responsiveness, quality, and accessibility of the health care system in Kazakhstan. Kazakhstan has been adopting a preventive, community, and family oriented model of primary care. Breast cancer screening program may fit well with the overall direction of the health reform initiative that is aimed at healthcare delivery restructuring and strengthening of primary care and outpatient specialty services, introduction of economic incentives for prevention, and population involvement.

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Table 3 Analysis of variance showing statistically discernable differences for Kazakh, Korean, and Russian groups

	Kazakh (N = 124)	Korean (N = 250)	Russian (N = 125)	F value	p-value
Education in years (mean)	15.30	13.98	13.81	9.66	0.00
Having a history of any breast diseases (N = 73) (%)	22.58	9.92	16.13	10.99	0.00
Clinical Breast Examination (CBE) performed by physician (%)	65.32	58.00	70.16	5.68	0.06
How long ego you had a CBE (%)					
Recently (this or last year)	50.80	31.74	50.81	34.65	0.00
Two years ego	5.65	9.92	12.10		
More than 3 years ago	43.55	58.34	37.10		
Having had a mammogram (N = 61) (%)	22.31	6.40	14.63	22.41	0.00
Trust in public health programs to enhance your health (%)					
Don't know	7.26	5.56	5.69	25.42	0.01
A little or no benefit	24.20	32.14	44.72		
Great or moderate benefit	68.55	62.30	48.78		
Trust in primary care as a solution for your community health (%)		.			
Don't know	4.88	1.65	2.46	23.36	0.06
A little or no benefit	19.51	24.69	33.61		
Great or moderate benefit	75.61	73.66	61.48		
Use of ethnic medicines, herbs, and foods (sometimes or more often) (%)	40.32	51.19	60.49	20.99	0.01
Breast cancer preventive behavior					
Sum of breast cancer knowledge (1–16 range) (mean)	7.94	8.49	7.93	2.75	0.07
Attitudes (%)					
Early detection of breast cancer will increase the chance of being cured	81.45	71.43	60.48	13.31	0.00
Will not have a mammogram if my doctor expressed even a little doubt about whether I really needed one	61.29	66.67	52.82	14.47	0.07

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Address for correspondence

Askar Chukmaitov, MD, Ph.D.
Florida State University College of Medicine
1115 West Call Street, Suite 3200-C
Tallahassee, FL 32306-4300
Phone: (850) 645-6897
Fax: (850) 645-2859
askar.chukmaitov@med.fsu.edu